

*Richardson Flat Tailings Site
Screening Ecological Risk Assessment*

APPENDIX C

**ESTIMATION OF FOOD ITEM
TISSUE CONCENTRATIONS**

Plants
Earthworms
Small Mammals
Benthic Invertebrates

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APPENDIX C
Estimation of Benthic Invertebrate Tissue Concentrations from Sediment Data
Screening Ecological Risk Assessment for the Richardson Flat Tailings Site

Location	COPC	Detect Freq	Min	Max	Geomean	Mean	Stdev	UCL95		EPC	BSAF 90th Percentile	Benthic Conc (mg/kg dw)	Benthic Conc (mg/kg ww)
								Norm	LogNorm				
Silver Creek - upstream	Aluminum	6/6	3181.00	15220.00	8629.76	9998.17	5081.85	14188.98	22888.16	15220.00	1	15220.00	2283.00
	Antimony	6/6	39.00	889.00	137.80	245.83	323.59	512.69	2412.86	889.00	1	889.00	133.35
	Arsenic	6/7	33.00	1735.00	219.29	459.14	604.93	902.71	6483.72	1735.00	0.69	1197.15	179.57
	Cadmium	7/7	14.00	179.00	42.33	62.29	60.55	106.68	245.02	179.00	41.55	7437.45	1115.62
	Chromium	7/7	12.00	42.00	25.02	27.30	11.20	35.52	45.06	42.00	0.468	19.66	2.95
	Copper	7/7	47.60	2559.00	608.70	966.66	826.84	1572.94	13577.66	2559.00	23.87	61083.33	9162.50
	Lead	7/7	641.00	42990.00	4998.14	11004.43	14850.40	21893.50	301984.65	42990.00	0.607	26094.93	3914.24
	Mercury	6/7	0.10	1.60	0.41	0.57	0.51	0.95	2.24	1.60	2.868	4.59	0.69
	Selenium	4/7	5.00	33.50	15.09	19.07	11.82	27.74	59.57	32.00	1	32.00	4.80
	Silver	7/7	3.33	136.00	31.97	51.19	45.44	84.51	612.49	136.00	1	136.00	20.40
	Zinc	7/7	2330.00	44560.00	8257.95	12930.57	14756.16	23750.54	59831.80	44560.00	7.527	335403.12	50310.47
	Silver Creek - downstream	Aluminum	4/4	8943.00	11590.00	10383.47	10438.00	1216.75	11867.68	12026.22	11590.00	1	11590.00
Antimony		4/4	97.00	140.00	122.74	124.00	19.65	147.09	154.10	140.00	1	140.00	21.00
Arsenic		4/4	177.00	341.00	271.46	280.25	75.53	369.00	432.66	341.00	0.69	235.29	35.29
Cadmium		4/4	29.00	58.00	42.00	43.50	12.97	58.74	67.71	58.00	41.55	2409.90	361.49
Chromium		4/4	21.00	32.00	26.91	27.25	4.86	32.96	34.70	32.00	0.468	14.98	2.25
Copper		4/4	430.00	766.00	584.34	596.50	137.30	757.83	811.65	766.00	23.87	18284.42	2742.66
Lead		4/4	4861.00	11130.00	6878.41	7223.25	2739.70	10442.39	12553.65	11130.00	0.607	6755.91	1013.39
Mercury		4/4	0.11	0.44	0.22	0.25	0.14	0.41	0.77	0.44	2.868	1.26	0.19
Selenium		4/4	5.00	11.00	8.82	9.25	2.87	12.62	16.99	11.00	1	11.00	1.65
Silver		4/4	28.00	49.00	37.23	38.00	8.83	48.38	51.56	49.00	1	49.00	7.35
Zinc		4/4	6780.00	11950.00	8964.73	9314.00	2918.16	12742.84	14737.98	11950.00	7.527	89947.65	13492.15
South Diversion Ditch		Aluminum	7/7	4850.00	20600.00	8644.57	9538.57	5188.37	13342.95	15125.44	15125.44	1	15125.44
	Antimony	7/7	36.00	97.00	65.32	68.43	21.46	84.17	92.87	92.87	1	92.87	13.93
	Arsenic	7/7	101.00	205.00	129.00	132.71	36.59	159.54	162.87	162.87	0.69	112.38	16.86
	Cadmium	7/7	18.00	73.00	40.19	43.29	17.09	55.81	66.18	66.18	41.55	2749.83	412.48
	Chromium	7/7	16.00	30.00	19.46	19.86	4.71	23.31	23.52	23.52	0.468	11.01	1.65
	Copper	7/7	173.00	280.00	230.34	233.29	38.99	261.87	269.63	269.63	23.87	6436.00	965.40
	Lead	7/7	1880.00	3490.00	2548.27	2590.00	508.07	2962.54	3041.88	3041.88	0.607	1846.42	276.96
	Mercury	7/7	0.32	1.60	0.95	1.05	0.44	1.37	1.89	1.60	2.868	4.59	0.69
	Selenium	3/7	2.50	8.00	3.69	4.14	2.23	5.78	6.98	6.98	1	6.98	1.05
	Silver	7/7	13.00	25.00	17.74	18.14	4.14	21.18	21.94	21.94	1	21.94	3.29
	Zinc	7/7	2940.00	12000.00	7281.82	7811.43	2744.78	9824.04	12099.50	12000.00	7.527	90324.00	13548.60
	Wetlands Area	Aluminum	5/5	1930.00	28800.00	9659.25	15072.00	12825.66	27289.27	664196.01	28800.00	1	28800.00
Antimony		5/5	40.10	99.00	79.85	84.04	25.19	108.04	144.44	99.00	1	99.00	14.85
Arsenic		5/5	128.00	310.00	195.60	203.60	66.08	266.54	299.77	299.77	0.69	206.84	31.03
Barium		5/5	92.10	562.00	230.36	275.62	180.96	448.00	1022.40	562.00	1	562.00	84.30
Cadmium		5/5	40.30	93.10	62.74	65.34	20.37	84.75	97.43	93.10	41.55	3868.31	580.25
Chromium		5/5	14.90	62.40	29.19	35.16	23.12	57.19	130.42	62.40	0.468	29.20	4.38
Cobalt		5/5	5.80	20.00	12.56	13.78	6.01	19.50	30.28	20.00	5.25	105.00	15.75
Copper		5/5	183.00	725.00	339.43	396.40	241.64	626.58	1157.22	725.00	23.87	17305.75	2595.86
Lead		5/5	2350.00	6520.00	4314.48	4662.00	1886.42	6458.93	9405.13	6520.00	0.607	3957.64	593.65
Manganese		5/5	2200.00	42000.00	5078.18	10938.00	17401.75	27514.29	426571.78	42000.00	1	42000.00	6300.00
Mercury		5/5	1.30	8.20	3.33	4.10	2.86	6.83	16.85	8.20	2.868	23.52	3.53
Nickel		5/5	13.20	97.20	35.73	44.90	32.97	76.30	233.95	97.20	2.32	225.50	33.83
Selenium		5/5	9.90	43.10	15.33	18.18	14.03	31.54	48.52	43.10	1	43.10	6.47
Silver		5/5	8.00	41.30	17.47	20.90	13.79	34.04	75.56	41.30	1	41.30	6.20
Thallium		5/5	6.60	13.60	8.27	8.58	2.85	11.30	12.16	12.16	1	12.16	1.82
Vanadium		5/5	9.50	70.60	29.46	38.34	27.95	64.97	289.48	70.60	1	70.60	10.59
Zinc		5/5	5400.00	15200.00	9903.53	10532.00	3837.33	14187.31	18484.37	15200.00	7.527	114410.40	17161.56

BJC, 1998. Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Oak Ridge Reservation. BJC-OR-112. US Dept. of Energy. August 1998.
EPC is equal to the estimated benthic invertebrate concentration based on the minimum of the 95UCL and the maximum in sediment.

Benthic tissue concentrations were estimated using the equation: conc in benthics dw)=BSAF * conc in sediment dw
Dry weight concentrations were converted to wet weight using a conversion factor (CF) of 0.15 [USFWS, 1998]. ww = dw * CF

APPENDIX C
Estimation of Terrestrial Plant Tissue Concentrations from Site Soil and Tailings Data
Screening Ecological Risk Assessment for the Richardson Flat Tailings Site

Location	COPC	Detect Freq	Min	Max	Geomean	Mean	Stdev	UCL95		EPC	BAF Parameters		Plant Conc (mg/kg dw)	Plant Conc (mg/kg ww)
								Norm	LogNorm		B ₀	B ₁		
Background Soils	Arsenic	11/11	6.70	14.00	8.52	8.77	2.35	10.05	10.14	10.14	-1.992	0.564	0.50	0.27
	Barium	3/3	213.00	265.00	234.00	235.00	26.91	280.36	292.98	265.00	na	na	na	na
	Cadmium	1/3	0.25	1.00	0.40	0.50	0.43	1.23	200.13	1.00	-0.476	0.546	0.62	0.33
	Chromium	3/3	20.00	23.00	21.63	21.67	1.53	24.24	24.92	23.00	na	na	na	na
	Copper	3/3	15.00	29.00	19.09	20.00	7.81	33.17	78.00	29.00	0.669	0.394	7.36	3.90
	Lead	11/11	22.00	98.00	36.74	41.91	25.65	55.91	58.67	58.67	-1.328	0.561	2.60	1.38
	Mercury	1/3	0.05	0.15	0.07	0.08	0.06	0.18	2.92	0.15	-0.996	0.544	0.13	0.07
	Selenium	0/3	2.50	2.50	2.50	2.50	0.00	2.50	2.50	2.50	-0.678	1.104	1.40	0.74
	Silver	0/3	2.50	2.50	2.50	2.50	0.00	2.50	2.50	2.50	na	na	na	na
Zinc	3/3	90.00	127.00	103.14	104.33	19.86	137.81	160.68	127.00	1.575	0.555	71.06	37.66	
Off-Impoundment Soils	Arsenic	69/69	6.00	316.00	13.51	29.93	62.54	42.50	28.24	42.50	-1.992	0.564	1.13	0.60
	Barium	14/14	188.00	413.00	274.29	285.07	84.09	324.85	331.38	331.38	na	na	na	na
	Cadmium	11/14	0.25	43.00	1.25	4.98	11.67	10.50	15.30	15.30	-0.476	0.546	2.75	1.46
	Chromium	14/14	20.00	31.00	22.36	22.57	3.46	24.21	24.12	24.21	na	na	na	na
	Copper	14/14	20.00	112.00	33.35	37.79	24.43	49.34	48.74	49.34	0.669	0.394	9.07	4.81
	Lead	69/69	17.00	6265.00	90.87	523.46	1405.41	806.01	496.03	806.01	-1.328	0.561	11.32	6.00
	Mercury	4/14	0.05	3.20	0.10	0.49	1.10	1.02	1.32	1.32	-0.996	0.544	0.43	0.23
	Selenium	0/14	2.50	2.50	2.50	2.50	0.00	2.50	2.50	2.50	-0.678	1.104	1.40	0.74
	Silver	0/14	2.50	2.50	2.50	2.50	0.00	2.50	2.50	2.50	na	na	na	na
Zinc	14/14	65.00	1800.00	183.83	319.64	478.99	546.23	550.85	550.85	1.575	0.555	160.43	85.03	
On-Impoundment Soils	Aluminum	11/11	17600.00	26100.00	21834.07	22009.09	2890.83	23586.72	23738.97	23738.97	na	na	na	na
	Antimony	1/11	2.50	10.00	2.84	3.18	2.26	4.42	4.04	4.42	na	na	na	na
	Arsenic	52/58	2.50	121.00	11.27	18.80	23.81	24.05	23.78	24.05	-1.992	0.564	0.82	0.43
	Barium	13/13	175.00	365.00	236.31	243.23	64.35	275.00	277.01	277.01	na	na	na	na
	Cadmium	9/24	0.25	6.00	0.55	1.11	1.56	1.66	2.03	2.03	-0.476	0.546	0.92	0.48
	Chromium	24/24	16.00	39.00	22.21	22.63	4.83	24.31	24.25	24.31	na	na	na	na
	Copper	24/24	13.00	99.00	29.02	33.92	23.08	41.97	41.52	41.97	0.669	0.394	8.51	4.51
	Lead	58/58	13.00	3239.00	72.21	283.29	600.09	415.67	428.97	428.97	-1.328	0.561	7.94	4.21
	Mercury	7/24	0.05	1.50	0.09	0.20	0.34	0.32	0.30	0.32	-0.996	0.544	0.20	0.11
	Selenium	0/24	2.50	2.50	2.50	2.50	0.00	2.50	2.50	2.50	-0.678	1.104	1.40	0.74
	Silver	0/24	2.50	2.50	2.50	2.50	0.00	2.50	2.50	2.50	na	na	na	na
Zinc	24/24	47.00	1010.00	131.32	212.50	261.61	303.81	314.05	314.05	1.575	0.555	117.45	62.25	
Site Tailings	Aluminum	40/40	813.00	32700.00	4071.60	7541.35	9038.98	9970.97	11034.40	11034.40	na	na	na	na
	Antimony	33/40	2.50	505.00	57.88	130.15	121.20	162.72	626.21	505.00	na	na	na	na
	Arsenic	49/49	6.60	637.00	147.60	236.98	149.14	272.78	595.62	595.62	-1.992	0.564	5.01	2.66
	Cadmium	43/46	0.25	250.00	22.34	46.42	46.82	58.02	212.38	212.38	-0.476	0.546	11.58	6.14
	Chromium	39/40	2.50	111.00	18.16	22.66	19.33	27.86	28.03	28.03	na	na	na	na
	Copper	48/48	20.00	1323.00	243.01	377.00	321.34	454.92	643.91	643.91	0.669	0.394	24.96	13.23
	Lead	46/46	19.00	31600.00	2154.97	5468.63	6153.05	6992.76	44489.30	31600.00	-1.328	0.561	88.63	46.97
	Mercury	40/45	0.05	85.00	1.59	5.51	13.15	8.81	17.06	17.06	-0.996	0.544	1.73	0.92
	Selenium	26/40	0.98	24.00	6.34	8.52	5.97	10.13	12.08	12.08	-0.678	1.104	7.94	4.21
	Silver	38/46	2.50	120.00	19.31	31.17	28.20	38.15	56.45	56.45	na	na	na	na
Zinc	47/47	97.00	33800.00	4046.74	7438.11	6630.33	9062.89	22053.08	22053.08	1.575	0.555	1243.48	659.05	

BAF Parameters from BJC, 1998. Empirical Models for the Uptake of Inorganic Chemicals from Soil by Plants. BJC-OR-133. US Dept. of Energy
EPC is equal to the estimated plant concentration based on the minimum of the 95UCL and the maximum in soil.

Plant tissue concentrations were estimated using the equation: $\ln(\text{conc in plant dw}) = B_0 + B_1(\ln[\text{conc in soil dw}])$
Dry weight concentrations were converted to wet weight using a conversion factor (CF) of 0.53 [DOI, 1998]. $\text{ww} = \text{dw} * \text{CF}$

APPENDIX C
Estimation of Small Mammal Tissue Concentrations from Site Soil and Tailings Data

Screening Ecological Risk Assessment for the Richardson Flat Tailings Site

Location	COPC	Detect Freq	Min	Max	Geomean	Mean	Stdev	UCL95		EPC	BAF Parameters												Max of Mammal Trophic Groups (mg/kg dw)	Max of Mammal Trophic Groups (mg/kg ww)
								Norm	LogNorm		Insectivore				Herbivore				Omnivore					
											B ₀	B ₁	Median UF	Tissue Conc (mg/kg dw)	B ₀	B ₁	Median UF	Tissue Conc (mg/kg dw)	B ₀	B ₁	Median UF	Tissue Conc (mg/kg dw)		
Background Soils	Arsenic	11/11	6.70	14.00	8.52	8.77	2.35	10.05	10.14	10.14	-4.8471	0.8188	na	0.05	-5.6531	1.1382	na	0.05	-4.5796	0.7354	na	0.06	0.06	0.04
	Barium	3/3	213.00	265.00	234.00	235.00	26.91	280.36	292.98	265.00	na	na	0.0168	4.45	na	na	0.0168	4.45	na	na	0.0168	4.45	4.45	3.03
	Cadmium	1/3	0.25	1.00	0.40	0.50	0.43	1.23	200.13	1.00	0.815	0.9638	na	2.26	-1.2571	0.4723	na	0.28	-1.5383	0.566	na	0.21	2.26	1.54
	Chromium	3/3	20.00	23.00	21.63	21.67	1.53	24.24	24.92	23.00	-1.4599	0.7338	na	2.32	na	na	0.0774	1.78	-1.4599	0.7338	na	2.32	2.32	1.58
	Copper	3/3	15.00	29.00	19.09	20.00	7.81	33.17	78.00	29.00	2.1042	0.1783	na	14.95	na	na	0.0525	1.52	1.4592	0.2681	na	10.61	14.95	10.16
	Lead	11/11	22.00	98.00	36.74	41.91	25.65	55.91	58.67	58.67	0.4819	0.4869	na	11.76	-0.6114	0.5181	na	4.47	0.0761	0.4422	na	6.53	11.76	8.00
	Mercury	1/3	0.05	0.15	0.07	0.08	0.06	0.18	2.92	0.15	na	na	0.0543	0.01	na	na	0.0543	0.01	na	na	0.0543	0.01	0.01	0.01
	Selenium	0/3	2.50	2.50	2.50	2.50	0.00	2.50	2.50	2.50	-0.4158	0.3764	na	0.93	-0.4158	0.3764	na	0.93	-0.4158	0.3764	na	0.93	0.93	0.63
	Silver	0/3	2.50	2.50	2.50	2.50	0.00	2.50	2.50	2.50	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	Zinc	3/3	90.00	127.00	103.14	104.33	19.86	137.81	160.68	127.00	4.4713	0.0738	na	125.06	4.4713	0.0738	na	125.06	4.4713	0.0738	na	125.06	125.06	85.04
Off-impoundment Soils	Arsenic	69/69	6.00	316.00	13.51	29.93	62.54	42.50	28.24	42.50	-4.8471	0.8188	na	0.17	-5.6531	1.1382	na	0.25	-4.5796	0.7354	na	0.16	0.25	0.17
	Barium	14/14	188.00	413.00	274.29	285.07	84.09	324.85	331.38	331.38	na	na	0.0168	5.57	na	na	0.0168	5.57	na	na	0.0168	5.57	5.57	3.79
	Cadmium	11/14	0.25	43.00	1.25	4.98	11.67	10.50	15.30	15.30	0.815	0.9638	na	31.32	-1.2571	0.4723	na	1.03	-1.5383	0.566	na	1.01	31.32	21.29
	Chromium	14/14	20.00	31.00	22.36	22.57	3.46	24.21	24.12	24.21	-1.4599	0.7338	na	2.41	na	na	0.0774	1.87	-1.4599	0.7338	na	2.41	2.41	1.64
	Copper	14/14	20.00	112.00	33.35	37.79	24.43	49.34	48.74	49.34	2.1042	0.1783	na	16.43	na	na	0.0525	2.59	1.4592	0.2681	na	12.24	16.43	11.18
	Lead	69/69	17.00	6265.00	90.87	523.46	1405.41	806.01	496.03	806.01	0.4819	0.4869	na	42.11	-0.6114	0.5181	na	17.39	0.0761	0.4422	na	20.81	42.11	28.63
	Mercury	4/14	0.05	3.20	0.10	0.49	1.10	1.02	1.32	1.32	na	na	0.0543	0.07	na	na	0.0543	0.07	na	na	0.0543	0.07	0.07	0.05
	Selenium	0/14	2.50	2.50	2.50	2.50	0.00	2.50	2.50	2.50	-0.4158	0.3764	na	0.93	-0.4158	0.3764	na	0.93	-0.4158	0.3764	na	0.93	0.93	0.63
	Silver	0/14	2.50	2.50	2.50	2.50	0.00	2.50	2.50	2.50	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	Zinc	14/14	65.00	1800.00	183.83	319.64	478.99	546.23	550.85	550.85	4.4713	0.0738	na	139.36	4.4713	0.0738	na	139.36	4.4713	0.0738	na	139.36	139.36	94.77
On-impoundment Soils	Aluminum	11/11	17600.00	26100.00	21834.07	22009.09	2890.83	23586.72	23738.97	23738.97	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	Antimony	1/11	2.50	10.00	2.84	3.18	2.26	4.42	4.04	4.42	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	Arsenic	52/58	2.50	121.00	11.27	18.80	23.81	24.05	23.78	24.05	-4.8471	0.8188	na	0.11	-5.6531	1.1382	na	0.13	-4.5796	0.7354	na	0.11	0.13	0.09
	Barium	13/13	175.00	365.00	236.31	243.23	64.35	275.00	277.01	277.01	na	na	0.0168	4.65	na	na	0.0168	4.65	na	na	0.0168	4.65	4.65	3.16
	Cadmium	9/24	0.25	6.00	0.55	1.11	1.56	1.66	2.03	2.03	0.815	0.9638	na	4.48	-1.2571	0.4723	na	0.40	-1.5383	0.566	na	0.32	4.48	3.04
	Chromium	24/24	16.00	39.00	22.21	22.63	4.83	24.31	24.25	24.31	-1.4599	0.7338	na	2.41	na	na	0.0774	1.88	-1.4599	0.7338	na	2.41	2.41	1.64
	Copper	24/24	13.00	99.00	29.02	33.92	23.08	41.97	41.52	41.97	2.1042	0.1783	na	15.97	na	na	0.0525	2.20	1.4592	0.2681	na	11.72	15.97	10.86
	Lead	58/58	13.00	3239.00	72.21	283.29	600.09	415.67	428.97	428.97	0.4819	0.4869	na	30.98	-0.6114	0.5181	na	12.54	0.0761	0.4422	na	15.74	30.98	21.06
	Mercury	7/24	0.05	1.50	0.09	0.20	0.34	0.32	0.30	0.32	na	na	0.0543	0.02	na	na	0.0543	0.02	na	na	0.0543	0.02	0.02	0.01
	Selenium	0/24	2.50	2.50	2.50	2.50	0.00	2.50	2.50	2.50	-0.4158	0.3764	na	0.93	-0.4158	0.3764	na	0.93	-0.4158	0.3764	na	0.93	0.93	0.63
Silver	0/24	2.50	2.50	2.50	2.50	0.00	2.50	2.50	2.50	na	na	na	na	na	na	na	na	na	na	na	na	na	na	
Zinc	24/24	47.00	1010.00	131.32	212.50	261.61	303.81	314.05	314.05	4.4713	0.0738	na	133.70	4.4713	0.0738	na	133.70	4.4713	0.0738	na	133.70	133.70	90.92	
Site Tailings	Aluminum	40/40	813.00	32700.00	4071.60	7541.35	9038.98	9970.97	11034.40	11034.40	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	Antimony	33/40	2.50	505.00	57.88	130.15	121.20	162.72	626.21	505.00	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	Arsenic	49/49	6.00	637.00	147.60	236.98	149.14	272.78	595.62	595.62	-4.8471	0.8188	na	1.47	-5.6531	1.1382	na	5.05	-4.5796	0.7354	na	1.13	5.05	3.43
	Cadmium	43/46	0.25	250.00	22.34	46.42	46.82	58.02	212.38	212.38	0.815	0.9638	na	395.21	-1.2571	0.4723	na	3.57	-1.5383	0.566	na	4.46	395.21	268.74
	Chromium	39/40	2.50	111.00	18.16	22.66	19.33	27.86	28.03	28.03	-1.4599	0.7338	na	2.68	na	na	0.0774	2.17	-1.4599	0.7338	na	2.68	2.68	1.82
	Copper	48/48	20.00	1323.00	243.01	377.00	321.34	454.92	643.91	643.91	2.1042	0.1783	na	25.98	na	na	0.0525	33.81	1.4592	0.2681	na	24.37	33.81	22.99
	Lead	46/46	19.00	31600.00	2154.97	5468.63	6153.05	6992.76	44489.30	31600.00	0.4819	0.4869	na	251.30	-0.6114	0.5181	na	116.35	0.0761	0.4422	na	105.39	251.30	170.88
	Mercury	40/45	0.05	85.00	1.59	5.51	13.15	8.81	17.06	17.06	na	na	0.0543	0.93	na	na	0.0543	0.93	na	na	0.0543	0.93	0.93	0.63
	Selenium	26/40	0.98	24.00	6.34	8.52	5.97	10.13	12.08	12.08	-0.4158	0.3764	na	1.69	-0.4158	0.3764	na	1.69	-0.4158	0.3764	na	1.69	1.69	1.15
	Silver	38/46	2.50	120.00	19.31	31.17	28.20	38.15	56.45	56.45	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Zinc	47/47	97.00	33800.00	4046.74	7438.11	6630.33	9062.89	22053.08	22053.08	4.4713	0.0738	na	182.98	4.4713	0.0738	na	182.98	4.4713	0.0738	na	182.98	182.98	124.43	

BAF Parameters from ERP, 1998, Development and Validation of Bioaccumulation Models for Small Mammals. ES/ER-TM-219, US Dept of Energy
EPC is equal to the estimated small mammal concentration based on the minimum of the 95UCL and the maximum in soil.

Small mammal tissue concentrations were estimated using the equation: $\ln(\text{conc in small mammals dw}) = \ln(\text{conc in soil dw}) + \ln(\text{CF})$
Dry weight concentrations were converted to wet weight using a conversion factor (CF) of 0.68 [EPA, 1993]. $\text{ww} = \text{dw} * \text{CF}$

APPENDIX C
Estimation of Earthworm Tissue Concentrations from Site Soil and Tailings Data
Screening Ecological Risk Assessment for the Richardson Flat Tailings Site

Location	COPC	Detect Freq	Min	Max	Geomean	Mean	Stddev	UCL95		EPC	BAF Parameters		Earthworm Conc (mg/kg dw)	Earthworm Conc (mg/kg ww)
								Norm	LogNorm		B ₀	B ₁		
								Background Soils	Arsenic		11/11	6.70		
Barium	3/3	213.00	265.00	234.00	235.00	26.91	280.36		292.98	265.00	na	na	na	na
Cadmium	1/3	0.25	1.00	0.40	0.50	0.43	1.23		200.13	1.00	2.114	0.795	8.28	6.96
Chromium	3/3	20.00	23.00	21.63	21.67	1.53	24.24		24.92	23.00	0	0	1.00	0.84
Copper	3/3	15.00	29.00	19.09	20.00	7.81	33.17		78.00	29.00	1.675	0.264	12.99	10.91
Lead	11/11	22.00	98.00	36.74	41.91	25.65	55.91		58.67	58.67	-0.218	0.807	21.50	18.06
Mercury	1/3	0.05	0.15	0.07	0.08	0.06	0.18		2.92	0.15	0.0781	0.3369	0.57	0.48
Selenium	0/3	2.50	2.50	2.50	2.50	0.00	2.50		2.50	2.50	-0.075	0.733	1.82	1.53
Silver	0/3	2.50	2.50	2.50	2.50	0.00	2.50		2.50	2.50	na	na	na	na
Zinc	3/3	90.00	127.00	103.14	104.33	19.86	137.81	160.68	127.00	4.449	0.328	419.01	351.97	
Off-Impoundment Soils	Arsenic	69/69	6.00	316.00	13.51	29.93	62.54	42.50	28.24	42.50	-1.421	0.706	3.41	2.86
	Barium	14/14	188.00	413.00	274.29	285.07	84.09	324.85	331.38	331.38	na	na	na	na
	Cadmium	11/14	0.25	43.00	1.25	4.98	11.67	10.50	15.30	15.30	2.114	0.795	72.43	60.84
	Chromium	14/14	20.00	31.00	22.36	22.57	3.46	24.21	24.12	24.21	0	0	1.00	0.84
	Copper	14/14	20.00	112.00	33.35	37.79	24.43	49.34	48.74	49.34	1.675	0.264	14.94	12.55
	Lead	69/69	17.00	6265.00	90.87	523.46	1405.41	806.01	496.03	806.01	-0.218	0.807	178.13	149.63
	Mercury	4/14	0.05	3.20	0.10	0.49	1.10	1.02	1.32	1.32	0.0781	0.3369	1.19	1.00
	Selenium	0/14	2.50	2.50	2.50	2.50	0.00	2.50	2.50	2.50	-0.075	0.733	1.82	1.53
	Silver	0/14	2.50	2.50	2.50	2.50	0.00	2.50	2.50	2.50	na	na	na	na
Zinc	14/14	65.00	1800.00	183.83	319.64	478.99	546.23	550.85	550.85	4.449	0.328	678.01	569.53	
On-Impoundment Soils	Aluminum	11/11	17600.00	26100.00	21834.07	22009.09	2890.83	23586.72	23738.97	23738.97	na	na	na	na
	Antimony	1/11	2.50	10.00	2.84	3.18	2.26	4.42	4.04	4.42	na	na	na	na
	Arsenic	52/58	2.50	121.00	11.27	18.80	23.81	24.05	23.78	24.05	-1.421	0.706	2.28	1.92
	Barium	13/13	175.00	365.00	236.31	243.23	64.35	275.00	277.01	277.01	na	na	na	na
	Cadmium	9/24	0.25	6.00	0.55	1.11	1.56	1.66	2.03	2.03	2.114	0.795	14.55	12.23
	Chromium	24/24	16.00	39.00	22.21	22.63	4.83	24.31	24.25	24.31	0	0	1.00	0.84
	Copper	24/24	13.00	99.00	29.02	33.92	23.08	41.97	41.52	41.97	1.675	0.264	14.32	12.03
	Lead	58/58	13.00	3239.00	72.21	283.29	600.09	415.67	428.97	428.97	-0.218	0.807	107.08	89.94
	Mercury	7/24	0.05	1.50	0.09	0.20	0.34	0.32	0.30	0.32	0.0781	0.3369	0.74	0.62
	Selenium	0/24	2.50	2.50	2.50	2.50	0.00	2.50	2.50	2.50	-0.075	0.733	1.82	1.53
	Silver	0/24	2.50	2.50	2.50	2.50	0.00	2.50	2.50	2.50	na	na	na	na
Zinc	24/24	47.00	1010.00	131.32	212.50	261.61	303.81	314.05	314.05	4.449	0.328	563.89	473.67	
Site Tailings	Aluminum	40/40	813.00	32700.00	4071.60	7541.35	9038.98	9970.97	11034.40	11034.40	na	na	na	na
	Antimony	33/40	2.50	505.00	57.88	130.15	121.20	162.72	626.21	505.00	na	na	na	na
	Arsenic	49/49	6.60	637.00	147.60	236.98	149.14	272.78	595.62	595.62	-1.421	0.706	21.98	18.46
	Cadmium	43/46	0.25	250.00	22.34	46.42	46.82	58.02	212.38	212.38	2.114	0.795	586.35	492.54
	Chromium	39/40	2.50	111.00	18.16	22.66	19.33	27.86	28.03	28.03	0	0	1.00	0.84
	Copper	48/48	20.00	1323.00	243.01	377.00	321.34	454.92	643.91	643.91	1.675	0.264	29.44	24.73
	Lead	46/46	19.00	31600.00	2154.97	5468.63	6153.05	6992.76	44489.30	31600.00	-0.218	0.807	3440.10	2889.69
	Mercury	40/45	0.05	85.00	1.59	5.51	13.15	8.81	17.06	17.06	0.0781	0.3369	2.81	2.36
	Selenium	26/40	0.98	24.00	6.34	8.52	5.97	10.13	12.08	12.08	-0.075	0.733	5.76	4.84
	Silver	38/46	2.50	120.00	19.31	31.17	28.20	38.15	56.45	56.45	na	na	na	na
Zinc	47/47	97.00	33800.00	4046.74	7438.11	6630.33	9062.89	22053.08	22053.08	4.449	0.328	2274.23	1910.35	

BAF Parameters from ERP, 1998. Development and Validation of Bioaccumulation Models for Earthworms. ES/ER/TM-220, US Dept of Energy
EPC is equal to the estimated earthworm concentration based on the minimum of the 95UCL and the maximum in soil.

Earthworm tissue concentrations were estimated using the equation: $\ln(\text{conc in earthworm dw}) = B_0 + B_1(\ln[\text{conc in soil dw}])$
Dry weight concentrations were converted to wet weight using a conversion factor (CF) of 0.84 [EPA, 1993]. $\text{ww} = \text{dw} * \text{CF}$