SECTION 8

PRELIMINARY SITE CHARACTERIZATION HISTORIC TAILINGS SPILL INVESTIGATION TECHNICAL MEMORANDUM

MOLYCORP MINE RI/FS

REVISION 0

Prepared for
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SECTIONEIGHT Historic Tailings Spill Investigation

This section presents and summarizes analyte concentrations and field data collected to assess impacts of historical tailings spills from the Molycorp tailings pipeline. On November 29, 2000, a comprehensive study of the historic tailings spills at the Molycorp Mine was required by the NMED as documented in the permit modification to Discharge Permit 933 (Permit Condition 42, in accordance with 20 NMAC 6.2 Subpart IV). In response, Molycorp developed the *Work Plan for the Comprehensive Study of Historic Tailings Spills and Potential Associated Impacts to Water Quality* (URS 2001). The Work Plan was a stepped investigation that included a review of documentation relating to the spills, field reconnaissance to locate and map the spills, sampling and analysis of the tailings spills, and reporting of results.

The investigation of historic spills was incorporated into the RI/FS. On January 12, 2004, the EPA expanded the study to include an investigation of Hunt's Pond, three private residences, and selected ditch samples (EPA 2004). Hunt's Pond is a small pond located south of the town of Questa. Small amounts of tailings were found at Hunt's Pond during excavations at the pond in 2000 and 2003. Soils and groundwater at nearby private residences and sediments from the irrigation ditch that runs behind these private residences were also sampled at the request of EPA. Investigations at these sites were included in the *Sampling and Analysis Plan for Investigating Historic Tailings Spill Deposits* (URS 2004b) which was finalized April 30, 2004. Results of the investigation of the historic tailings spills, including the additional studies, were presented in the *Draft Final Report on Historical Tailings Spills Molycorp Mine, Questa, NM* (URS 2004a).

This section of the Preliminary Site Characterization Report discusses the analytical results from tailings and soil samples relating directly to pipeline spills. Results of all other analyses, including groundwater and samples at Hunt's Pond, the private residences, and the ditches, are discussed in the appropriate section for each sample medium.

The tailings spills were mapped along the current pipeline corridor and the historical pipeline right-of-way during a field reconnaissance in May 2002 (Figure 8-1). Individual deposits of tailings were mapped from just west of the mill site (Sites 1 and 2) to the Tailings Facility (Sites 36 and 38). Tailings spills that were estimated to contain greater than 10 cubic yards of tailings are colored green on the figure. Yellow squares indicate spills containing fewer than 10 cubic yards of tailings. Sites 40, 41, and 42 are located adjacent to the Upper Dump Sump and are colored orange. The tailings that were originally mapped in this area were removed in the fall of 2003 at the direction of NMED.

The historic tailings spills and associated soils were sampled from May 7 to May 12, 2004. Samples were collected from tailings spills containing greater than 10 cubic yards of tailings. At each of these spills, three samples were collected. One sample was collected from the spilled tailings, a second sample was collected to a depth of 1 foot below the tailings, and a third sample was collected from soils adjacent to the tailings. The adjacent soils were located upgradient from any potential tailings spill and were unimpacted by tailings deposition. Therefore, they were used as reference for the tailings and sub-tailings soil samples.

Two sites contained much larger amounts of tailings than the other sites. Site 8, located on Molycorp property, contained an estimated 3,030 cubic yards of tailings. Site 42, located at the

Upper Dump Sump and also on Molycorp property, contained approximately 3,882 cubic yards of tailings. Together these two sites comprise 88 percent of all the tailings mapped. Because these sites represented a larger portion of the total amount of tailings deposited, multiple samples were collected at each one. Twenty-four samples were collected at Site 8: eight each of tailings, sub-tailings soil, and adjacent soil. Eight sub-tailings soils and adjacent soils were collected at Site 42. Eight tailings samples were originally planned at this site, but the tailings had been removed.

Most tailings deposits were less than 2 feet thick. The most notable exception was at the Lower Dump Sump where tailings were found to be 8 feet thick at what appears to be the lowest point in the basin in which they were deposited. A bobcat with an auger attachment was used to sample across the depth of the tailings, but was unable to reach deep enough to sample the underlying soils. A backhoe accessed the underlying soils at a depth of 8 feet. The soil sample was collected from material brought to the surface with the backhoe. The tailings in this area were covered by 6 to 12 inches of soil that has naturally revegetated.

Tailings and soil samples were sieved using a 10 um sieve and the finer material saved for analysis. All soil samples were analyzed for metal concentrations and inorganic parameters (chloride, fluoride, nitrate, pH, phosphorus, percent solids, specific conductance, sulfate, TKN, and TOC). Metal concentrations were determined by ICP-MS, ICP-AES, and CV-AA. For ICP-MS and ICP-AES, samples were prepared using an EPA 3050B digestion that employs nitric acid and peroxide to dissolve the sample.

The Synthetic Precipitation Leaching Procedure (SPLP; EPA Method 1312) was conducted on three tailings samples to assess the solubility of the material. The SPLP test was designed to simulate weathering of soils. The procedure combines a solid material with a leach solution with the pH adjusted to 5.0. The solid is combined with the leach solution in a 1:20 ratio. The mixture is agitated end-over-end, and the solution is extracted for analysis by ICP – MS.

Some data were rejected during the data validation process. The details of the QA process are discussed in Section 15.0 QA Summary of the Preliminary Site Characterization.

Rejected data are noted in the sections below.

The raw data for the tailings and soil samples are provided in Appendix A-8a, and the data are summarized in Tables 8-1 through 8-4. These summary tables contain the number of samples collected; the percent detection of each analyte; and the minimum, maximum, mean, and median values. The summary tables also contain EPA Region 6 Risk-Based SLC for human health and EPA Region 6 Tier 1-3 compound screening values for inorganic constituents, where appropriate. Soil Data Quality Objectives (URS 2002d) require comparison of analyte concentrations to these SLC as a first step in the DQO process.

The following sections present the results of analyses of the spilled tailings and the associated soil samples. Section 8.5 Summary discusses analyte concentrations that exceed human health or ecological SLC, and compares the results in each area to the appropriate reference area.

8.1 ADJACENT (REFERENCE) SOIL SAMPLES

Data for the adjacent soils are summarized in Table 8-1. Thirty-five adjacent soils were collected. Six of these samples were analyzed for cyanide.

CEC, organic soils, pH, phosphorus concentration, percent solids, specific conductance, and TOC were determined for all samples. Chloride, fluoride, and TKN were detected in 97 percent of samples, nitrate was detected in 94 percent of samples, and sulfate and SAR were detected in 80 percent of samples. Cyanide was not detected in any sample.

Aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, potassium, vanadium, and zinc were detected in all samples. Antimony was detected in 6 percent of samples and sodium was detected in 3 percent of samples. Selenium was detected in 14 percent of samples and boron and mercury were detected in 20 percent of samples. Silver and thallium were detected in 46 percent and 57 percent of samples, respectively.

8.2 TAILINGS SPILL SAMPLES

Data for the adjacent soils are summarized in Table 8-2. Twenty-six samples of spilled tailings were collected. Cyanide was analyzed in six samples.

CEC, chloride concentrations, fluoride concentrations, organic soils, pH, phosphorus concentrations, percent solids, specific conductance, sulfate concentrations, and TKN were determined in all samples. Nitrate was detected in 65 percent of samples. SAR and TOC were determined for 77 percent and 89 percent of samples, respectively.

Aluminum, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, potassium, vanadium, and zinc were detected in all samples. Antimony and boron were each detected in one sample. Arsenic was detected in 96 percent of samples and mercury was detected in 11 percent of samples. Selenium was detected in 15 percent of samples. Silver and thallium were detected in 89 percent and 85 percent of samples, respectively. Sodium was not detected in any samples.

8.3 SUB-TAILINGS SOIL SAMPLES

Data for the sub-tailings soils are summarized in Table 8-3. Thirty-five sub-tailings soils were collected. Cyanide was analyzed in six samples.

CEC, chloride concentrations, fluoride concentrations, organic soils, pH, phosphorus concentrations, percent solids, specific conductance, sulfate concentrations, and TKN were determined in all samples. Nitrate was detected in 77 percent of samples. SAR and TOC were determined for 94 percent and 91 percent of samples, respectively. Cyanide was not detected in any sample.

Aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, potassium, vanadium, and zinc were detected in

all samples. Antimony and selenium were detected in 6 percent of samples, boron was detected in 11 percent of samples, and mercury was detected in 9 percent of samples. Silver was detected in 74 percent of samples and thallium was detected in 57 percent of samples. Sodium was not detected in any samples.

8.4 SYNTHETIC PRECIPITATION LEACHING PROCEDURE

To determine the mobility of analytes in the tailings, SPLPs were conducted on TD7, TD24, and TD8C. TD8C is a composite of the eight samples collected at Site 8 (TD8-1 through TD8-8). Leachate data are summarized in Table 8-4. Validated analytical leachate data are provided in Appendix A-8b.

The solid samples TD7 and TD24 were analyzed for total metal concentrations. Samples TD8-1 through TD8-8 were also analyzed for metal concentrations, but the composite TD8C was not. Therefore, in the following discussion of the geochemistry of the solid samples, the analyses of individual samples collected at Site TD8 are compared to the geochemistry of TD7 and TD24.

TD7 and TD8-8 had different geochemical signatures than that of TD24 and the other samples collected at Site 8. These samples had low pH values and generally higher metal concentrations. TD7 and TD8-8 had paste pH values of 3.2 su and 3.4 su, respectively. As shown in Figure 8-2, TD8-7 had a pH of 6.1 su, whereas, TD24 and all other TD8 samples had pH values above 7 su In this and the following figures, TD7 is shown in yellow, TD-24 is shown in light blue, and the samples that comprise TD8C (i.e., TD8-1 through TD8-8) are shown in blue. The low pH of TD7 and TD8-8 indicate that these samples have little to no buffering capacity. This lack of buffering is also reflected in the greater metal concentrations in these two samples. TD7 had greater concentrations of arsenic, cadmium, chloride, cobalt, fluoride, iron, lead, molybdenum, selenium, and silver, and a higher specific conductance than all other samples. TD7 and TD8-8 also contained lower concentrations of calcium and manganese. Figures 8-3 and 8-4 show the distribution of molybdenum and cadmium, respectively.

TD24 had a sulfate concentration of 512 mg/kg, greater than the concentrations in the other samples, which ranged from 8 mg/kg to 217 mg/kg (Figure 8-5). Although the geochemistry of TD8-8 was similar in many aspects to that in TD7, it is one of eight samples in the composite TD8C. The overall geochemistry of this composite is more reflective of the geochemistry in the other samples. This is demonstrated in the analysis of the leachate samples.

The pH values of the SPLP leachates are shown in the table below. Two leachates were produced on each sample. The pH values for samples TD7 and TD24 reflect the paste pH values determined on the solid samples. The circum-neutral pH of TD8C reflects the pH values of TD8-1 through TD8-7, which had circum-neutral pH values. The low pH of TD8-8 is masked in the composite sample.

Sample	pH 1 (su)	pH 2 (su)
TD7	4.36	3.82
TD24	6.75	7.33
TD8C	6.85	7.68

The leachate data indicate that there were low concentrations of carbonate, bicarbonate, nitrite, and total alkalinity in TD7 compared to the other two samples. This is consistent with the lack of buffering capacity. The leach solution from TD7 had greater concentrations of aluminum, beryllium, cadmium, cobalt, copper, fluoride, iron, lead, magnesium, manganese, nickel, sulfate, and zinc than in TD24 or TD8C. The greater concentrations of these metals in this sample reflect the low pH of the sample. In contrast, the molybdenum concentration was lowest in the leachate from TD7 (0.002 mg/L), which had the greatest concentration in the solid sample (536 mg/kg). Molybdenum is more mobile at neutral pH, similar to that found in TD24 and 8C, and decreases in mobility at lower and higher pH ranges.

Data from the SPLP leachates are summarized in Table 8-4. The leachates were analyzed for inorganic parameters and metals.

Fluoride, phosphate, sulfate, and TKN were detected in all three leachate samples. Bicarbonate, carbonate, nitrate, nitrite, phosphorus, and total alkalinity were detected in two samples. Chloride was detected in one sample. The SPLP leachates were analyzed for cyanide, but the solids were not. Neither TD7 nor TD24 had detectable cyanide. TD8C had a detectable cyanide concentration of 11.9 mg/L. With a detection limit of 10 mg/L, the cyanide detected in TD8C is within analytical variability.

Aluminum, barium, calcium, copper, magnesium, manganese, molybdenum, and potassium were detected in all three samples. Arsenic, iron, and lead were each detected in two samples. Beryllium, cadmium, cobalt, nickel, silver, vanadium, and zinc were each detected in one sample. Antimony, boron, chromium, mercury, selenium, sodium, and thallium were not detected in any sample.

8.5 SUMMARY

This section compares the results of analysis of the tailings, sub-tailings soil, and adjacent tailings to the EPA Region 6 human health and ecological SLC and compares the tailings and sub-tailings soils to the reference (adjacent) soils.

The table below lists the analytes that exceed the human health and ecological SLC in each of the three groups of samples. Arsenic, iron, and molybdenum exceeded the human health SLC in at least one sample in the tailings, sub-tailings soils, and the adjacent soils. Antimony, barium, boron, cadmium, chromium, copper, lead, manganese, molybdenum, and vanadium exceeded the ecological SLC in the three groups of soils. Selenium and zinc also exceeded the ecological SLC in the tailings samples. In the adjacent soils, mercury and zinc exceeded the ecological SLC.

SLC (Sample Depth)	Metal Analytes Exceeding Human Health and Ecological SLC in Historic Tailings Spills, Sub-tailings Soils and Adjacent Soils		
	Historic Tailings	Sub-tailings Soils	Adjacent (Reference) Soils
Human Health (0-6 inches)	As, Fe, Mo	As, Fe, Mo	As, Fe, Mo
Ecological (0-24 inches)	Sb, Ba, B, Cd, Cr, Cu, Pb, Mn, Mo, V Se, Zn	Sb, Ba, B, Cd, Cr, Cu, Pb, Mn, Mo, V	Sb, Ba, B, Cd, Cr, Cu, Pb, Mn, Mo, V Hg, Zn

Figures 8-6 and 8-7 show the mean concentrations of the analytes exceeding the human health and ecological SLC, respectively, for each group of samples. The reporting limit was used for values that were not detected. Antimony, boron, mercury, and selenium are not plotted because more than fifty percent of the analyses were not detected.

Figure 8-6 shows that the mean arsenic and iron concentrations were similar in the soils and the tailings spill samples. The mean molybdenum concentration was four times higher in the tailings spill samples (mean = 248 mg/kg) than in the sub-tailings soils (66 mg/kg), and six times the mean concentration in the adjacent soils (40 mg/kg).

In Figure 8-7, mean concentrations of cadmium, chromium, copper, lead, molybdenum, vanadium, and zinc were highest in the tailings spill samples. The next highest mean concentration of these elements was in the sub-tailings soils. The mean concentration of manganese was also highest in the tailings spills (638 mg/kg), but this value was similar to those in the other two sample groups (522 mg/kg and 585 mg/kg). Mean barium concentrations in the tailings spill samples were lower than that in the other two sample groups.

Analysis of SPLP leachates indicates that certain metals within the tailings spill samples are leachable when subjected to weathering. However, these tests also showed that the leached concentrations were generally low. Concentrations of metal analytes in the leachates were below the EPA Region 6 Human Tap water SLCs (HQ=1) with the exception of fluoride in TD7.

SECTION 8

HISTORIC TAILING SPILLS

TABLES

Table 8-1
Historic Tailings Spills - Biased 0-12 inches
RI/FS Adjacent (Reference) Soils
Summary of Results

Analyte	Sample Fraction	Units	Total Number of Samples	Percent Detects (%)	SLC	SLC Value	Percent Above SLC	Min RL for ND	Max RL for ND	Min Value	Max Value	Mean Value	Median Value
Inorganics													
Cation-Exchange Capacity	T	meq/100g	35	100	No SLC	0	0			10.7	32.5	21.8	21.5
Chloride	T	mg/kg-dry	35	97.1	No SLC	0	0	2.2	2.2	2.5	11	4.5	4.3
Cyanide	T	mg/kg-dry	6	0	HH Soil (HQ=1)	1200	0	0.45	0.56	0	0		
Fluoride	T	mg/kg-dry	35	97.1	HH Soil (HQ=1)	3700	0	0.12	0.12	0.11	2.9	0.67	0.44
Nitrate	T	mg/kg-dry	35	91.4	No SLC	0	0	2.2	2.3	2.1	12.9	5.8	5.8
Organic Soils	T	%	35	100	No SLC	0	0			2.4	9.2	4.6	4.2
pH	T	SU	35	100	No SLC	0	0			5.6	8.8	7.2	7.4
Phosphorus	T	mg/kg-dry	35	100	No SLC	0	0			37.8	1490	442	346
Sodium Absorption Ratio	T	ratio	35	80	No SLC	0	0	0.05	0.08	0.04	0.69	0.13	0.08
Solids, Percent	T	%	35	100	No SLC	0	0			80.6	96	90	90.2
Specific Conductance	T	umhos/cm	35	100	No SLC	0	0			26.1	371	101	74.5
Sulfate	T	mg/kg-dry	35	80	No SLC	0	0	2.2	2.5	2.7	216	20.1	7.1
Total Kjeldahl Nitrogen	T	mg/kg-dry	35	97.1	No SLC	0	0	25	25	163	1710	889	932
Total Organic Carbon	T	mg/kg-dry	35	100	No SLC	0	0			2920	246000	28200	21000
Metals													
Aluminum	T	mg/kg-dry	35	100	HH Soil (HQ=1)	76000	0			5150	16900	7850	7170
Antimony	T	mg/kg-dry	35	5.7	HH Soil (HQ=1)	31	0	0.4	1.5	0.45	0.75		
Antimony	T	mg/kg-dry	35	5.7	ECO Soil	0.3	100	0.4	1.5	0.45	0.75		
Arsenic	T	mg/kg-dry	35	100	HH Soil (HQ=1)	0.39	100			1.9	5.3	3.4	3.4
Arsenic	T	mg/kg-dry	35	100	ECO Soil	31	0			1.9	5.3	3.4	3.4
Barium	T	mg/kg-dry	35	100	HH Soil (HQ=1)	5500	0			46.8	382	154	166
Barium	T	mg/kg-dry	35	100	ECO Soil	330	2.9			46.8	382	154	166
Beryllium	T	mg/kg-dry	35	100	HH Soil (HQ=1)	150	0			0.43	1.3	0.7	0.66
Beryllium	T	mg/kg-dry	35	100	ECO Soil	30	0			0.43	1.3	0.7	0.66
Boron	T	mg/kg-dry	35	20	HH Soil (HQ=1)	5500	0	0.18	3.5	2.1	3.2		
Boron	T	mg/kg-dry	35	20	ECO Soil	0.5	100	0.18	3.5	2.1	3.2		
Cadmium	T	mg/kg-dry	35	100	HH Soil (HQ=1)	39	0			0.13	1.4	0.43	0.37
Cadmium	T	mg/kg-dry	35	100	ECO Soil	0.4	34.3			0.13	1.4	0.43	0.37
Calcium	T	mg/kg-dry	35	100	No SLC	0	0			1540	7540	3540	3180
Chromium	T	mg/kg-dry	35	100	HH Soil (HQ=1)	210	0			7.1	56.2	17	16.7
Chromium	T	mg/kg-dry	35	100	ECO Soil	7.9	91.4			7.1	56.2	17	16.7

"No SLC" indicates that there is not a Screening Level Criterion for this medium specified for the RI/FS.
"HH Soil (HQ=1)" EPA Region 6 RBSLs Human Health Residential Soil (HQ=1)
"Eco Soil" EPA Region 6 Tier 1-3 RBSLs Ecological Soil
Median Value determined using 1/2 the Reporting Limit value for Non-Detectsif greater than 50% of the values were detected.
Mean Value calculated using 1/2 the Reporting Limit for Non-Detects if greater than 50% of the values were detected.

T = Total Fraction
D = Filtered Fraction (0.45 micron filter)
A = Filtered Fraction (0.1 micron filter)
ND = Non-Detected Value

Table 8-1
Historic Tailings Spills - Biased 0-12 inches
RI/FS Adjacent (Reference) Soils
Summary of Results

Analyte	Sample Fraction	Units	Total Number of Samples	Percent Detects (%)	SLC	SLC Value	Percent Above SLC	Min RL for ND	Max RL for ND	Min Value	Max Value	Mean Value	Median Value
Cobalt	T	mg/kg-dry	35	100	HH Soil (HQ=1)	900	0			3.4	13.9	6.1	5.8
Cobalt	T	mg/kg-dry	35	100	ECO Soil	32	0			3.4	13.9	6.1	5.8
Copper	T	mg/kg-dry	35	100	HH Soil (HQ=1)	2900	0			8.4	97.7	36.3	37
Copper	T	mg/kg-dry	35	100	ECO Soil	54	20			8.4	97.7	36.3	37
Iron	T	mg/kg-dry	35	100	HH Soil (HQ=1)	23000	11.4			11000	39200	18100	17300
Lead	T	mg/kg-dry	35	100	HH Soil (HQ=1)	400	0			15.6	107	46.9	43.6
Lead	T	mg/kg-dry	35	100	ECO Soil	15	100			15.6	107	46.9	43.6
Magnesium	T	mg/kg-dry	35	100	No SLC	0	0			1830	10600	3770	4010
Manganese	T	mg/kg-dry	35	100	HH Soil (HQ=1)	3200	0			183	1530	585	552
Manganese	T	mg/kg-dry	35	100	ECO Soil	152	100			183	1530	585	552
Mercury	T	mg/kg-dry	35	20	ECO Soil	0.1	14.3	0.015	0.02	0.02	0.49		
Mercury	T	mg/kg-dry	35	20	HH Soil (HQ=1)	23	0	0.015	0.02	0.02	0.49		
Molybdenum	T	mg/kg-dry	35	100	HH Soil (HQ=1)	390	2.9			2.8	399	39.6	16.6
Molybdenum	T	mg/kg-dry	35	100	ECO Soil	2	100			2.8	399	39.6	16.6
Nickel	T	mg/kg-dry	35	100	HH Soil (HQ=1)	1600	0			5.6	27.9	12.3	12.7
Nickel	T	mg/kg-dry	35	100	ECO Soil	48	0			5.6	27.9	12.3	12.7
Potassium	T	mg/kg-dry	35	100	No SLC	0	0			1390	5420	2180	1960
Selenium	T	mg/kg-dry	35	14.3	HH Soil (HQ=1)	390	0	0.69	0.83	0.88	1.2		
Selenium	T	mg/kg-dry	35	14.3	ECO Soil	1	20	0.69	0.83	0.88	1.2		
Silver	T	mg/kg-dry	35	45.7	HH Soil (HQ=1)	390	0	0.1	0.68	0.12	0.54		
Silver	T	mg/kg-dry	35	45.7	ECO Soil	2	0	0.1	0.68	0.12	0.54		
Sodium	T	mg/kg-dry	35	2.9	No SLC	0	0	26.4	162	60.3	60.3		
Thallium	T	mg/kg-dry	35	57.1	HH Soil (HQ=1)	5.5	0	0.099	0.25	0.12	0.31	0.16	0.14
Thallium	T	mg/kg-dry	35	57.1	ECO Soil	1	0	0.099	0.25	0.12	0.31	0.16	0.14
Vanadium	T	mg/kg-dry	35	100	HH Soil (HQ=1)	78	0			9.9	60.7	19.9	19.7
Vanadium	T	mg/kg-dry	35	100	ECO Soil	2	100			9.9	60.7	19.9	19.7
Zinc	T	mg/kg-dry	35	100	ECO Soil	120	17.1			45.6	165	87	81.1
Zinc	T	mg/kg-dry	35	100	HH Soil (HQ=1)	23000	0			45.6	165	87	81.1

"No SLC" indicates that there is not a Screening Level Criterion for this medium specified for the RI/FS.
"HH Soil (HQ=1)" EPA Region 6 RBSLs Human Health Residential Soil (HQ=1)
"Eco Soil" EPA Region 6 Tier 1-3 RBSLs Ecological Soil
Median Value determined using 1/2 the Reporting Limit value for Non-Detectsif greater than 50% of the values were detected.
Mean Value calculated using 1/2 the Reporting Limit for Non-Detects if greater than 50% of the values were detected.

T = Total Fraction
D = Filtered Fraction (0.45 micron filter)
A = Filtered Fraction (0.1 micron filter)
ND = Non-Detected Value

Table 8-2
Historic Tailings Spills - Biased Variable Depth
RI/FS Tailings Spills
Summary of Results

Analyte	Sample Fraction	Units	Total Number of Samples	Percent Detects (%)	SLC	SLC Value	Percent Above SLC	Min RL for ND	Max RL for ND	Min Value	Max Value	Mean Value	Median Value
Inorganics													
Cation-Exchange Capacity	T	meq/100g	26	100	No SLC	0	0			5.1	28.7	14.3	13.7
Chloride	T	mg/kg-dry	26	100	No SLC	0	0			2.1	139	11.7	3.9
Cyanide	T	mg/kg-dry	6	0	HH Soil (HQ=1)	1200	0	0.49	0.59	0	0		
Fluoride	T	mg/kg-dry	26	100	HH Soil (HQ=1)	3700	0			0.26	19.6	3.8	2
Nitrate	T	mg/kg-dry	26	65.4	No SLC	0	0	2	2.4	2.1	8.6	3	2.5
Organic Soils	T	%	26	100	No SLC	0	0			0.6	7.1	2.7	2.2
pH	T	SU	26	100	No SLC	0	0			3.2	8.5	6.8	7.5
Phosphorus	T	mg/kg-dry	26	100	No SLC	0	0			58.7	2130	513	410
Sodium Absorption Ratio	T	ratio	26	76.9	No SLC	0	0	0.02	0.04	0.04	0.64	0.15	0.09
Solids, Percent	T	%	26	100	No SLC	0	0			83.4	99.1	95.1	95.7
Specific Conductance	T	umhos/cm	26	100	No SLC	0	0			85.2	2680	722	320
Sulfate	T	mg/kg-dry	26	100	No SLC	0	0			3	2780	259	88.6
Total Kjeldahl Nitrogen	T	mg/kg-dry	26	100	No SLC	0	0			61.1	2310	456	219
Total Organic Carbon	T	mg/kg-dry	26	88.5	No SLC	0	0	802	1350	418	32300	9030	5440
Metals													
Aluminum	T	mg/kg-dry	26	100	HH Soil (HQ=1)	76000	0			4400	13700	8540	8580
Antimony	T	mg/kg-dry	26	3.8	HH Soil (HQ=1)	31	0	0.39	1.3	0.73	0.73		
Antimony	T	mg/kg-dry	26	3.8	ECO Soil	0.3	100	0.39	1.3	0.73	0.73		
Arsenic	T	mg/kg-dry	26	96.2	ECO Soil	31	0	1.9	1.9	1.5	29	4.9	3.3
Arsenic	T	mg/kg-dry	26	96.2	HH Soil (HQ=1)	0.39	100	1.9	1.9	1.5	29	4.9	3.3
Barium	T	mg/kg-dry	26	100	HH Soil (HQ=1)	5500	0			26.6	200	101	97.5
Barium	T	mg/kg-dry	26	100	ECO Soil	330	0			26.6	200	101	97.5
Beryllium	T	mg/kg-dry	26	100	HH Soil (HQ=1)	150	0			0.26	1.6	0.88	0.84
Beryllium	T	mg/kg-dry	26	100	ECO Soil	30	0			0.26	1.6	0.88	0.84
Boron	T	mg/kg-dry	26	3.8	ECO Soil	0.5	100	0.17	1.4	3.3	3.3		
Boron	T	mg/kg-dry	26	3.8	HH Soil (HQ=1)	5500	0	0.17	1.4	3.3	3.3		
Cadmium	T	mg/kg-dry	26	100	HH Soil (HQ=1)	39	0			0.37	3.6	1.1	0.84
Cadmium	T	mg/kg-dry	26	100	ECO Soil	0.4	96.2			0.37	3.6	1.1	0.84
Calcium	T	mg/kg-dry	26	100	No SLC	0	0			876	14900	8080	7770
Chromium	T	mg/kg-dry	26	100	ECO Soil	7.9	92.3			7.4	67.6	37	38.7
Chromium	T	mg/kg-dry	26	100	HH Soil (HQ=1)	210	0			7.4	67.6	37	38.7

"No SLC" indicates that there is not a Screening Level Criterion for this medium specified for the RI/FS.
"HH Soil (HQ=1)" EPA Region 6 RBSLs Human Health Residential Soil (HQ=1)
"Eco Soil" EPA Region 6 Tier 1-3 RBSLs Ecological Soil
Median Value determined using 1/2 the Reporting Limit value for Non-Detectsif greater than 50% of the values were detected.
Mean Value calculated using 1/2 the Reporting Limit for Non-Detects if greater than 50% of the values were detected.

T = Total Fraction
D = Filtered Fraction (0.45 micron filter)
A = Filtered Fraction (0.1 micron filter)
ND = Non-Detected Value

Table 8-2

Historic Tailings Spills - Biased Variable Depth

RI/FS Tailings Spills

Summary of Results

Analyte	Sample Fraction	Units	Total Number of Samples	Percent Detects (%)	SLC	SLC Value	Percent Above SLC	Min RL for ND	Max RL for ND	Min Value	Max Value	Mean Value	Median Value
Cobalt	T	mg/kg-dry	26	100	ECO Soil	32	0			3.5	28.5	9.3	8.2
Cobalt	T	mg/kg-dry	26	100	HH Soil (HQ=1)	900	0			3.5	28.5	9.3	8.2
Copper	T	mg/kg-dry	26	100	ECO Soil	54	100			62.7	193	115	116
Copper	T	mg/kg-dry	26	100	HH Soil (HQ=1)	2900	0			62.7	193	115	116
Iron	T	mg/kg-dry	26	100	HH Soil (HQ=1)	23000	26.9			9250	55500	21200	18400
Lead	T	mg/kg-dry	26	100	HH Soil (HQ=1)	400	0			22.5	396	107	74.4
Lead	T	mg/kg-dry	26	100	ECO Soil	15	100			22.5	396	107	74.4
Magnesium	T	mg/kg-dry	26	100	No SLC	0	0			2080	11600	6660	6980
Manganese	T	mg/kg-dry	26	100	HH Soil (HQ=1)	3200	0			262	1170	638	613
Manganese	T	mg/kg-dry	26	100	ECO Soil	152	100			262	1170	638	613
Mercury	T	mg/kg-dry	26	11.5	HH Soil (HQ=1)	23	0	0.014	0.018	0.017	0.026		
Mercury	T	mg/kg-dry	26	11.5	ECO Soil	0.1	0	0.014	0.018	0.017	0.026		
Molybdenum	T	mg/kg-dry	26	100	HH Soil (HQ=1)	390	15.4			92.6	642	247	213
Molybdenum	T	mg/kg-dry	26	100	ECO Soil	2	100			92.6	642	247	213
Nickel	T	mg/kg-dry	26	100	ECO Soil	48	3.8			6.1	59.8	24.3	23.8
Nickel	T	mg/kg-dry	26	100	HH Soil (HQ=1)	1600	0			6.1	59.8	24.3	23.8
Potassium	T	mg/kg-dry	26	100	No SLC	0	0			1150	5130	3460	3570
Selenium	T	mg/kg-dry	26	15.4	HH Soil (HQ=1)	390	0	0.68	0.8	0.71	2.4		
Selenium	T	mg/kg-dry	26	15.4	ECO Soil	1	75	0.68	0.8	0.71	2.4		
Silver	T	mg/kg-dry	26	88.5	HH Soil (HQ=1)	390	0	0.3	0.46	0.18	3.9	0.7	0.49
Silver	T	mg/kg-dry	26	88.5	ECO Soil	2	4.3	0.3	0.46	0.18	3.9	0.7	0.49
Sodium	T	mg/kg-dry	26	0	No SLC	0	0	16.7	184	0	0		
Thallium	T	mg/kg-dry	26	84.6	ECO Soil	1	0	0.1	0.11	0.16	0.48	0.27	0.27
Thallium	T	mg/kg-dry	26	84.6	HH Soil (HQ=1)	5.5	0	0.1	0.11	0.16	0.48	0.27	0.27
Vanadium	T	mg/kg-dry	26	100	HH Soil (HQ=1)	78	0			12.6	60.6	35.3	36.4
Vanadium	T	mg/kg-dry	26	100	ECO Soil	2	100			12.6	60.6	35.3	36.4
Zinc	T	mg/kg-dry	26	100	HH Soil (HQ=1)	23000	0			47.9	472	158	123
Zinc	T	mg/kg-dry	26	100	ECO Soil	120	50			47.9	472	158	123

"No SLC" indicates that there is not a Screening Level Criterion for this medium specified for the RI/FS.
"HH Soil (HQ=1)" EPA Region 6 RBSLs Human Health Residential Soil (HQ=1)
"Eco Soil" EPA Region 6 Tier 1-3 RBSLs Ecological Soil
Median Value determined using 1/2 the Reporting Limit value for Non-Detectsif greater than 50% of the values were detected.
Mean Value calculated using 1/2 the Reporting Limit for Non-Detects if greater than 50% of the values were detected.

T = Total Fraction
D = Filtered Fraction (0.45 micron filter)
A = Filtered Fraction (0.1 micron filter)
ND = Non-Detected Value

Table 8-3
Historic Tailings Spills - Biased 0-12 inches
RI/FS Sub-Tailings Soils
Summary of Results

Analyte	Sample Fraction	Units	Total Number of Samples	Percent Detects (%)	SLC	SLC Value	Percent Above SLC	Min RL for ND	Max RL for ND	Min Value	Max Value	Mean Value	Median Value
Inorganics													
Cation-Exchange Capacity	T	meq/100g	35	100	No SLC	0	0			5.4	30.1	17.2	18.3
Chloride	T	mg/kg-dry	35	100	No SLC	0	0			2.1	46.1	7.2	4.2
Cyanide	T	mg/kg-dry	6	0	HH Soil (HQ=1)	1200	0	0.47	0.58	0	0		
Fluoride	T	mg/kg-dry	35	100	HH Soil (HQ=1)	3700	0			0.2	73.7	5.9	1.1
Nitrate	T	mg/kg-dry	35	77.1	No SLC	0	0	2.1	2.3	2.1	114	10.9	4.2
Organic Soils	T	%	35	100	No SLC	0	0			1.3	5.7	3.1	2.9
pH	T	SU	35	100	No SLC	0	0			4.2	8.2	6.9	7.4
Phosphorus	T	mg/kg-dry	35	100	No SLC	0	0			49.7	1210	457	423
Sodium Absorption Ratio	T	ratio	35	94.3	No SLC	0	0	0.03	0.06	0.04	0.68	0.16	0.13
Solids, Percent	T	%	35	100	No SLC	0	0			85.2	97.2	92	91.6
Specific Conductance	T	umhos/cm	35	100	No SLC	0	0			30.5	2110	605	422
Sulfate	T	mg/kg-dry	35	100	No SLC	0	0			4.2	1000	205	151
Total Kjeldahl Nitrogen	T	mg/kg-dry	35	100	No SLC	0	0			55.6	1330	473	434
Total Organic Carbon	T	mg/kg-dry	35	91.4	No SLC	0	0	890	1610	567	22400	9540	9510
Metals													
Aluminum	T	mg/kg-dry	35	100	HH Soil (HQ=1)	76000	0			4430	13700	7880	8200
Antimony	T	mg/kg-dry	35	5.7	HH Soil (HQ=1)	31	0	0.4	1.3	0.74	0.85		
Antimony	T	mg/kg-dry	35	5.7	ECO Soil	0.3	100	0.4	1.3	0.74	0.85		
Arsenic	T	mg/kg-dry	35	100	ECO Soil	31	0			2	7.3	3.9	3.8
Arsenic	T	mg/kg-dry	35	100	HH Soil (HQ=1)	0.39	100			2	7.3	3.9	3.8
Barium	T	mg/kg-dry	35	100	ECO Soil	330	0			46.5	328	160	161
Barium	T	mg/kg-dry	35	100	HH Soil (HQ=1)	5500	0			46.5	328	160	161
Beryllium	T	mg/kg-dry	35	100	HH Soil (HQ=1)	150	0			0.44	1.4	0.72	0.69
Beryllium	T	mg/kg-dry	35	100	ECO Soil	30	0			0.44	1.4	0.72	0.69
Boron	T	mg/kg-dry	35	11.4	HH Soil (HQ=1)	5500	0	0.18	1.9	1.9	2.6		
Boron	T	mg/kg-dry	35	11.4	ECO Soil	0.5	100	0.18	1.9	1.9	2.6		
Cadmium	T	mg/kg-dry	35	100	ECO Soil	0.4	54.3			0.16	2	0.54	0.44
Cadmium	T	mg/kg-dry	35	100	HH Soil (HQ=1)	39	0			0.16	2	0.54	0.44
Calcium	T	mg/kg-dry	35	100	No SLC	0	0			1240	17800	4050	3950
Chromium	T	mg/kg-dry	35	100	ECO Soil	7.9	100			9.7	39	20.2	20.1
Chromium	T	mg/kg-dry	35	100	HH Soil (HQ=1)	210	0			9.7	39	20.2	20.1

"No SLC" indicates that there is not a Screening Level Criterion for this medium specified for the RI/FS.
"HH Soil (HQ=1)" EPA Region 6 RBSLs Human Health Residential Soil (HQ=1)
"Eco Soil" EPA Region 6 Tier 1-3 RBSLs Ecological Soil
Median Value determined using 1/2 the Reporting Limit value for Non-Detectsif greater than 50% of the values were detected.
Mean Value calculated using 1/2 the Reporting Limit for Non-Detects if greater than 50% of the values were detected.

T = Total Fraction
D = Filtered Fraction (0.45 micron filter)
A = Filtered Fraction (0.1 micron filter)
ND = Non-Detected Value

Table 8-3
Historic Tailings Spills - Biased 0-12 inches
RI/FS Sub-Tailings Soils
Summary of Results

Analyte	Sample Fraction	Units	Total Number of Samples	Percent Detects (%)	SLC	SLC Value	Percent Above SLC	Min RL for ND	Max RL for ND	Min Value	Max Value	Mean Value	Median Value
Cobalt	T	mg/kg-dry	35	100	HH Soil (HQ=1)	900	0			3.1	11.5	7.2	7.5
Cobalt	T	mg/kg-dry	35	100	ECO Soil	32	0			3.1	11.5	7.2	7.5
Copper	T	mg/kg-dry	35	100	HH Soil (HQ=1)	2900	0			10.2	147	50.9	46.7
Copper	T	mg/kg-dry	35	100	ECO Soil	54	31.4			10.2	147	50.9	46.7
Iron	T	mg/kg-dry	35	100	HH Soil (HQ=1)	23000	8.6			10700	26700	19100	19700
Lead	T	mg/kg-dry	35	100	HH Soil (HQ=1)	400	0			17.2	227	52.9	49.6
Lead	T	mg/kg-dry	35	100	ECO Soil	15	100			17.2	227	52.9	49.6
Magnesium	T	mg/kg-dry	35	100	No SLC	0	0			2020	7000	4290	4310
Manganese	T	mg/kg-dry	35	100	HH Soil (HQ=1)	3200	0			271	1300	522	482
Manganese	T	mg/kg-dry	35	100	ECO Soil	152	100			271	1300	522	482
Mercury	T	mg/kg-dry	35	8.6	HH Soil (HQ=1)	23	0	0.014	0.019	0.019	0.072		
Mercury	T	mg/kg-dry	35	8.6	ECO Soil	0.1	0	0.014	0.019	0.019	0.072		
Molybdenum	T	mg/kg-dry	35	100	ECO Soil	2	100			5.3	519	66	37
Molybdenum	T	mg/kg-dry	35	100	HH Soil (HQ=1)	390	2.9			5.3	519	66	37
Nickel	T	mg/kg-dry	35	100	ECO Soil	48	0			6	29.9	15.9	16.2
Nickel	T	mg/kg-dry	35	100	HH Soil (HQ=1)	1600	0			6	29.9	15.9	16.2
Potassium	T	mg/kg-dry	35	100	No SLC	0	0			1100	3880	1960	2010
Selenium	T	mg/kg-dry	35	5.7	HH Soil (HQ=1)	390	0	0.7	0.8	0.77	0.82		
Selenium	T	mg/kg-dry	35	5.7	ECO Soil	1	0	0.7	0.8	0.77	0.82		
Silver	T	mg/kg-dry	35	74.3	HH Soil (HQ=1)	390	0	0.1	0.4	0.11	1	0.26	0.22
Silver	T	mg/kg-dry	35	74.3	ECO Soil	2	0	0.1	0.4	0.11	1	0.26	0.22
Sodium	T	mg/kg-dry	35	0	No SLC	0	0	19.2	196	0	0		
Thallium	T	mg/kg-dry	35	57.1	ECO Soil	1	0	0.1	0.28	0.11	0.32	0.16	0.15
Thallium	T	mg/kg-dry	35	57.1	HH Soil (HQ=1)	5.5	0	0.1	0.28	0.11	0.32	0.16	0.15
Vanadium	T	mg/kg-dry	35	100	HH Soil (HQ=1)	78	0			9.7	41.1	21.4	21
Vanadium	T	mg/kg-dry	35	100	ECO Soil	2	100			9.7	41.1	21.4	21
Zinc	T	mg/kg-dry	35	100	HH Soil (HQ=1)	23000	0			48.1	375	94.9	89.8
Zinc	T	mg/kg-dry	35	100	ECO Soil	120	8.6			48.1	375	94.9	89.8

"No SLC" indicates that there is not a Screening Level Criterion for this medium specified for the RI/FS.
"HH Soil (HQ=1)" EPA Region 6 RBSLs Human Health Residential Soil (HQ=1)
"Eco Soil" EPA Region 6 Tier 1-3 RBSLs Ecological Soil
Median Value determined using 1/2 the Reporting Limit value for Non-Detectsif greater than 50% of the values were detected.
Mean Value calculated using 1/2 the Reporting Limit for Non-Detects if greater than 50% of the values were detected.

T = Total Fraction
D = Filtered Fraction (0.45 micron filter)
A = Filtered Fraction (0.1 micron filter)
ND = Non-Detected Value

Table 8-4
Historic Tailings Spills - SPLP Biased Variable Depth
RI/FS Tailings Spills
Summary of Results

Analyte	Sample Fraction	Units	Total Number of Samples	Percent Detects (%)	SLC	SLC Value	Percent Above SLC	Min RL for ND	Max RL for ND	Min Value	Max Value	Mean Value	Median Value
Inorganics													
Bicarbonate (as CaCO3)	T	mg/L	3	66.7	No SLC	0	0	1	1	25.9	55.6	27.3	25.9
Carbonate (as CaCO3)	T	mg/L	3	66.7	No SLC	0	0	1	1	1.5	20.7	7.6	1.5
Chloride	T	mg/L	3	33.3	No SLC	0	0	0.41	0.45	1.6	1.6		
Cyanide	T	mg/L	3	33.3	HH Soil (HQ=1)	1200	0	0.01	0.01	0.012	0.012		
Fluoride	T	mg/L	3	100	HH Soil (HQ=1)	3700	0			0.49	15.3	5.5	0.81
Hydroxide (as CaCO3)	T	mg/L	3	0	No SLC	0	0	1	1	0	0		
Nitrate	T	mg/L	3	66.7	No SLC	0	0	0.2	0.2	0.21	0.6	0.3	0.21
Nitrite	T	mg/L	3	66.7	No SLC	0	0	0.005	0.005	0.048	0.063	0.038	0.048
Phosphate, Ortho As P	T	mg/L	3	100	No SLC	0	0			0.01	0.083	0.035	0.012
Phosphorus	T	mg/L	3	66.7	No SLC	0	0	0.014	0.014	0.065	0.068	0.047	0.065
Sulfate	T	mg/L	3	100	No SLC	0	0			12	184	109	131
Total Alkalinity	T	mg/L	3	66.7	No SLC	0	0	1	1	46.5	57.1	34.7	46.5
Total Kjeldahl Nitrogen	T	mg/L	3	100	No SLC	0	0			0.4	1.1	0.63	0.4
Metals													
Aluminum	T	mg/L	3	100	HH Soil (HQ=1)	76000	0			0.026	12.6	4.2	0.048
Antimony	T	mg/L	3	0	HH Soil (HQ=1)	31	0	0.0004	0.0004	0	0		
Antimony	T	mg/L	3	0	ECO Soil	0.3	0	0.0004	0.0004	0	0		
Arsenic	T	mg/L	3	66.7	ECO Soil	31	0	0.0002	0.0002	0.00068	0.00071	0.0005	0.00068
Arsenic	T	mg/L	3	66.7	HH Soil (HQ=1)	0.39	0	0.0002	0.0002	0.00068	0.00071	0.0005	0.00068
Barium	T	mg/L	3	100	HH Soil (HQ=1)	5500	0			0.013	0.046	0.028	0.025
Barium	T	mg/L	3	100	ECO Soil	330	0			0.013	0.046	0.028	0.025
Beryllium	T	mg/L	3	33.3	HH Soil (HQ=1)	150	0	0.0002	0.0002	0.0026	0.0026		
Beryllium	T	mg/L	3	33.3	ECO Soil	30	0	0.0002	0.0002	0.0026	0.0026		
Boron	T	mg/L	3	0	HH Soil (HQ=1)	5500	0	0.0121	0.0168	0	0		
Boron	T	mg/L	3	0	ECO Soil	0.5	0	0.0121	0.0168	0	0		
Cadmium	T	mg/L	3	33.3	HH Soil (HQ=1)	39	0	0.0002	0.0002	0.0061	0.0061		
Cadmium	T	mg/L	3	33.3	ECO Soil	0.4	0	0.0002	0.0002	0.0061	0.0061		
Calcium	T	mg/L	3	100	No SLC	0	0			23.6	55.6	44	52.8
Chromium	T	mg/L	3	0	HH Soil (HQ=1)	210	0	0.0008	0.0008	0	0		
Chromium	T	mg/L	3	0	ECO Soil	7.9	0	0.0008	0.0008	0	0		
Cobalt	T	mg/L	3	33.3	ECO Soil	32	0	0.0011	0.0011	0.059	0.059		

"No SLC" indicates that there is not a Screening Level Criterion for this medium specified for the RI/FS.
"HH Soil (HQ=1)" EPA Region 6 RBSLs Human Health Residential Soil (HQ=1)
"Eco Soil" EPA Region 6 Tier 1-3 RBSLs Ecological Soil
Median Value determined using 1/2 the Reporting Limit value for Non-Detectsif greater than 50% of the values were detected.
Mean Value calculated using 1/2 the Reporting Limit for Non-Detects if greater than 50% of the values were detected.

T = Total Fraction
D = Filtered Fraction (0.45 micron filter)
A = Filtered Fraction (0.1 micron filter)
ND = Non-Detected Value

Table 8-4
Historic Tailings Spills - SPLP Biased Variable Depth
RI/FS Tailings Spills
Summary of Results

Analyte	Sample Fraction	Units	Total Number of Samples	Percent Detects (%)	SLC	SLC Value	Percent Above SLC	Min RL for ND	Max RL for ND	Min Value	Max Value	Mean Value	Median Value
Cobalt	T	mg/L	3	33.3	HH Soil (HQ=1)	900	0	0.0011	0.0011	0.059	0.059		
Copper	T	mg/L	3	100	ECO Soil	54	0			0.00099	0.31	0.11	0.012
Copper	T	mg/L	3	100	HH Soil (HQ=1)	2900	0			0.00099	0.31	0.11	0.012
Iron	T	mg/L	3	66.7	HH Soil (HQ=1)	23000	0	0.0192	0.0192	0.065	0.7	0.26	0.065
Lead	T	mg/L	3	66.7	HH Soil (HQ=1)	400	0	0.0004	0.0004	0.00062	0.011	0.004	0.00062
Lead	T	mg/L	3	66.7	ECO Soil	15	0	0.0004	0.0004	0.00062	0.011	0.004	0.00062
Magnesium	T	mg/L	3	100	No SLC	0	0			0.83	7.9	3.4	1.4
Manganese	T	mg/L	3	100	HH Soil (HQ=1)	3200	0			0.0084	1.7	0.6	0.062
Manganese	T	mg/L	3	100	ECO Soil	152	0			0.0084	1.7	0.6	0.062
Mercury	T	mg/L	3	0	HH Soil (HQ=1)	23	0	0.0001	0.0001	0	0		
Mercury	T	mg/L	3	0	ECO Soil	0.1	0	0.0001	0.0001	0	0		
Molybdenum	T	mg/L	3	100	HH Soil (HQ=1)	390	0			0.002	0.82	0.33	0.16
Molybdenum	T	mg/L	3	100	ECO Soil	2	0			0.002	0.82	0.33	0.16
Nickel	T	mg/L	3	33.3	HH Soil (HQ=1)	1600	0	0.0009	0.0009	0.12	0.12		
Nickel	T	mg/L	3	33.3	ECO Soil	48	0	0.0009	0.0009	0.12	0.12		
Potassium	T	mg/L	3	100	No SLC	0	0			1.2	4.3	3.1	3.7
Selenium	T	mg/L	3	0	HH Soil (HQ=1)	390	0	0.0007	0.0007	0	0		
Selenium	T	mg/L	3	0	ECO Soil	1	0	0.0007	0.0007	0	0		
Silver	T	mg/L	3	33.3	HH Soil (HQ=1)	390	0	0.0001	0.0001	0.00013	0.00013		
Silver	T	mg/L	3	33.3	ECO Soil	2	0	0.0001	0.0001	0.00013	0.00013		
Sodium	T	mg/L	3	0	No SLC	0	0	1.24	1.43	0	0		
Thallium	T	mg/L	3	0	HH Soil (HQ=1)	5.5	0	0.0001	0.00018	0	0		
Thallium	T	mg/L	3	0	ECO Soil	1	0	0.0001	0.00018	0	0		
Vanadium	T	mg/L	3	33.3	HH Soil (HQ=1)	78	0	0.0002	0.0002	0.00023	0.00023		
Vanadium	T	mg/L	3	33.3	ECO Soil	2	0	0.0002	0.0002	0.00023	0.00023		
Zinc	T	mg/L	3	33.3	ECO Soil	120	0	0.0027	0.0083	0.64	0.64		
Zinc	T	mg/L	3	33.3	HH Soil (HQ=1)	23000	0	0.0027	0.0083	0.64	0.64		

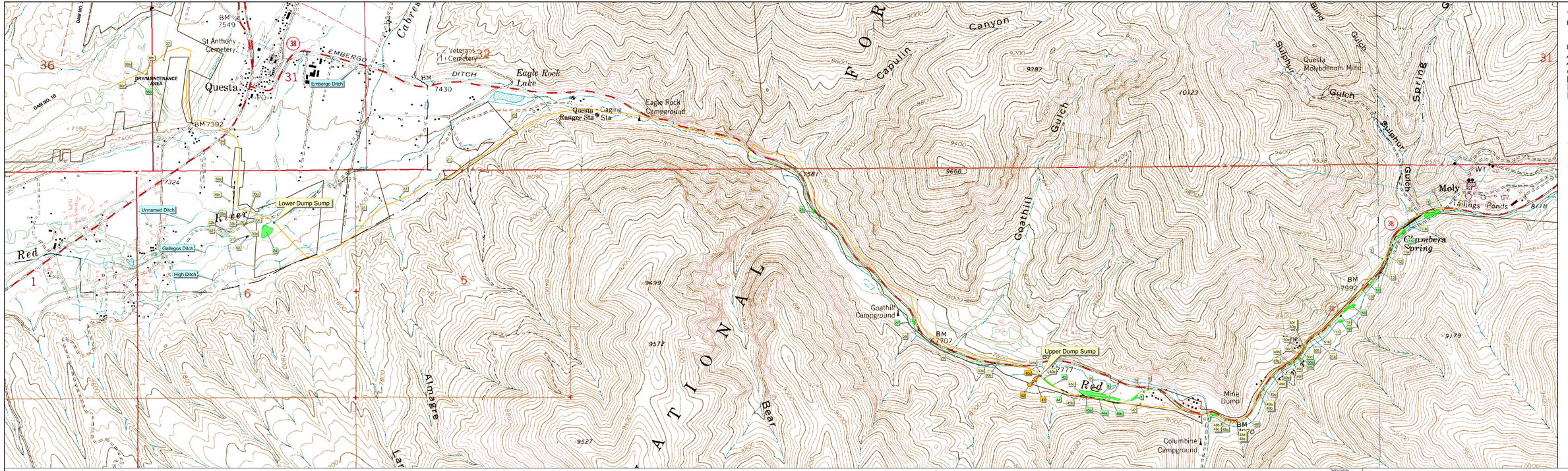
"No SLC" indicates that there is not a Screening Level Criterion for this medium specified for the RI/FS.
"HH Soil (HQ=1)" EPA Region 6 RBSLs Human Health Residential Soil (HQ=1)
"Eco Soil" EPA Region 6 Tier 1-3 RBSLs Ecological Soil
Median Value determined using 1/2 the Reporting Limit value for Non-Detectsif greater than 50% of the values were detected.
Mean Value calculated using 1/2 the Reporting Limit for Non-Detects if greater than 50% of the values were detected.

T = Total Fraction
D = Filtered Fraction (0.45 micron filter)
A = Filtered Fraction (0.1 micron filter)
ND = Non-Detected Value

SECTION 8

HISTORIC TAILING SPILLS

FIGURES



TAILINGS DEPOSITS

Point Feature
- No Sampling
- Sample Location

Linear Feature
- No Sampling
- Sample Location

Area Feature
- No Sampling
- Sample Location
- Tailings Removed

- Sump Well
- Sumps
- Utilities
- Springs
- Seeps
- Property Boundaries
- Mine Site/Tailings Area
- Pipeline - Current
- Pipeline - Historic
- Paved Roads
- Unpaved Roads
- Bridges
- Vegetation
- Major Buildings
- Miscellaneous Buildings
- Conveyors/Decline

URS
URS Center
8181 East Tufts Avenue
Denver, CO 80237-2637
(303) 694-2770

APPLICATION: ArcView GIS
FILE NAME: spills_techmemo.apr
DRAWN BY: GCK - Denver
DATE: 2/9/05

MOLYCORP - TAILINGS PIPELINE

LOCATIONS OF TAILINGS SPILL DEPOSITS

REVISION

PROJECT: 22236235.00100

FIGURE 8-1

Figure 8-2
pH in SPLP Solid Samples

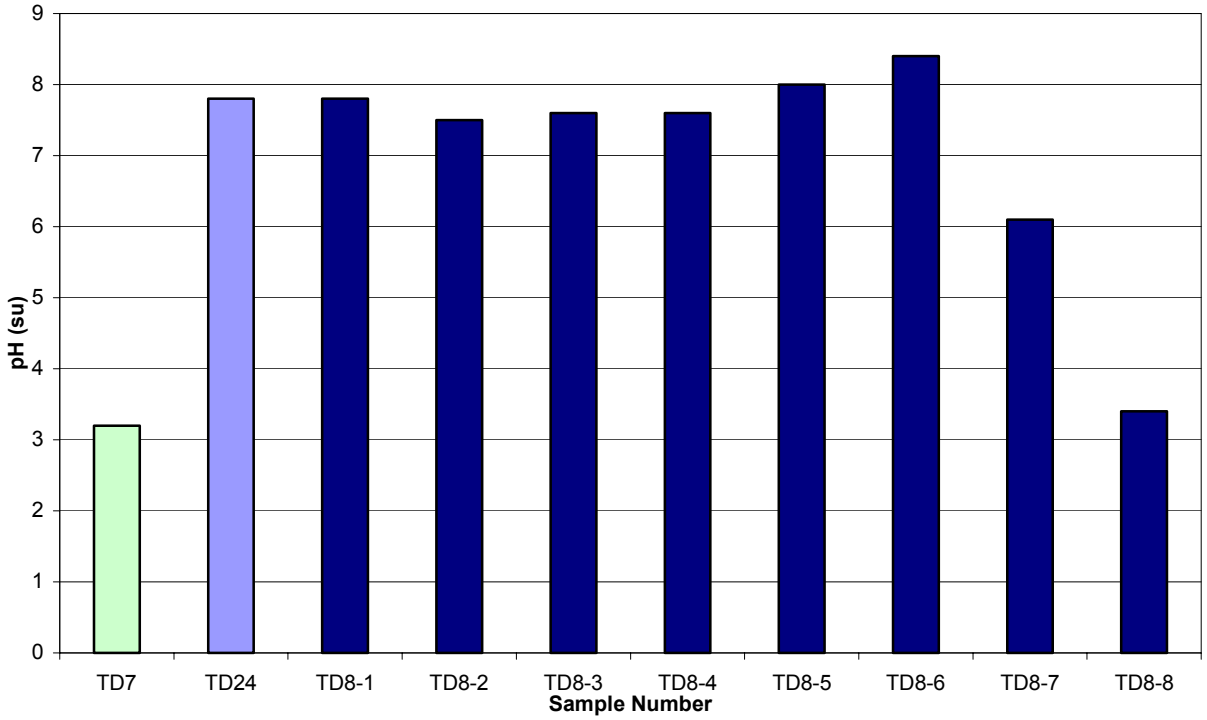


Figure 8-3
Molybdenum in SPLP Solid Samples

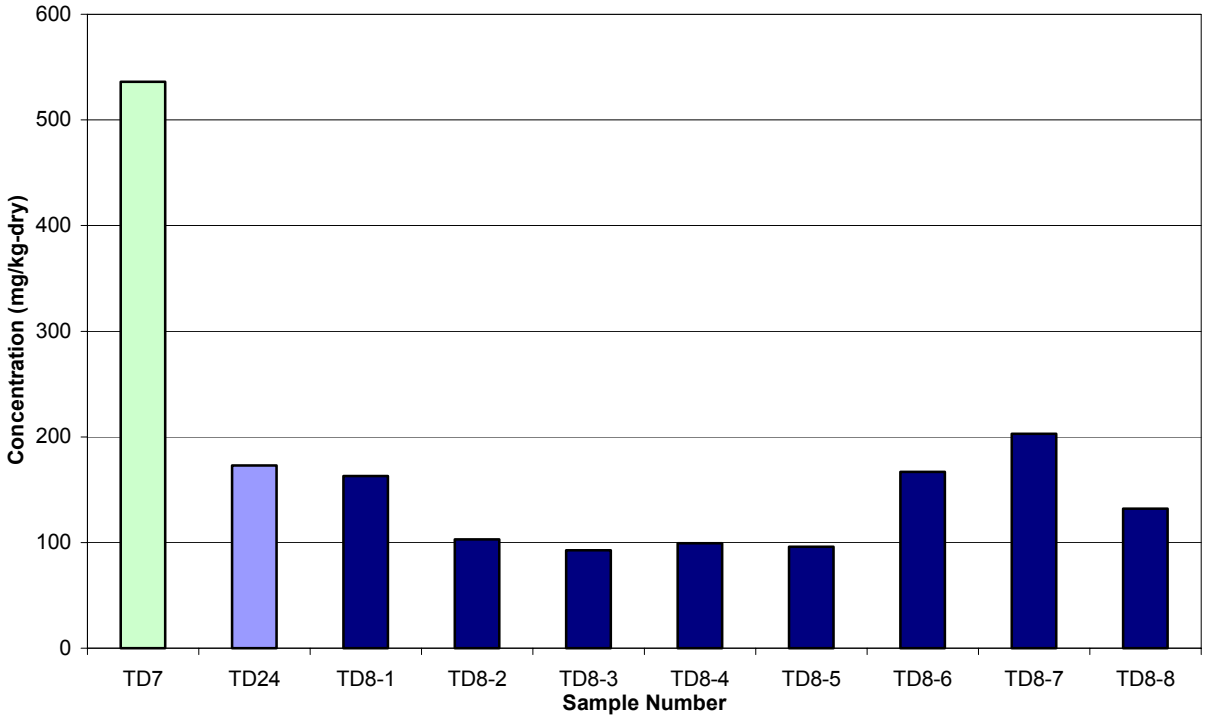


Figure 8-4
Cadmium in SPLP Solid Samples

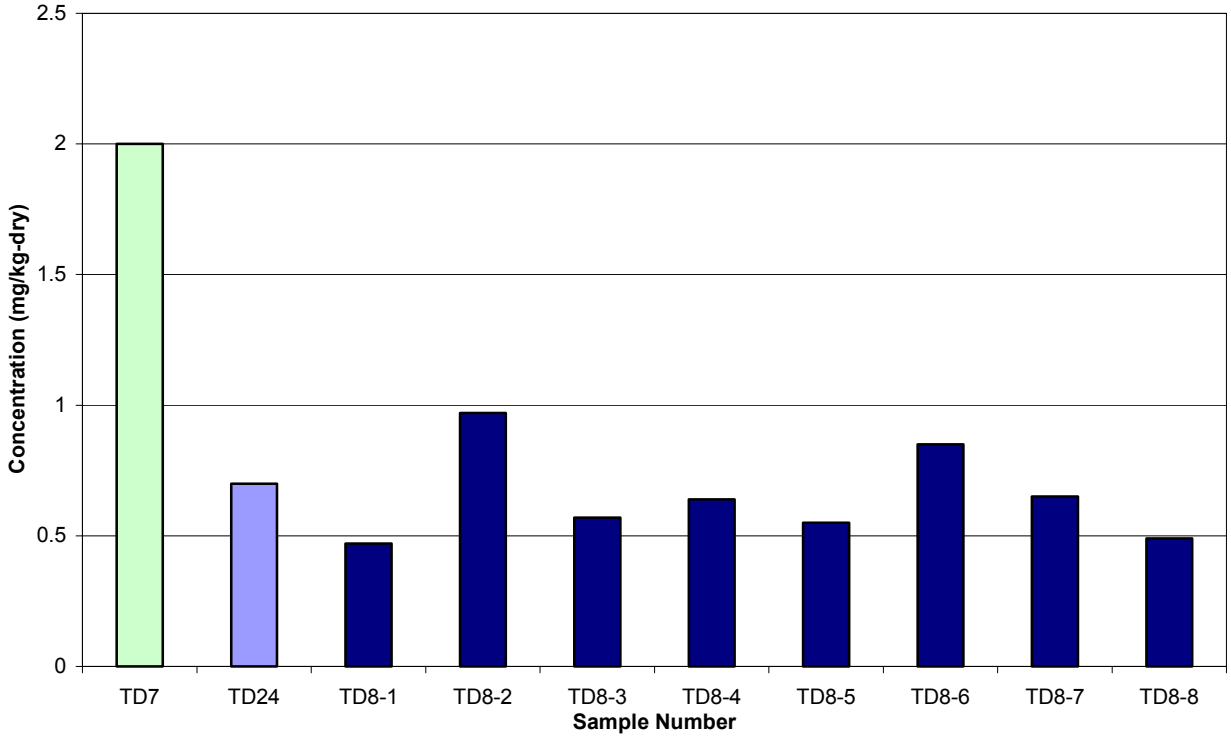


Figure 8-5
Sulfate in SPLP Solid Samples

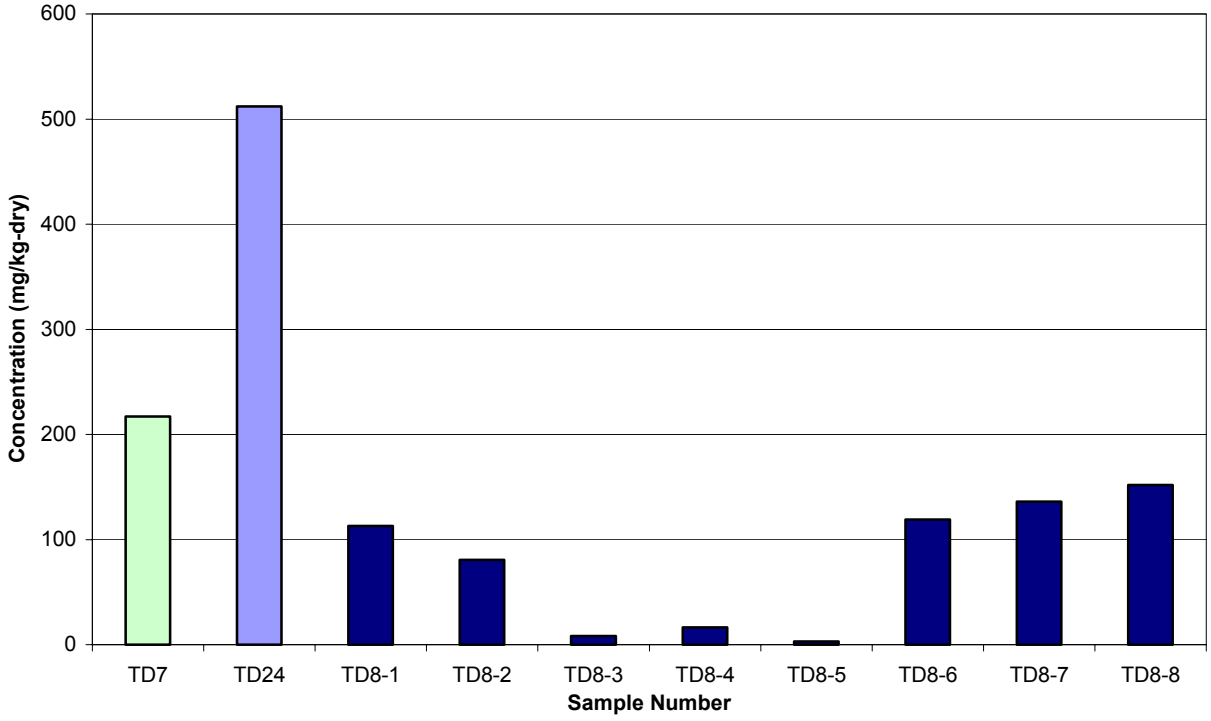
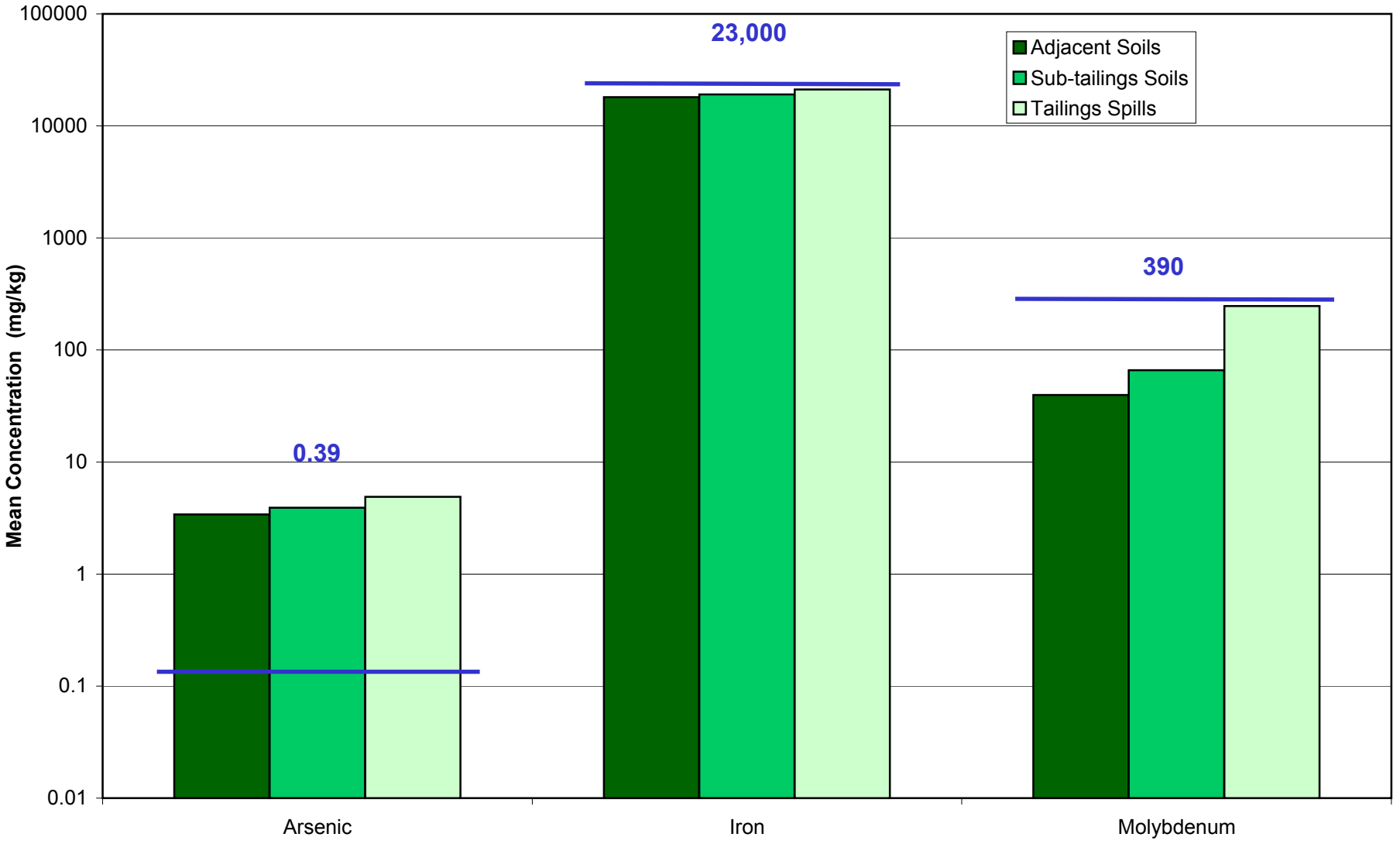
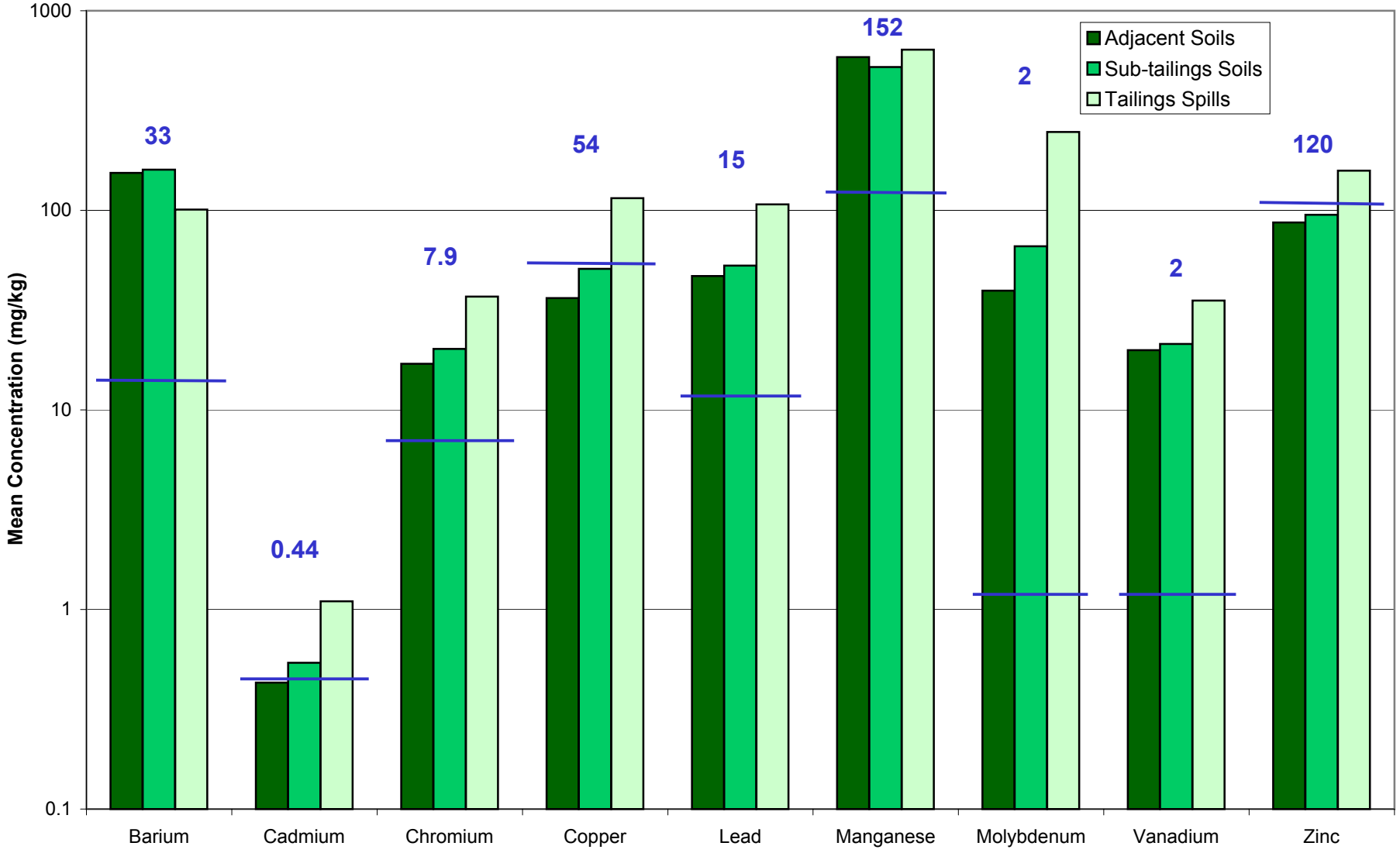


Figure 8-6
Mean Concentrations of Analytes that Exceeded the Human Health Screening Level Criteria in Adjacent Soils, Sub-tailings Soils, and Tailings Spills



Note: SLCs are presented as horizontal lines in Figure. For calculating means, the reporting limit was used for values below detection.

Figure 8-7
Mean Concentrations of Analytes that Exceeded the Ecological Screening Level Criteria in Adjacent Soils, Sub-tailings Soils, and Tailings Spills



Note: SLCs are presented as horizontal lines in Figure. For calculating means, the reporting limit was used for values below detection.

APPENDIX A-8

HISTORIC TAILINGS SPILLS

VALIDATED ANALYTICAL RESULTS

Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID	Sample Date	Sample ID	ATD1	ATD11C	ATD14	ATD16	ATD19	ATD24
						5/8/2004	5/8/2004	5/7/2004	5/7/2004	5/7/2004	5/8/2004
						ATD1-T01N-SOL	ATD11C-T01N-SOL	ATD14-T01N-SOL	ATD16-T01N-SOL	ATD19-T01N-SOL	ATD24-T01N-SOL
						ATD	ATD	ATD	ATD	ATD	ATD
General Chemistry											
Ammonia	mg/kg-dry	T				64.2 :	56.2 :	31.2 :	37.9 :	26.2 :	39. :
Chloride	mg/kg-dry	T				5.1 :	4.8 J	5.5 :	4.2 :	3.6 :	11. J
Fluoride	mg/kg-dry	T				2.7 :	1.1 :	0.8 :	2.9 :	0.26 :	2.4 :
Nitrate	mg/kg-dry	T				2.6 J	7.2 J	<2.2 J	3.5 J	2.1 J	5.3 J
Phosphorus	mg/kg-dry	T				78.6 J	1490. J	61.1 J	134. J	717. J	694. J
Sulfate	mg/kg-dry	T				19.8 J	34.7 J	20.4 J	31.1 J	21.7 J	51.7 J
Total Kjeldahl Nitrogen	mg/kg-dry	T				1120. :	524. :	312. :	460. :	338. :	932. :
Total Organic Carbon	mg/kg-dry	T				25400. :	15700. :	4370. :	12600. :	13900. :	22600. J
Laboratory Parameters											
pH	SU	T				7.4 J	6. J	6.8 J	7.3 J	6.2 J	8.3 J
Solids, Percent	%	T				87.9 :	89. :	92. :	94.1 :	95.6 :	95.7 :
Specific Conductance	umhos/cm	T				141. J	66.3 J	99.4 J	207. J	46.5 J	215. J
Inorganics											
Cyanide	mg/kg-dry	T				<0.56 :	<0.55 :	<0.53 :	-	<0.45 :	-
Geotechnical											
Organic Soils	%	T				5.7 :	4.4 :	3.3 :	3.6 :	3.4 :	3.3 :
Physical Properties											
Cation-Exchange Capacity	meq/100g	T				17.8 :	24.7 :	17.1 :	22.2 :	10.7 :	23.6 :
Sodium Absorption Ratio	ratio	T				0.08 :	0.1 :	0.2 :	0.08 :	0.13 :	0.27 :
Metals											
Aluminum	mg/kg-dry	T				7170. :	16900. :	9940. :	8620. :	6440. :	7390. :
Antimony	mg/kg-dry	T				<0.47 J	<0.44 J	<1.2 J	<1.1 J	<0.41 J	<0.41 J
Arsenic	mg/kg-dry	T				4.2 :	4.8 :	4.3 :	3.4 :	2.9 J	2.9 :
Barium	mg/kg-dry	T				173. :	239. :	169. :	164. :	125. :	107. :
Beryllium	mg/kg-dry	T				0.84 J	1.3 J	0.9 J	1.1 J	0.47 J	0.66 J
Boron	mg/kg-dry	T				2.4 :	<0.3 :	<0.19 :	<0.18 :	<0.18 :	<3.5 :
Cadmium	mg/kg-dry	T				0.97 :	0.95 :	0.39 :	1.4 :	0.23 :	0.51 :
Calcium	mg/kg-dry	T				4480. :	3040. :	5220. :	3650. :	1970. :	3260. :
Chromium	mg/kg-dry	T				17.3 :	56.2 :	25.1 :	21.9 :	18. :	9.2 :
Cobalt	mg/kg-dry	T				7.7 :	13.9 :	9.8 :	7.1 :	6.5 :	5.8 :
Copper	mg/kg-dry	T				63.3 :	97.7 :	63.3 :	73.6 :	44.4 :	17.2 :
Iron	mg/kg-dry	T				18600. :	39200. :	30900. :	26400. :	17300. :	13400. :

J = Qualified as estimated during data validation
R = Qualified as rejected value from data validation and results are considered unusable for any purpose
T = Total Fraction

Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID	Sample Date	Sample ID	Exposure Area		Site ID	Sample Date	Sample ID	Exposure Area		Site ID	Sample Date	Sample ID	Exposure Area		Site ID	Sample Date	Sample ID	Exposure Area		Site ID	Sample Date	Sample ID	Exposure Area	
			ATD1	5/8/2004	ATD1-T01N-SOL	ATD		ATD11C	5/8/2004	ATD11C-T01N-SOL	ATD		ATD14	5/7/2004	ATD14-T01N-SOL	ATD		ATD16	5/7/2004	ATD16-T01N-SOL	ATD		ATD19	5/7/2004	ATD19-T01N-SOL	ATD	
Lead	mg/kg-dry	T	58.5	:				107.	:				61.6	:				107.	:				38.2	:				32.8	:	
Magnesium	mg/kg-dry	T	4190.	:				10600.	:				4890.	:				4250.	:				4410.	:				2330.	:	
Manganese	mg/kg-dry	T	698.	:				1300.	:				746.	:				884.	:				382.	:				631.	:	
Mercury	mg/kg-dry	T	0.029	:				<0.017	:				<0.016	:				0.026	:				<0.015	J				<0.017	:	
Molybdenum	mg/kg-dry	T	399.	:				188.	:				82.3	:				92.	:				76.1	:				6.9	:	
Nickel	mg/kg-dry	T	15.2	J				27.9	J				19.7	J				14.2	J				13.5	J				8.5	J	
Potassium	mg/kg-dry	T	2170.	J				5420.	J				2450.	J				2540.	J				1900.	J				2300.	J	
Selenium	mg/kg-dry	T	0.88	J				1.2	J				<0.73	:				<0.72	:				<0.71	:				<0.72	:	
Silver	mg/kg-dry	T	0.5	:				<0.68	:				0.23	J				0.54	:				0.23	:				<0.1	:	
Sodium	mg/kg-dry	T	<104.	:				<154.	:				<109.	:				<143.	:				<78.8	:				<70.5	:	
Thallium	mg/kg-dry	T	0.18	:				0.28	J				0.26	:				0.26	:				0.14	:				<0.1	J	
Vanadium	mg/kg-dry	T	22.9	:				60.7	:				29.9	:				23.5	:				19.7	:				17.3	:	
Zinc	mg/kg-dry	T	146.	J				144.	J				94.2	J				165.	J				56.9	J				89.2	J	

J = Qualified as estimated during data validation
R = Qualified as rejected value from data validation and results are considered unusable for any purpose
T = Total Fraction

Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID	ATD25		ATD27		ATD36B		ATD4		ATD40C		ATD41	
			Sample Date	5/8/2004		5/8/2004		5/10/2004		5/8/2004		5/7/2004		5/6/2004	
			Sample ID	ATD25-T01N-SOL		ATD27-T01N-SOL		ATD36B-T02N-SOL		ATD4-T01N-SOL		ATD40C-T01N-SOL		ATD41-T01N-SOL	
			Exposure Area	ATD		ATD		ATD		ATD		ATD		ATD	
General Chemistry															
Ammonia	mg/kg-dry	T		83.6	:	56.7	:	53.6	:	42.1	:	46.4	:	64.9	:
Chloride	mg/kg-dry	T		4.5	J	3.4	J	4.7	:	4.6	J	<2.2	J	4.5	:
Fluoride	mg/kg-dry	T		0.24	:	0.36	:	1.3	:	0.45	:	0.79	:	0.8	:
Nitrate	mg/kg-dry	T		6.8	J	2.9	J	3.1	J	2.6	J	<2.2	J	4.8	J
Phosphorus	mg/kg-dry	T		851.	J	594.	J	452.	J	907.	J	273.	J	323.	J
Sulfate	mg/kg-dry	T		67.4	J	69.3	J	7.1	J	28.8	J	21.7	J	9.7	J
Total Kjeldahl Nitrogen	mg/kg-dry	T		1610.	:	<25.	:	710.	:	1080.	:	598.	:	1110.	:
Total Organic Carbon	mg/kg-dry	T		61100.	J	18500.	:	5640.	:	25600.	J	31000.	:	18000.	:
Laboratory Parameters															
pH	SU	T		6.6	J	5.6	J	8.8	J	6.9	J	7.1	J	8.2	J
Solids, Percent	%	T		88.4	:	96.	:	93.3	:	94.7	:	92.8	:	87.1	:
Specific Conductance	umhos/cm	T		135.	J	108.	J	159.	J	63.4	J	35.8	J	199.	J
Inorganics															
Cyanide	mg/kg-dry	T		-		-		-		<0.52	:	-		-	
Geotechnical															
Organic Soils	%	T		6.	:	3.6	:	3.9	:	4.1	:	3.2	:	4.4	:
Physical Properties															
Cation-Exchange Capacity	meq/100g	T		22.4	:	19.9	:	30.1	:	24.8	:	14.6	:	20.8	:
Sodium Absorption Ratio	ratio	T		0.28	:	0.15	:	0.13	:	0.24	:	0.08	:	0.14	:
Metals															
Aluminum	mg/kg-dry	T		5780.	:	5150.	:	13600.	:	7040.	:	6520.	:	6930.	:
Antimony	mg/kg-dry	T		<0.45	J	<0.4	J	0.75	J	<0.41	J	<1.2	J	<0.46	J
Arsenic	mg/kg-dry	T		4.2	:	3.7	:	4.7	:	4.7	:	2.7	:	2.3	:
Barium	mg/kg-dry	T		170.	:	80.6	:	177.	:	125.	:	51.4	:	100.	:
Beryllium	mg/kg-dry	T		0.52	J	0.49	J	0.87	J	0.55	J	0.69	J	0.65	J
Boron	mg/kg-dry	T		<1.8	:	<1.1	:	<1.	:	<1.4	:	<1.3	:	<2.2	:
Cadmium	mg/kg-dry	T		0.48	:	0.33	:	0.2	:	0.51	:	0.25	:	0.4	:
Calcium	mg/kg-dry	T		3180.	:	1540.	:	7540.	:	2290.	:	2170.	:	3360.	:
Chromium	mg/kg-dry	T		17.2	:	12.9	:	14.	:	18.	:	11.3	:	12.8	:
Cobalt	mg/kg-dry	T		6.9	:	4.7	:	8.4	:	7.3	:	4.1	:	4.	:
Copper	mg/kg-dry	T		43.2	:	37.	:	17.1	:	43.8	:	14.9	:	14.5	:
Iron	mg/kg-dry	T		20600.	:	15100.	:	18500.	:	18000.	:	13300.	:	13200.	:

J = Qualified as estimated during data validation
R = Qualified as rejected value from data validation and results are considered unusable for any purpose
T = Total Fraction

Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID		Exposure Area															
			ATD25		5/8/2004		ATD25-T01N-SOL		ATD		ATD27		5/8/2004		ATD27-T01N-SOL		ATD		ATD36B		5/10/2004		ATD36B-T02N-SOL		ATD	
Lead	mg/kg-dry	T	52.	:							37.2	:							15.6	:						
Magnesium	mg/kg-dry	T	3640.	:							2870.	:							4630.	:						
Manganese	mg/kg-dry	T	415.	:							374.	:							457.	:						
Mercury	mg/kg-dry	T	<0.018	:							<0.015	:							<0.017	:						
Molybdenum	mg/kg-dry	T	45.6	:							25.9	:							2.8	:						
Nickel	mg/kg-dry	T	12.7	J							8.9	J							12.9	J						
Potassium	mg/kg-dry	T	1870.	J							1540.	J							1930.	J						
Selenium	mg/kg-dry	T	<0.79	:							<0.69	:							<0.72	:						
Silver	mg/kg-dry	T	<0.28	:							<0.33	:							<0.1	:						
Sodium	mg/kg-dry	T	<124.	:							<95.3	:							<79.7	:						
Thallium	mg/kg-dry	T	<0.11	J							<0.099	J							0.26	:						
Vanadium	mg/kg-dry	T	20.7	:							15.1	:							32.9	:						
Zinc	mg/kg-dry	T	91.1	J							62.	J							49.9	J						

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID		Exposure Area															
			ATD4		5/8/2004		ATD4-T01N-SOL		ATD		ATD40C		5/7/2004		ATD40C-T01N-SOL		ATD		ATD41		5/6/2004		ATD41-T01N-SOL		ATD	
Lead	mg/kg-dry	T	55.	:							31.5	:							29.3	:						
Magnesium	mg/kg-dry	T	4010.	:							2820.	:							2920.	:						
Manganese	mg/kg-dry	T	478.	:							552.	:							521.	:						
Mercury	mg/kg-dry	T	<0.017	:							<0.018	:							<0.019	J						
Molybdenum	mg/kg-dry	T	56.7	:							8.3	:							3.2	:						
Nickel	mg/kg-dry	T	14.3	J							7.9	J							8.4	J						
Potassium	mg/kg-dry	T	1800.	J							1560.	J							2190.	J						
Selenium	mg/kg-dry	T	<0.72	:							<0.73	:							<0.79	:						
Silver	mg/kg-dry	T	<0.2	:							0.12	:							<0.11	J						
Sodium	mg/kg-dry	T	<162.	:							<51.	:							<52.	J						
Thallium	mg/kg-dry	T	<0.1	J							0.18	:							<0.22	:						
Vanadium	mg/kg-dry	T	19.7	:							12.8	:							13.9	:						
Zinc	mg/kg-dry	T	86.7	J							61.3	J							64.1	J						

J = Qualified as estimated during data validation
R = Qualified as rejected value from data validation and results are considered unusable for any purpose
T = Total Fraction

Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Fraction	ATD42-1		ATD42-2		ATD42-3		ATD42-4		ATD42-5		ATD42-6	
Sample Date			5/6/2004		5/6/2004		5/6/2004		5/6/2004		5/6/2004		5/6/2004	
Sample ID			ATD42-1-T01N-SOL		ATD42-2-T01N-SOL		ATD42-3-T01N-SOL		ATD42-4-T01N-SOL		ATD42-5-T01N-SOL		ATD42-6-T01N-SOL	
Exposure Area			ATD		ATD		ATD		ATD		ATD		ATD	
General Chemistry														
Ammonia	mg/kg-dry	T	61.2	:	104.	:	125.	:	81.4	:	98.6	:	82.7	:
Chloride	mg/kg-dry	T	4.7	:	8.5	:	7.5	:	4.5	:	4.5	:	4.3	:
Fluoride	mg/kg-dry	T	0.14	:	0.55	:	0.25	:	0.47	:	0.4	:	0.22	:
Nitrate	mg/kg-dry	T	11.7	J	8.6	J	12.9	J	10.5	J	7.4	J	7.2	J
Phosphorus	mg/kg-dry	T	253.	J	322.	J	513.	J	306.	J	453.	J	346.	J
Sulfate	mg/kg-dry	T	2.7	J	9.1	J	13.6	J	14.7	J	6.9	J	<2.3	J
Total Kjeldahl Nitrogen	mg/kg-dry	T	860.	:	1700.	:	1550.	:	1100.	:	814.	:	996.	:
Total Organic Carbon	mg/kg-dry	T	21000.	:	23500.	:	45400.	:	245500.	:	29600.	:	20800.	:
Laboratory Parameters														
pH	SU	T	7.7	J	7.7	J	7.8	J	7.5	J	7.	J	7.4	J
Solids, Percent	%	T	87.3	:	82.1	:	89.7	:	85.6	:	83.8	:	88.2	:
Specific Conductance	umhos/cm	T	91.	J	116.	J	201.	J	65.8	J	55.4	J	59.9	J
Geotechnical														
Organic Soils	%	T	4.	:	7.	:	6.	:	5.6	:	7.	:	4.2	:
Physical Properties														
Cation-Exchange Capacity	meq/100g	T	20.4	:	27.4	:	24.6	:	26.4	:	31.8	:	22.8	:
Sodium Absorption Ratio	ratio	T	0.11	:	0.07	:	0.06	:	<0.06	:	0.07	:	0.07	:
Metals														
Aluminum	mg/kg-dry	T	5690.	:	6880.	:	5340.	:	7330.	:	9170.	:	6630.	:
Antimony	mg/kg-dry	T	<0.46	J	<0.5	J	<0.45	J	<0.49	J	<0.48	J	<0.45	J
Arsenic	mg/kg-dry	T	2.6	:	3.2	:	2.2	:	3.	:	3.3	:	1.9	:
Barium	mg/kg-dry	T	63.8	:	113.	:	73.5	:	146.	:	206.	:	115.	:
Beryllium	mg/kg-dry	T	0.64	J	0.74	J	0.59	J	0.8	J	0.84	J	0.66	J
Boron	mg/kg-dry	T	<1.7	:	<2.6	:	3.	:	<1.6	:	2.8	:	<2.3	:
Cadmium	mg/kg-dry	T	0.31	:	0.4	:	0.34	:	0.42	:	0.51	:	0.33	:
Calcium	mg/kg-dry	T	2830.	:	4560.	:	4650.	:	4400.	:	5080.	:	2900.	:
Chromium	mg/kg-dry	T	7.8	:	13.8	:	8.3	:	11.9	:	15.7	:	7.6	:
Cobalt	mg/kg-dry	T	3.8	:	4.9	:	3.6	:	5.1	:	6.5	:	3.4	:
Copper	mg/kg-dry	T	13.7	:	19.5	:	13.8	:	19.8	:	30.9	:	13.1	:
Iron	mg/kg-dry	T	12600.	:	14200.	:	11400.	:	14600.	:	17800.	:	11200.	:
Lead	mg/kg-dry	T	31.3	:	35.4	:	29.1	:	39.5	:	44.2	:	30.6	:
Magnesium	mg/kg-dry	T	2290.	:	3000.	:	2310.	:	2920.	:	3520.	:	1860.	:
Manganese	mg/kg-dry	T	605.	:	733.	:	655.	:	782.	:	764.	:	643.	:

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID																	
			ATD42-1		5/6/2004		ATD42-1-T01N-SOL		ATD42-2		5/6/2004		ATD42-2-T01N-SOL		ATD42-3		5/6/2004		ATD42-3-T01N-SOL		ATD42-4		5/6/2004		ATD42-4-T01N-SOL	
			ATD						ATD						ATD						ATD					
Mercury	mg/kg-dry	T	<0.019	J					<0.02	J					<0.017	J					<0.018	J				
Molybdenum	mg/kg-dry	T	5.2	:					9.8	:					4.8	:					4.4	:				
Nickel	mg/kg-dry	T	6.2	J					9.9	J					6.9	J					9.7	J				
Potassium	mg/kg-dry	T	1790.	J					2200.	J					1830.	J					1910.	J				
Selenium	mg/kg-dry	T	<0.79	:					<0.78	:					<0.77	:					<0.78	:				
Silver	mg/kg-dry	T	<0.11	J					<0.11	J					<0.1	J					<0.11	J				
Sodium	mg/kg-dry	T	<56.5	J					<41.2	J					<37.4	J					<48.3	J				
Thallium	mg/kg-dry	T	<0.22	:					<0.23	:					<0.2	:					<0.25	:				
Vanadium	mg/kg-dry	T	11.1	:					14.1	:					10.	:					15.	:				
Zinc	mg/kg-dry	T	63.8	J					86.2	J					74.3	J					85.2	J				

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID																	
			ATD42-5		5/6/2004		ATD42-5-T01N-SOL		ATD42-6		5/6/2004		ATD42-6-T01N-SOL											
			ATD						ATD															
Mercury	mg/kg-dry	T	0.022	J					<0.016	J														
Molybdenum	mg/kg-dry	T	7.3	:					3.6	:														
Nickel	mg/kg-dry	T	12.9	J					5.6	J														
Potassium	mg/kg-dry	T	2310.	J					1940.	J														
Selenium	mg/kg-dry	T	<0.83	:					<0.77	:														
Silver	mg/kg-dry	T	<0.12	J					<0.11	J														
Sodium	mg/kg-dry	T	<68.2	J					<67.2	J														
Thallium	mg/kg-dry	T	<0.24	:					<0.24	:														
Vanadium	mg/kg-dry	T	18.5	:					11.7	:														
Zinc	mg/kg-dry	T	111.	J					70.1	J														

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID / Sample Date / Sample ID / Exposure Area	ATD42-7 5/6/2004 ATD42-7-T01N-SOL ATD		ATD42-8 5/6/2004 ATD42-8-T01N-SOL ATD		ATD43 5/8/2004 ATD43-T01N-SOL ATD		ATD44 5/8/2004 ATD44-T01N-SOL ATD		ATD45A 5/8/2004 ATD45A-T01N-SOL ATD		ATD46A 5/8/2004 ATD46A-T01N-SOL ATD	
General Chemistry															
Ammonia	mg/kg-dry	T		48.4	:	94.2	:	23.5	:	30.8	:	63.3	:	53.4	:
Chloride	mg/kg-dry	T		4.5	:	5.1	:	2.7	:	2.7	:	3.4	:	2.7	J
Fluoride	mg/kg-dry	T		0.14	:	0.53	:	0.44	:	0.24	:	<0.12	:	1.2	:
Nitrate	mg/kg-dry	T		3.5	J	7.2	J	4.2	J	7.1	J	7.1	J	5.1	J
Phosphorus	mg/kg-dry	T		628.	J	314.	J	37.8	J	335.	J	232.	J	423.	J
Sulfate	mg/kg-dry	T		3.	J	4.6	J	<2.2	J	<2.3	J	<2.5	J	<2.2	J
Total Kjeldahl Nitrogen	mg/kg-dry	T		558.	:	1230.	:	523.	:	973.	:	1710.	:	742.	:
Total Organic Carbon	mg/kg-dry	T		8260.	:	23700.	:	11500.	:	21000.	:	43900.	:	20600.	:
Laboratory Parameters															
pH	SU	T		7.1	J	7.4	J	7.4	J	7.	J	7.5	J	7.2	J
Solids, Percent	%	T		90.6	:	85.6	:	94.3	:	87.6	:	80.6	:	91.2	:
Specific Conductance	umhos/cm	T		30.7	J	120.	J	74.5	J	28.5	J	31.4	J	34.5	J
Geotechnical															
Organic Soils	%	T		3.5	:	5.	:	2.5	:	4.6	:	9.2	:	3.7	:
Physical Properties															
Cation-Exchange Capacity	meq/100g	T		19.3	:	27.7	:	16.1	:	18.6	:	32.5	:	21.5	:
Sodium Absorption Ratio	ratio	T		0.11	:	0.13	:	<0.05	:	0.04	:	0.15	:	0.05	:
Metals															
Aluminum	mg/kg-dry	T		9170.	:	6610.	:	5620.	:	7900.	:	11700.	:	7360.	J
Antimony	mg/kg-dry	T		<0.45	J	<0.52	J	<1.2	J	0.45	J	<0.48	J	<0.42	J
Arsenic	mg/kg-dry	T		4.2	:	2.2	:	2.1	:	2.	J	3.5	:	2.6	:
Barium	mg/kg-dry	T		227.	:	97.4	:	46.8	:	118.	:	220.	:	64.2	J
Beryllium	mg/kg-dry	T		0.71	J	0.79	J	0.61	J	0.7	J	1.1	J	0.76	J
Boron	mg/kg-dry	T		<1.4	J	2.8	:	<0.19	:	<1.3	:	3.2	:	<1.8	:
Cadmium	mg/kg-dry	T		0.42	J	0.38	:	0.21	:	0.3	:	0.68	:	0.37	:
Calcium	mg/kg-dry	T		2920.	:	3740.	:	2330.	:	2810.	:	5980.	:	2300.	J
Chromium	mg/kg-dry	T		21.	:	7.1	:	11.3	:	12.7	:	15.6	:	11.8	J
Cobalt	mg/kg-dry	T		7.4	:	3.5	:	3.9	:	4.8	:	6.7	:	3.9	:
Copper	mg/kg-dry	T		51.6	:	13.8	:	14.6	:	13.	:	23.7	:	8.4	J
Iron	mg/kg-dry	T		22700.	:	11000.	:	13400.	:	15300.	:	18400.	:	14400.	J
Lead	mg/kg-dry	T		51.1	:	43.6	:	25.1	:	30.2	:	50.9	:	37.1	J
Magnesium	mg/kg-dry	T		4800.	:	1830.	:	2470.	:	2540.	:	3250.	:	2600.	J
Manganese	mg/kg-dry	T		439.	:	691.	:	476.	:	749.	:	1530.	:	720.	J

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID / Sample Date / Sample ID											
			ATD42-7 / 5/6/2004 / ATD42-7-T01N-SOL		ATD42-8 / 5/6/2004 / ATD42-8-T01N-SOL		ATD43 / 5/8/2004 / ATD43-T01N-SOL		ATD44 / 5/8/2004 / ATD44-T01N-SOL		ATD45A / 5/8/2004 / ATD45A-T01N-SOL		ATD46A / 5/8/2004 / ATD46A-T01N-SOL	
			ATD		ATD		ATD		ATD		ATD		ATD	
Mercury	mg/kg-dry	T	<0.018	J	<0.019	J	0.022	:	<0.015	J	<0.02	J	<0.018	:
Molybdenum	mg/kg-dry	T	17.	:	6.	:	3.8	:	3.	:	3.7	:	3.4	:
Nickel	mg/kg-dry	T	17.	J	6.1	J	7.4	J	8.1	J	11.9	J	8.	J
Potassium	mg/kg-dry	T	2250.	J	1960.	J	1390.	J	1960.	J	3400.	J	1730.	J
Selenium	mg/kg-dry	T	<0.71	:	<0.79	:	<0.73	:	<0.78	:	0.91	J	<0.73	:
Silver	mg/kg-dry	T	0.15	J	<0.11	J	0.12	J	0.41	:	<0.12	:	<0.11	:
Sodium	mg/kg-dry	T	<72.4	J	<59.1	J	<55.1	:	<43.3	:	<49.1	:	60.3	:
Thallium	mg/kg-dry	T	<0.24	:	<0.22	:	0.14	:	0.12	:	0.19	:	<0.1	J
Vanadium	mg/kg-dry	T	23.4	:	9.9	:	14.	:	15.9	:	20.6	:	12.4	J
Zinc	mg/kg-dry	T	99.2	J	83.	J	58.2	J	81.1	J	135.	J	75.4	J

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID		Exposure Area															
			ATD46B		5/7/2004		ATD46B-T01N-SOL		ATD		ATD50A		5/8/2004		ATD50A-T01N-SOL		ATD		ATD7		5/8/2004		ATD7-T01N-SOL		ATD	
			ATD8-1		5/8/2004		ATD8-1-T01N-SOL		ATD		ATD8-2		5/7/2004		ATD8-2-T01N-SOL		ATD		ATD8-3		5/8/2004		ATD8-3-T01N-SOL		ATD	
General Chemistry																										
Ammonia	mg/kg-dry	T	44.4	:							71.3	:							33.5	:						
Chloride	mg/kg-dry	T	4.3	J							3.7	:							3.8	J						
Fluoride	mg/kg-dry	T	1.1	:							0.24	:							0.54	:						
Nitrate	mg/kg-dry	T	4.7	J							4.4	J							7.6	J						
Phosphorus	mg/kg-dry	T	338.	J							730.	J							815.	J						
Sulfate	mg/kg-dry	T	4.	J							216.	J							7.8	J						
Total Kjeldahl Nitrogen	mg/kg-dry	T	741.	:							1570.	:							587.	:						
Total Organic Carbon	mg/kg-dry	T	19200.	:							37100.	:							11300.	J						
Laboratory Parameters																										
pH	SU	T	6.6	J							6.6	J							6.8	J						
Solids, Percent	%	T	90.2	:							92.8	:							89.6	:						
Specific Conductance	umhos/cm	T	37.	J							371.	J							35.5	J						
Inorganics																										
Cyanide	mg/kg-dry	T	-								<0.51	:							-							
Geotechnical																										
Organic Soils	%	T	4.1	:							7.	:							2.9	:						
Physical Properties																										
Cation-Exchange Capacity	meq/100g	T	15.8	:							23.3	:							19.2	:						
Sodium Absorption Ratio	ratio	T	0.23	:							0.06	:							<0.06	:						
Metals																										
Aluminum	mg/kg-dry	T	6840.	:							6970.	:							7180.	:						
Antimony	mg/kg-dry	T	<1.2	J							<0.42	J							<0.43	J						
Arsenic	mg/kg-dry	T	2.3	:							3.9	:							4.1	:						
Barium	mg/kg-dry	T	80.5	:							189.	:							167.	:						
Beryllium	mg/kg-dry	T	0.69	J							0.63	J							0.62	J						
Boron	mg/kg-dry	T	<1.7	:							<1.7	J							<0.86	:						
Cadmium	mg/kg-dry	T	0.3	:							0.91	:							0.37	:						
Calcium	mg/kg-dry	T	2420.	:							5440.	:							2070.	:						
Chromium	mg/kg-dry	T	10.8	:							22.7	:							20.8	:						
Cobalt	mg/kg-dry	T	4.3	:							9.5	:							8.8	:						
Copper	mg/kg-dry	T	14.3	:							59.5	:							56.7	:						
Iron	mg/kg-dry	T	13900.	:							22300.	:							21100.	:						

Parameter	Units	Exposure Area Fraction	ATD8-1		ATD8-2		ATD8-3	
			5/8/2004		5/7/2004		5/8/2004	
			ATD8-1-T01N-SOL		ATD8-2-T01N-SOL		ATD8-3-T01N-SOL	
			ATD		ATD		ATD	
General Chemistry								
Ammonia	mg/kg-dry	T	80.9	:	106.	:	66.8	J
Chloride	mg/kg-dry	T	4.3	:	4.3	:	3.1	:
Fluoride	mg/kg-dry	T	0.85	:	0.19	:	0.11	:
Nitrate	mg/kg-dry	T	8.4	J	4.2	J	6.8	J
Phosphorus	mg/kg-dry	T	67.8	J	144.	J	87.8	J
Sulfate	mg/kg-dry	T	5.	J	<2.2	J	<2.3	J
Total Kjeldahl Nitrogen	mg/kg-dry	T	1310.	:	1290.	:	970.	:
Total Organic Carbon	mg/kg-dry	T	33900.	:	23100.	:	25000.	:
Laboratory Parameters								
pH	SU	T	7.7	J	7.4	J	7.4	J
Solids, Percent	%	T	86.2	:	94.3	:	90.	:
Specific Conductance	umhos/cm	T	216.	J	105.	J	93.1	J
Inorganics								
Cyanide	mg/kg-dry	T	-		-		-	
Geotechnical								
Organic Soils	%	T	6.3	:	5.3	:	4.9	:
Physical Properties								
Cation-Exchange Capacity	meq/100g	T	26.8	:	23.4	:	18.7	:
Sodium Absorption Ratio	ratio	T	<0.05	:	<0.05	:	<0.06	:
Metals								
Aluminum	mg/kg-dry	T	7300.	:	8280.	:	6450.	:
Antimony	mg/kg-dry	T	<1.3	J	<1.5	J	<1.2	J
Arsenic	mg/kg-dry	T	3.2	:	4.4	:	3.7	:
Barium	mg/kg-dry	T	220.	:	228.	:	169.	:
Beryllium	mg/kg-dry	T	0.52	J	0.67	J	0.49	J
Boron	mg/kg-dry	T	2.1	:	<0.19	:	<1.8	:
Cadmium	mg/kg-dry	T	0.28	:	0.48	:	0.32	:
Calcium	mg/kg-dry	T	5820.	:	4220.	:	3030.	:
Chromium	mg/kg-dry	T	19.2	:	22.	:	20.5	:
Cobalt	mg/kg-dry	T	6.3	:	8.5	:	5.8	:
Copper	mg/kg-dry	T	46.3	:	53.2	:	40.	:
Iron	mg/kg-dry	T	16200.	:	22000.	:	17100.	:

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID																	
			ATD46B		5/7/2004		ATD46B-T01N-SOL		ATD50A		5/8/2004		ATD50A-T01N-SOL		ATD7		5/8/2004		ATD7-T01N-SOL		ATD8-1		5/8/2004		ATD8-1-T01N-SOL	
			ATD						ATD						ATD						ATD					
Lead	mg/kg-dry	T	30.6	:					56.9	:					51.	:					50.4	:				
Magnesium	mg/kg-dry	T	2580.	:					4510.	:					4440.	:					4220.	:				
Manganese	mg/kg-dry	T	715.	:					483.	:					489.	:					295.	:				
Mercury	mg/kg-dry	T	<0.016	:					<0.018	J					<0.017	:					0.49	:				
Molybdenum	mg/kg-dry	T	6.5	:					72.3	:					55.5	:					21.6	:				
Nickel	mg/kg-dry	T	8.1	J					18.5	J					17.2	J					13.5	J				
Potassium	mg/kg-dry	T	1590.	J					2410.	J					2110.	J					2530.	J				
Selenium	mg/kg-dry	T	<0.75	:					0.89	J					<0.74	:					<0.78	:				
Silver	mg/kg-dry	T	<0.11	:					0.22	:					<0.31	:					0.19	J				
Sodium	mg/kg-dry	T	<40.	:					<117.	:					<115.	:					<76.4	:				
Thallium	mg/kg-dry	T	0.2	:					0.19	:					<0.11	J					0.21	:				
Vanadium	mg/kg-dry	T	11.2	:					23.1	:					21.8	:					19.8	:				
Zinc	mg/kg-dry	T	76.4	J					149.	J					71.9	J					93.7	J				

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID																	
			ATD8-2		5/7/2004		ATD8-2-T01N-SOL		ATD8-3		5/8/2004		ATD8-3-T01N-SOL											
			ATD						ATD															
Lead	mg/kg-dry	T	74.9	:					35.1	:														
Magnesium	mg/kg-dry	T	4810.	:					4810.	:														
Manganese	mg/kg-dry	T	406.	:					292.	:														
Mercury	mg/kg-dry	T	<0.017	:					<0.016	:														
Molybdenum	mg/kg-dry	T	25.3	:					18.	:														
Nickel	mg/kg-dry	T	17.8	J					14.8	J														
Potassium	mg/kg-dry	T	2240.	J					1940.	J														
Selenium	mg/kg-dry	T	<0.73	:					<0.77	:														
Silver	mg/kg-dry	T	0.27	J					<0.11	J														
Sodium	mg/kg-dry	T	<98.2	:					<88.9	:														
Thallium	mg/kg-dry	T	0.19	:					0.16	:														
Vanadium	mg/kg-dry	T	24.5	:					19.9	:														
Zinc	mg/kg-dry	T	135.	J					63.6	J														

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID		Exposure Area															
			ATD8-4		5/7/2004		ATD8-4-T01N-SOL		ATD		ATD8-5		5/7/2004		ATD8-5-T01N-SOL		ATD		ATD8-6		5/7/2004		ATD8-6-T01N-SOL		ATD	
General Chemistry																										
Ammonia	mg/kg-dry	T	34.7	:							38.7	:							71.3	:						
Chloride	mg/kg-dry	T	5.1	J							4.3	J							4.	J						
Fluoride	mg/kg-dry	T	0.39	:							0.21	:							0.13	:						
Nitrate	mg/kg-dry	T	7.4	J							9.4	J							7.4	J						
Phosphorus	mg/kg-dry	T	812.	J							784.	J							354.	J						
Sulfate	mg/kg-dry	T	3.6	J							7.7	J							6.4	J						
Total Kjeldahl Nitrogen	mg/kg-dry	T	488.	:							384.	:							163.	:						
Total Organic Carbon	mg/kg-dry	T	10000.	:							6060.	:							2920.	:						
Laboratory Parameters																										
pH	SU	T	7.4	J							7.4	J							6.7	J						
Solids, Percent	%	T	90.9	:							90.7	:							93.	:						
Specific Conductance	umhos/cm	T	33.9	J							43.5	J							26.1	J						
Inorganics																										
Cyanide	mg/kg-dry	T	-								-								-							
Geotechnical																										
Organic Soils	%	T	3.4	:							3.3	:							2.4	:						
Physical Properties																										
Cation-Exchange Capacity	meq/100g	T	20.4	:							19.	:							16.7	:						
Sodium Absorption Ratio	ratio	T	0.25	:							0.69	:							0.22	:						
Metals																										
Aluminum	mg/kg-dry	T	8760.	:							9590.	:							7140.	:						
Antimony	mg/kg-dry	T	<1.3	J							<1.3	J							<1.2	J						
Arsenic	mg/kg-dry	T	4.7	:							5.3	:							3.2	:						
Barium	mg/kg-dry	T	267.	:							382.	:							185.	:						
Beryllium	mg/kg-dry	T	0.61	J							0.5	J							0.43	J						
Boron	mg/kg-dry	T	2.5	:							<1.8	:							<1.2	:						
Cadmium	mg/kg-dry	T	0.21	:							0.18	:							0.13	:						
Calcium	mg/kg-dry	T	2870.	:							2680.	:							1950.	:						
Chromium	mg/kg-dry	T	19.7	:							26.8	:							19.2	:						
Cobalt	mg/kg-dry	T	4.4	:							4.	:							4.3	:						
Copper	mg/kg-dry	T	52.	:							55.5	:							42.6	:						
Iron	mg/kg-dry	T	21800.	:							24000.	:							14000.	:						

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID		Exposure Area	
			ATD8-7		5/7/2004		ATD8-7-T01N-SOL		ATD	
General Chemistry										
Ammonia	mg/kg-dry	T	83.	:						
Chloride	mg/kg-dry	T	4.4	:						
Fluoride	mg/kg-dry	T	0.57	:						
Nitrate	mg/kg-dry	T	5.8	J						
Phosphorus	mg/kg-dry	T	45.3	J						
Sulfate	mg/kg-dry	T	5.8	J						
Total Kjeldahl Nitrogen	mg/kg-dry	T	944.	:						
Total Organic Carbon	mg/kg-dry	T	24300.	:						
Laboratory Parameters										
pH	SU	T	7.5	J						
Solids, Percent	%	T	90.4	:						
Specific Conductance	umhos/cm	T	133.	J						
Inorganics										
Cyanide	mg/kg-dry	T	-							
Geotechnical										
Organic Soils	%	T	5.1	:						
Physical Properties										
Cation-Exchange Capacity	meq/100g	T	23.1	:						
Sodium Absorption Ratio	ratio	T	0.05	:						
Metals										
Aluminum	mg/kg-dry	T	8600.	:						
Antimony	mg/kg-dry	T	<1.2	J						
Arsenic	mg/kg-dry	T	3.8	:						
Barium	mg/kg-dry	T	166.	:						
Beryllium	mg/kg-dry	T	0.79	J						
Boron	mg/kg-dry	T	<0.19	:						
Cadmium	mg/kg-dry	T	0.31	:						
Calcium	mg/kg-dry	T	3960.	:						
Chromium	mg/kg-dry	T	18.7	:						
Cobalt	mg/kg-dry	T	6.2	:						
Copper	mg/kg-dry	T	36.	:						
Iron	mg/kg-dry	T	19300.	:						

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID		Exposure Area	
			ATD8-8		5/7/2004		ATD8-8-T01N-SOL		ATD	
General Chemistry										
Ammonia	mg/kg-dry	T	84.9	:						
Chloride	mg/kg-dry	T	2.5	:						
Fluoride	mg/kg-dry	T	0.26	:						
Nitrate	mg/kg-dry	T	<2.3	J						
Phosphorus	mg/kg-dry	T	568.	J						
Sulfate	mg/kg-dry	T	2.7	J						
Total Kjeldahl Nitrogen	mg/kg-dry	T	1090.	:						
Total Organic Carbon	mg/kg-dry	T	26200.	:						
Laboratory Parameters										
pH	SU	T	7.3	J						
Solids, Percent	%	T	87.9	:						
Specific Conductance	umhos/cm	T	52.8	J						
Inorganics										
Cyanide	mg/kg-dry	T	-							
Geotechnical										
Organic Soils	%	T	5.3	:						
Physical Properties										
Cation-Exchange Capacity	meq/100g	T	20.5	:						
Sodium Absorption Ratio	ratio	T	<0.08	:						
Metals										
Aluminum	mg/kg-dry	T	6750.	:						
Antimony	mg/kg-dry	T	<0.45	J						
Arsenic	mg/kg-dry	T	3.5	:						
Barium	mg/kg-dry	T	171.	:						
Beryllium	mg/kg-dry	T	0.57	J						
Boron	mg/kg-dry	T	<0.27	:						
Cadmium	mg/kg-dry	T	0.36	:						
Calcium	mg/kg-dry	T	3350.	:						
Chromium	mg/kg-dry	T	16.7	:						
Cobalt	mg/kg-dry	T	6.4	:						
Copper	mg/kg-dry	T	49.4	:						
Iron	mg/kg-dry	T	19100.	:						

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID		Exposure Area	
			TD1		5/8/2004		TD1-T01N-SOL		TD	
General Chemistry										
Ammonia	mg/kg-dry	T	22.4	J						
Chloride	mg/kg-dry	T	43.7	:						
Fluoride	mg/kg-dry	T	6.5	:						
Nitrate	mg/kg-dry	T	3.1	J						
Phosphorus	mg/kg-dry	T	125.	J						
Sulfate	mg/kg-dry	T	79.1	J						
Total Kjeldahl Nitrogen	mg/kg-dry	T	417.	J						
Total Organic Carbon	mg/kg-dry	T	9130.	:						
Laboratory Parameters										
pH	SU	T	7.5	J						
Solids, Percent	%	T	91.2	:						
Specific Conductance	umhos/cm	T	1660.	J						
Inorganics										
Cyanide	mg/kg-dry	T	<0.55	:						
Geotechnical										
Organic Soils	%	T	3.2	:						
Physical Properties										
Cation-Exchange Capacity	meq/100g	T	13.3	:						
Sodium Absorption Ratio	ratio	T	0.35	:						
Metals										
Aluminum	mg/kg-dry	T	11200.	:						
Antimony	mg/kg-dry	T	<0.43	J						
Arsenic	mg/kg-dry	T	4.4	:						
Barium	mg/kg-dry	T	108.	:						
Beryllium	mg/kg-dry	T	1.5	J						
Boron	mg/kg-dry	T	<0.26	J						
Cadmium	mg/kg-dry	T	1.8	J						
Calcium	mg/kg-dry	T	9890.	J						
Chromium	mg/kg-dry	T	43.8	J						
Cobalt	mg/kg-dry	T	10.7	J						
Copper	mg/kg-dry	T	138.	:						
Iron	mg/kg-dry	T	23700.	J						

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID Sample Date Sample ID Exposure Area	ATD8-4 5/7/2004 ATD8-4-T01N-SOL ATD		ATD8-5 5/7/2004 ATD8-5-T01N-SOL ATD		ATD8-6 5/7/2004 ATD8-6-T01N-SOL ATD		ATD8-7 5/7/2004 ATD8-7-T01N-SOL ATD		ATD8-8 5/7/2004 ATD8-8-T01N-SOL ATD		TD1 5/8/2004 TD1-T01N-SOL TD	
Lead	mg/kg-dry	T		60.6	:	68.1	:	51.1	:	49.5	:	40.4	:	186.	J
Magnesium	mg/kg-dry	T		4130.	:	5210.	:	4080.	:	4190.	:	4070.	:	7790.	J
Manganese	mg/kg-dry	T		247.	:	195.	:	183.	:	586.	:	369.	:	1170.	:
Mercury	mg/kg-dry	T		0.02	:	0.022	:	<0.017	:	<0.018	:	<0.016	J	0.017	J
Molybdenum	mg/kg-dry	T		35.2	:	41.3	:	23.3	:	11.	:	16.6	:	642.	J
Nickel	mg/kg-dry	T		12.4	J	13.6	J	12.	J	13.8	J	14.	J	27.	J
Potassium	mg/kg-dry	T		2570.	J	2860.	J	1760.	J	2080.	J	1820.	J	3930.	J
Selenium	mg/kg-dry	T		<0.75	:	0.88	J	<0.72	:	<0.77	:	<0.78	:	<0.75	J
Silver	mg/kg-dry	T		0.23	:	0.51	:	0.15	:	0.14	J	0.15	:	0.85	:
Sodium	mg/kg-dry	T		<72.6	:	<79.4	:	<26.4	:	<91.3	:	<92.5	:	<110.	:
Thallium	mg/kg-dry	T		0.28	:	0.31	:	0.23	:	0.19	:	0.15	:	0.31	:
Vanadium	mg/kg-dry	T		23.3	:	29.2	:	19.	:	20.5	:	19.2	:	43.7	:
Zinc	mg/kg-dry	T		64.5	J	51.7	J	45.6	J	89.	J	72.9	J	232.	J

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID		TD1		5/8/2004		STD1-T01N-SOL		STD		TD11C		5/8/2004		TD11C-T01N-SOL		TD		TD11C		5/8/2004		STD11C-T01N-SOL		STD		TD14		5/7/2004		TD14-T01N-SOL		TD		TD14		5/7/2004		STD14-T01N-SOL		STD		TD16		5/7/2004		TD16-T01N-SOL		TD
General Chemistry																																																					
Ammonia	mg/kg-dry	T							17.4	:							45.1	:							18.1	:							31.	:							25.7	:							15.2	:				
Chloride	mg/kg-dry	T							46.1	:							2.7	J							4.2	J							139.	:							23.6	:							2.8	:				
Fluoride	mg/kg-dry	T							9.9	:							8.4	:							8.1	:							3.3	:							1.4	:							1.	:				
Nitrate	mg/kg-dry	T							2.1	J							<2.4	J							4.7	J							3.5	J							<2.2	J							<2.	J				
Phosphorus	mg/kg-dry	T							73.8	J							2130.	J							1210.	J							58.7	J							61.9	J							810.	J				
Sulfate	mg/kg-dry	T							49.	J							46.	J							72.2	J							2780.	J							1000.	J							19.6	J				
Total Kjeldahl Nitrogen	mg/kg-dry	T							148.	:							562.	:							315.	:							340.	:							251.	:							192.	:				
Total Organic Carbon	mg/kg-dry	T							2650.	:							9660.	:							9610.	J							18300.	:							5260.	:							4750.	:				
Laboratory Parameters																																																					
pH	SU	T							5.1	J							5.9	J							6.4	J							7.3	J							5.9	:							8.1	J				
Solids, Percent	%	T							95.9	:							83.4	:							86.3	:							97.7	:							94.4	J							97.8	:				
Specific Conductance	umhos/cm	T							1340.	J							225.	J							154.	J							2680.	J							1500.	J							106.	J				
Inorganics																																																				
Cyanide	mg/kg-dry	T							<0.48	:							<0.59	:							<0.58	:							<0.5	:							<0.49	:							-					
Geotechnical																																																				
Organic Soils	%	T							2.4	:							3.1	:							2.8	:							2.8	:							2.9	:							2.	:				
Physical Properties																																																				
Cation-Exchange Capacity	meq/100g	T							8.8	:							21.8	:							21.4	:							14.2	:							13.7	:							8.6	:				
Sodium Absorption Ratio	ratio	T							0.41	:							0.15	:							0.12	:							0.64	:							0.16	:							0.05	:				
Metals																																																				
Aluminum	mg/kg-dry	T							5540.	:							13700.	:							11600.	:							9830.	:							8220.	:							10100.	:				
Antimony	mg/kg-dry	T							<0.4	J							<0.46	J							<0.45	J							<1.1	J							<1.2	J							<0.4	J				
Arsenic	mg/kg-dry	T							5.	:							6.	:							7.3	:							3.8	:							4.1	:							2.8	J				
Barium	mg/kg-dry	T							94.1	:							129.	:							118.	:							118.	:							138.	:							66.9	:				
Beryllium	mg/kg-dry	T							0.62	J							1.3	J							1.4	J							1.	J							0.68	J							0.79	J				
Boron	mg/kg-dry	T							<0.18	J							<1.4	:							<0.76	:							<0.18	:							<0.19	:							<0.18	:				
Cadmium	mg/kg-dry	T							0.51	J							1.9	:							1.3	:							0.93	:							0.31	:							2.4	:				
Calcium	mg/kg-dry	T							2290.	:							7420.	:							6840.	:							10300.	:							3540.	:							9400.	:				
Chromium	mg/kg-dry	T							14.7	:							67.6	:							39.	:							32.6	:							26.1	:							61.3	:				
Cobalt	mg/kg-dry	T							6.5	:							12.5	:							9.5	:							7.3	:							7.5	:							9.2	:				
Copper	mg/kg-dry	T							59.2	:							160.	:							139.	:							83.4	:							65.5	:							98.3	:				
Iron	mg/kg-dry	T							20800.	:							30200.	:							26700.	:							18700.	:							20400.	:							16600.	:				

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID																	
			TD1		5/8/2004		STD1-T01N-SOL		TD11C		5/8/2004		TD11C-T01N-SOL		TD11C		5/8/2004		STD11C-T01N-SOL		TD14		5/7/2004		TD14-T01N-SOL		TD14		5/7/2004		STD14-T01N-SOL		TD16		5/7/2004		TD16-T01N-SOL	
			STD						TD						STD						TD						STD						TD					
Lead	mg/kg-dry	T	41.3	:					125.	:					112.	:					89.3	:					49.4	:					158.	:				
Magnesium	mg/kg-dry	T	3650.	:					11600.	:					7000.	:					6560.	:					5200.	:					9670.	:				
Manganese	mg/kg-dry	T	437.	:					1080.	:					921.	:					751.	:					482.	:					888.	:				
Mercury	mg/kg-dry	T	<0.017	J					<0.018	:					<0.018	:					<0.016	:					<0.016	:					<0.016	J				
Molybdenum	mg/kg-dry	T	51.2	:					364.	:					519.	:					376.	:					129.	:					215.	:				
Nickel	mg/kg-dry	T	10.9	J					37.3	J					23.2	J					20.3	J					16.5	J					31.3	J				
Potassium	mg/kg-dry	T	1300.	J					4970.	J					3880.	J					3290.	J					2390.	J					2900.	J				
Selenium	mg/kg-dry	T	<0.7	:					<0.8	:					<0.8	:					<0.7	:					0.77	J					<0.71	:				
Silver	mg/kg-dry	T	0.19	:					1.1	:					0.83	:					0.48	:					0.3	J					0.31	:				
Sodium	mg/kg-dry	T	<137.	:					<22.2	:					<72.1	:					<167.	:					<115.	:					<17.	:				
Thallium	mg/kg-dry	T	<0.1	:					0.23	J					0.23	J					0.3	:					0.23	:					0.21	:				
Vanadium	mg/kg-dry	T	19.2	:					60.6	:					41.1	:					35.9	:					27.1	:					42.6	:				
Zinc	mg/kg-dry	T	86.6	J					255.	J					159.	J					147.	J					77.3	J					307.	J				

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID	TD16	TD19	TD19	TD24	TD24	TD25
			Sample Date	5/7/2004	5/7/2004	5/7/2004	5/8/2004	5/10/2004	5/8/2004
			Sample ID	STD16-T01N-SOL	TD19-T01N-SOL	STD19-T01N-SOL	TD24-T01N-SOL	STD24-T01N-SOL	TD25-T01N-SOL
			Exposure Area	STD	TD	STD	TD	STD	TD
General Chemistry									
Ammonia	mg/kg-dry	T		35.4 :	31.4 :	20.7 :	9.9 :	14.9 :	18.8 :
Chloride	mg/kg-dry	T		4.8 :	2.9 :	2.9 :	2.4 J	2.1 :	3.8 J
Fluoride	mg/kg-dry	T		0.36 :	1.1 :	2.1 :	2.5 :	1.5 :	0.46 :
Nitrate	mg/kg-dry	T		<2.1 J	<2. J	2.1 J	<2.2 J	2.3 J	2.6 J
Phosphorus	mg/kg-dry	T		49.7 J	702. J	73.3 J	910. J	349. J	685. J
Sulfate	mg/kg-dry	T		304. J	45.5 J	334. J	512. J	33.6 J	574. J
Total Kjeldahl Nitrogen	mg/kg-dry	T		178. :	310. :	108. :	71.9 :	55.6 :	199. :
Total Organic Carbon	mg/kg-dry	T		3980. :	9390. :	3020. :	<1350. J	567. :	2450. :
Laboratory Parameters									
pH	SU	T		5.8 J	7.9 J	6.8 J	7.8 J	7.8 J	7. J
Solids, Percent	%	T		96.3 :	98.7 :	97.2 :	91.2 :	96.5 :	97.8 :
Specific Conductance	umhos/cm	T		472. J	155. J	530. J	1390. J	117. J	1080. J
Inorganics									
Cyanide	mg/kg-dry	T		-	<0.49 :	<0.47 :	-	-	-
Geotechnical									
Organic Soils	%	T		2.7 :	2.4 :	1.8 :	1.1 :	1.5 :	1.3 :
Physical Properties									
Cation-Exchange Capacity	meq/100g	T		13.2 :	8.7 :	11. :	19.4 :	7.5 :	16.5 :
Sodium Absorption Ratio	ratio	T		0.09 :	0.09 :	<0.03 :	0.07 :	0.13 :	0.09 :
Metals									
Aluminum	mg/kg-dry	T		7270. :	9210. :	5870. :	8420. :	4430. :	4610. :
Antimony	mg/kg-dry	T		<1.1 J	<0.39 J	<1.1 J	<0.43 J	0.74 J	<0.41 J
Arsenic	mg/kg-dry	T		4.4 :	3.7 :	3.2 :	3.2 :	2.9 :	1.9 :
Barium	mg/kg-dry	T		129. :	67.4 :	106. :	92. :	51.1 :	102. :
Beryllium	mg/kg-dry	T		0.59 J	0.82 J	0.45 J	0.86 J	0.44 J	0.53 J
Boron	mg/kg-dry	T		<0.18 :	<0.18 :	<0.18 :	<0.3 :	<0.18 :	<0.46 :
Cadmium	mg/kg-dry	T		0.2 :	3.6 :	0.16 :	0.7 :	0.18 :	0.8 :
Calcium	mg/kg-dry	T		2240. :	10900. :	2000. :	12300. :	1520. :	9270. :
Chromium	mg/kg-dry	T		21.8 :	49.9 :	16.9 :	41.4 :	13. :	7.8 :
Cobalt	mg/kg-dry	T		8.4 :	10.5 :	5.4 :	7.8 :	5.2 :	4.1 :
Copper	mg/kg-dry	T		61.4 :	145. :	42. :	64.2 :	24.2 :	71.9 :
Iron	mg/kg-dry	T		21300. :	18100. :	16200. :	16200. :	12500. :	9250. :

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID / Sample Date / Sample ID											
			TD16 / 5/7/2004 / STD16-T01N-SOL		TD19 / 5/7/2004 / TD19-T01N-SOL		TD19 / 5/7/2004 / STD19-T01N-SOL		TD24 / 5/8/2004 / TD24-T01N-SOL		TD24 / 5/10/2004 / STD24-T01N-SOL		TD25 / 5/8/2004 / TD25-T01N-SOL	
			STD		TD		STD		TD		STD		TD	
Lead	mg/kg-dry	T	50.9	:	396.	:	33.	:	62.6	:	24.6	:	62.8	:
Magnesium	mg/kg-dry	T	4490.	:	7500.	:	4170.	:	6740.	:	3320.	:	2490.	:
Manganese	mg/kg-dry	T	411.	:	868.	:	347.	:	780.	:	327.	:	546.	:
Mercury	mg/kg-dry	T	<0.016	:	<0.016	J	<0.014	:	<0.017	:	<0.016	:	<0.017	:
Molybdenum	mg/kg-dry	T	53.6	:	289.	:	63.9	:	173.	:	24.1	:	135.	:
Nickel	mg/kg-dry	T	14.3	J	29.4	J	12.5	J	23.8	J	12.3	J	8.8	J
Potassium	mg/kg-dry	T	1860.	J	2560.	J	1780.	J	2680.	J	1150.	J	1430.	J
Selenium	mg/kg-dry	T	<0.71	:	<0.68	:	<0.72	:	<0.75	:	<0.71	:	<0.72	:
Silver	mg/kg-dry	T	0.5	:	0.68	:	<0.1	J	<0.34	:	<0.19	:	<0.3	:
Sodium	mg/kg-dry	T	<113.	:	<35.5	:	<104.	:	<32.6	:	<100.	:	<106.	:
Thallium	mg/kg-dry	T	0.21	:	0.19	:	0.19	:	<0.11	J	0.16	:	<0.1	J
Vanadium	mg/kg-dry	T	23.3	:	37.1	:	19.7	:	32.4	:	13.2	:	13.4	:
Zinc	mg/kg-dry	T	60.7	J	472.	J	52.9	J	104.	J	49.7	J	111.	J

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID		TD25 5/8/2004 STD25-T01N-SOL STD		TD27 5/8/2004 TD27-T01N-SOL TD		TD27 5/8/2004 STD27-T01N-SOL STD		TD36B 5/10/2004 TD36B-T01N-SOL TD		TD36B 5/10/2004 STD36B-T01N-SOL STD		TD4 5/8/2004 TD4-T01N-SOL TD	
General Chemistry																				
Ammonia	mg/kg-dry	T							35.	:	13.1	:	29.4	:	9.9	:	101.	:	8.4	:
Chloride	mg/kg-dry	T							32.6	J	4.	J	4.5	J	2.1	:	2.9	:	3.8	J
Fluoride	mg/kg-dry	T							0.51	:	0.68	:	1.6	:	0.63	:	0.38	:	3.5	:
Nitrate	mg/kg-dry	T							<2.1	J	<2.1	J	4.1	J	2.3	J	8.7	J	3.6	J
Phosphorus	mg/kg-dry	T							624.	J	500.	J	421.	J	245.	J	163.	J	454.	J
Sulfate	mg/kg-dry	T							196.	J	29.5	J	40.	J	185.	J	109.	J	91.4	J
Total Kjeldahl Nitrogen	mg/kg-dry	T							608.	:	61.1	:	93.6	:	64.7	:	823.	:	94.2	:
Total Organic Carbon	mg/kg-dry	T							22400.	J	<802.	:	1360.	:	418.	:	6200.	:	3730.	J
Laboratory Parameters																				
pH	SU	T							6.	J	8.5	J	7.9	J	8.	J	8.2	J	7.8	J
Solids, Percent	%	T							96.3	:	96.4	:	95.5	:	96.8	:	88.3	:	95.9	:
Specific Conductance	umhos/cm	T							1990.	J	85.2	J	81.2	J	1640.	J	925.	J	200.	J
Inorganics																				
Cyanide	mg/kg-dry	T							-		-		-		-		-		<0.51	:
Geotechnical																				
Organic Soils	%	T							3.4	:	0.6	:	1.3	:	0.8	:	4.8	:	1.	:
Physical Properties																				
Cation-Exchange Capacity	meq/100g	T							17.5	:	16.3	:	5.4	:	5.1	:	26.1	:	19.7	:
Sodium Absorption Ratio	ratio	T							0.35	:	0.21	:	0.27	:	<0.02	:	0.15	:	0.09	:
Metals																				
Aluminum	mg/kg-dry	T							5260.	:	5870.	:	4820.	:	7680.	:	13700.	:	4400.	:
Antimony	mg/kg-dry	T							<0.42	J	<0.4	J	<0.41	J	0.73	J	0.85	J	<0.4	J
Arsenic	mg/kg-dry	T							3.9	:	3.3	:	2.4	:	<1.9	:	5.3	:	3.8	:
Barium	mg/kg-dry	T							99.7	:	26.6	:	58.8	:	70.7	:	188.	:	53.2	:
Beryllium	mg/kg-dry	T							0.48	J	1.4	J	0.49	J	0.83	J	0.89	J	0.89	J
Boron	mg/kg-dry	T							<0.98	:	<0.42	:	<0.49	:	<0.18	:	1.9	:	<0.49	:
Cadmium	mg/kg-dry	T							0.44	:	0.72	:	0.27	:	0.49	:	0.24	:	1.2	:
Calcium	mg/kg-dry	T							4620.	:	14900.	:	1850.	:	12900.	:	17800.	:	7610.	:
Chromium	mg/kg-dry	T							16.	:	15.9	:	12.4	:	39.4	:	14.7	:	7.4	:
Cobalt	mg/kg-dry	T							5.7	:	3.5	:	4.9	:	7.1	:	8.7	:	3.6	:
Copper	mg/kg-dry	T							48.2	:	114.	:	29.8	:	118.	:	18.3	:	62.7	:
Iron	mg/kg-dry	T							16400.	:	9540.	:	13500.	:	13500.	:	18700.	:	10700.	:

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID															
			TD25		5/8/2004		STD25-T01N-SOL		TD27		5/8/2004		TD27-T01N-SOL		TD27		5/8/2004		STD27-T01N-SOL		TD36B		5/10/2004		TD36B-T01N-SOL		TD36B		5/10/2004		STD36B-T01N-SOL		TD4		5/8/2004		TD4-T01N-SOL	
			STD						TD						STD						TD						STD						TD					
Lead	mg/kg-dry	T	45.1	:					63.9	:					24.5	:					22.5	:					17.2	:					149.	:		
Magnesium	mg/kg-dry	T	3230.	:					3140.	:					2780.	:					7980.	:					5020.	:					2080.	:		
Manganese	mg/kg-dry	T	388.	:					743.	:					374.	:					411.	:					491.	:					561.	:		
Mercury	mg/kg-dry	T	<0.016	:					<0.017	:					<0.017	:					<0.017	:					<0.019	:					<0.014	:		
Molybdenum	mg/kg-dry	T	50.9	:					105.	:					45.4	:					559.	:					25.	:					171.	:		
Nickel	mg/kg-dry	T	13.9	J					8.9	J					9.6	J					25.	J					13.4	J					6.1	J		
Potassium	mg/kg-dry	T	1720.	J					1500.	J					1100.	J					4880.	J					2190.	J					1150.	J		
Selenium	mg/kg-dry	T	<0.73	:					<0.7	:					<0.73	:					<0.7	:					<0.79	:					<0.7	:		
Silver	mg/kg-dry	T	0.31	:					<0.46	:					<0.16	:					0.73	:					<0.11	:					1.4	:		
Sodium	mg/kg-dry	T	<147.	:					<169.	:					<75.4	:					<37.4	:					<78.	:					<121.	:		
Thallium	mg/kg-dry	T	<0.1	J					<0.1	J					<0.1	J					0.45	:					0.25	:					<0.1	J		
Vanadium	mg/kg-dry	T	15.9	:					14.8	:					14.3	:					44.	:					33.8	:					12.6	:		
Zinc	mg/kg-dry	T	71.6	J					101.	J					59.2	J					84.2	J					52.	J					155.	J		

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID		TD4		TD40C		TD40C		TD41		TD42-1		TD42-2	
			Sample Date		5/8/2004		5/7/2004		5/7/2004		5/6/2004		5/6/2004		5/6/2004	
			Sample ID		STD4-T01N-SOL		TD40C-T01N-SOL		STD40C-T01N-SOL		STD41-T01N-SOL		STD42-1-T01N-SOL		STD42-2-T01N-SOL	
			Exposure Area		STD		TD		STD		STD		STD		STD	
General Chemistry																
Ammonia	mg/kg-dry	T			53.1	:	30.5	:	49.6	:	<9.6	:	12.3	:	66.1	:
Chloride	mg/kg-dry	T			13.2	J	2.6	J	5.6	J	3.1	:	4.3	:	6.2	:
Fluoride	mg/kg-dry	T			6.6	:	5.	:	1.8	:	0.94	:	1.1	:	0.91	:
Nitrate	mg/kg-dry	T			<2.1	J	8.6	J	13.3	J	4.	J	6.2	J	22.5	J
Phosphorus	mg/kg-dry	T			965.	J	240.	J	587.	J	565.	J	157.	J	423.	J
Sulfate	mg/kg-dry	T			769.	J	698.	J	723.	J	69.4	J	115.	J	169.	J
Total Kjeldahl Nitrogen	mg/kg-dry	T			434.	:	356.	:	530.	:	66.7	:	258.	:	680.	J
Total Organic Carbon	mg/kg-dry	T			9380.	:	11200.	:	11400.	:	<1020.	:	7220.	:	16300.	:
Laboratory Parameters																
pH	SU	T			4.6	J	6.3	J	6.9	J	6.7	J	7.5	J	7.5	J
Solids, Percent	%	T			93.7	:	90.	:	86.8	:	95.1	:	93.5	:	91.1	:
Specific Conductance	umhos/cm	T			1420.	J	1270.	J	1440.	J	96.4	J	240.	J	453.	J
Inorganics																
Cyanide	mg/kg-dry	T			<0.53	:	-		-		-		-		-	
Geotechnical																
Organic Soils	%	T			3.6	:	2.3	:	3.6	:	1.7	:	2.5	:	4.1	:
Physical Properties																
Cation-Exchange Capacity	meq/100g	T			21.1	:	14.	:	21.3	:	9.1	:	17.	:	23.8	:
Sodium Absorption Ratio	ratio	T			0.08	:	0.09	:	0.12	:	0.13	:	0.18	:	0.13	:
Metals																
Aluminum	mg/kg-dry	T			8260.	:	9760.	:	8730.	:	7050.	:	7160.	:	8130.	J
Antimony	mg/kg-dry	T			<0.42	J	<1.3	J	<1.3	J	<0.42	J	<0.51	J	<0.44	J
Arsenic	mg/kg-dry	T			5.3	:	3.6	:	3.5	:	3.2	:	3.6	:	3.6	:
Barium	mg/kg-dry	T			241.	:	132.	:	224.	:	136.	:	234.	:	198.	:
Beryllium	mg/kg-dry	T			0.69	J	0.85	J	0.82	J	0.5	J	0.67	J	0.8	J
Boron	mg/kg-dry	T			<1.	:	<1.3	:	2.	:	<0.18	:	<0.34	:	<1.4	:
Cadmium	mg/kg-dry	T			0.47	J	0.59	:	0.48	:	0.19	:	0.26	:	0.4	:
Calcium	mg/kg-dry	T			4450.	:	5670.	:	4680.	:	2210.	:	2750.	:	4090.	J
Chromium	mg/kg-dry	T			21.8	:	33.3	:	20.3	:	28.9	:	18.7	:	17.1	J
Cobalt	mg/kg-dry	T			8.2	:	8.9	:	8.3	:	7.7	:	7.	:	6.8	J
Copper	mg/kg-dry	T			79.4	:	89.8	:	46.7	:	42.7	:	48.9	:	34.6	:
Iron	mg/kg-dry	T			25200.	:	18500.	:	21200.	:	19700.	:	18700.	:	18200.	J

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID															
			TD4		5/8/2004		STD4-T01N-SOL		TD40C		5/7/2004		TD40C-T01N-SOL		TD40C		5/7/2004		STD40C-T01N-SOL		TD41		5/6/2004		STD41-T01N-SOL		TD42-1		5/6/2004		STD42-1-T01N-SOL		TD42-2		5/6/2004		STD42-2-T01N-SOL	
			STD						TD						STD						STD						STD					
Lead	mg/kg-dry	T	49.6	:					54.8	:					47.7	:					30.2	:					51.2	:					42.6	J				
Magnesium	mg/kg-dry	T	4470.	:					6560.	:					4310.	:					4920.	:					4300.	:					3810.	J				
Manganese	mg/kg-dry	T	457.	:					640.	:					608.	:					343.	:					342.	:					622.	J				
Mercury	mg/kg-dry	T	<0.017	:					<0.016	:					<0.019	:					<0.016	J					<0.015	J					<0.017	J				
Molybdenum	mg/kg-dry	T	116.	:					225.	:					37.	:					23.8	:					18.5	:					17.1	:				
Nickel	mg/kg-dry	T	16.1	J					23.9	J					18.6	J					20.8	J					17.3	J					14.6	J				
Potassium	mg/kg-dry	T	2190.	J					3640.	J					2170.	J					1740.	J					1630.	J					2010.	J				
Selenium	mg/kg-dry	T	0.82	J					<0.76	:					<0.8	:					<0.7	:					<0.75	:					<0.7	:				
Silver	mg/kg-dry	T	<0.4	:					0.54	:					0.32	:					0.36	J					0.23	J					0.17	J				
Sodium	mg/kg-dry	T	<196.	:					<29.6	:					<87.4	:					<63.5	J					<106.	:					<80.8	:				
Thallium	mg/kg-dry	T	<0.11	J					0.35	J					0.25	:					<0.24	:					<0.26	:					<0.25	:				
Vanadium	mg/kg-dry	T	27.	:					33.7	:					21.	:					21.	:					18.7	:					18.	:				
Zinc	mg/kg-dry	T	87.8	J					109.	J					102.	J					48.1	J					83.5	J					93.8	J				

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID	TD42-3		TD42-4		TD42-5		TD42-6		TD42-7		TD42-8	
			Sample Date	5/6/2004		5/6/2004		5/6/2004		5/6/2004		5/6/2004		5/6/2004	
			Sample ID	STD42-3-T01N-SOL		STD42-4-T01N-SOL		STD42-5-T01N-SOL		STD42-6-T01N-SOL		STD42-7-T01N-SOL		STD42-8-T01N-SOL	
			Exposure Area	STD		STD		STD		STD		STD		STD	
General Chemistry															
Ammonia	mg/kg-dry	T		84.6	:	30.	:	45.5	:	112.	:	71.8	:	81.7	:
Chloride	mg/kg-dry	T		7.5	:	3.2	:	4.1	:	8.3	:	4.9	:	5.2	:
Fluoride	mg/kg-dry	T		0.55	:	0.55	:	0.91	:	0.2	:	1.	:	0.82	:
Nitrate	mg/kg-dry	T		54.	J	9.1	J	19.4	J	114.	J	29.3	J	25.5	J
Phosphorus	mg/kg-dry	T		425.	J	268.	J	389.	J	339.	J	404.	J	542.	J
Sulfate	mg/kg-dry	T		151.	J	283.	J	160.	J	255.	J	153.	J	257.	J
Total Kjeldahl Nitrogen	mg/kg-dry	T		761.	:	620.	:	656.	:	1330.	:	991.	:	956.	:
Total Organic Carbon	mg/kg-dry	T		17700.	:	13000.	:	10400.	:	19600.	:	10100.	:	12800.	:
Laboratory Parameters															
pH	SU	T		7.6	J	7.5	J	7.6	J	7.4	J	7.6	J	7.2	J
Solids, Percent	%	T		90.7	:	93.7	:	89.4	:	89.2	:	90.7	:	90.6	:
Specific Conductance	umhos/cm	T		533.	J	654.	J	369.	J	1070.	J	491.	J	604.	J
Geotechnical															
Organic Soils	%	T		4.3	:	3.3	:	3.9	:	5.7	:	3.8	:	4.4	:
Physical Properties															
Cation-Exchange Capacity	meq/100g	T		25.1	:	19.	:	25.3	:	30.1	:	24.1	:	26.7	:
Sodium Absorption Ratio	ratio	T		0.23	:	0.07	:	0.17	:	0.1	:	0.12	:	0.08	:
Metals															
Aluminum	mg/kg-dry	T		8620.	:	7820.	:	9620.	:	9240.	:	9850.	:	9770.	:
Antimony	mg/kg-dry	T		<0.47	J	<0.45	J	<0.47	J	<0.45	J	<0.46	J	<0.45	J
Arsenic	mg/kg-dry	T		4.2	:	3.7	:	3.9	:	3.7	:	4.6	:	4.5	:
Barium	mg/kg-dry	T		263.	:	123.	:	202.	:	328.	:	230.	:	209.	:
Beryllium	mg/kg-dry	T		0.86	J	0.79	J	0.93	J	1.	J	0.89	J	0.92	J
Boron	mg/kg-dry	T		<1.5	:	<1.6	:	<1.7	:	2.6	:	<1.9	:	<1.7	:
Cadmium	mg/kg-dry	T		0.44	:	0.5	:	0.5	:	0.77	:	0.45	:	0.53	:
Calcium	mg/kg-dry	T		4550.	:	4010.	:	4420.	:	7460.	:	4450.	:	4590.	:
Chromium	mg/kg-dry	T		19.7	:	16.5	:	19.1	:	16.4	:	20.3	:	22.2	:
Cobalt	mg/kg-dry	T		8.	:	5.6	:	7.1	:	8.7	:	7.9	:	7.7	:
Copper	mg/kg-dry	T		43.2	:	32.4	:	39.3	:	35.6	:	46.8	:	46.2	:
Iron	mg/kg-dry	T		20500.	:	16400.	:	19700.	:	19900.	:	21000.	:	21100.	:
Lead	mg/kg-dry	T		49.6	:	46.6	:	50.5	:	52.9	:	57.8	:	51.8	:
Magnesium	mg/kg-dry	T		4130.	:	3560.	:	4000.	:	3690.	:	4390.	:	4450.	:
Manganese	mg/kg-dry	T		730.	:	724.	:	745.	:	1300.	:	583.	:	607.	:

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID	Sample Date	Sample ID													
			TD42-3	5/6/2004	STD42-3-T01N-SOL		TD42-4	5/6/2004	STD42-4-T01N-SOL		TD42-5	5/6/2004	STD42-5-T01N-SOL		TD42-6	5/6/2004	STD42-6-T01N-SOL	
Mercury	mg/kg-dry	T	<0.017	J			0.072	J			<0.019	J			<0.019	J		
Molybdenum	mg/kg-dry	T	20.8	:			37.2	:			99.3	:			12.8	:		
Nickel	mg/kg-dry	T	16.2	J			11.9	J			14.5	J			15.	J		
Potassium	mg/kg-dry	T	2130.	J			2150.	J			2130.	J			2200.	J		
Selenium	mg/kg-dry	T	<0.76	:			<0.74	:			<0.76	:			<0.75	:		
Silver	mg/kg-dry	T	0.15	J			<0.11	J			0.22	J			0.15	J		
Sodium	mg/kg-dry	T	<59.7	J			<52.9	J			<84.8	:			<80.8	:		
Thallium	mg/kg-dry	T	<0.26	:			<0.25	:			<0.28	:			<0.26	:		
Vanadium	mg/kg-dry	T	20.5	:			17.5	:			21.4	:			19.4	:		
Zinc	mg/kg-dry	T	95.3	J			97.	J			99.1	J			106.	J		

Parameter	Units	Exposure Area Fraction	Site ID	Sample Date	Sample ID													
			TD42-7	5/6/2004	STD42-7-T01N-SOL		TD42-8	5/6/2004	STD42-8-T01N-SOL									
Mercury	mg/kg-dry	T	<0.017	J			0.025	J										
Molybdenum	mg/kg-dry	T	32.5	:			90.3	:										
Nickel	mg/kg-dry	T	16.7	J			18.	J										
Potassium	mg/kg-dry	T	2220.	J			2170.	J										
Selenium	mg/kg-dry	T	<0.73	:			<0.76	:										
Silver	mg/kg-dry	T	0.24	J			0.25	J										
Sodium	mg/kg-dry	T	<74.	J			<64.5	J										
Thallium	mg/kg-dry	T	<0.25	:			<0.26	:										
Vanadium	mg/kg-dry	T	22.9	:			23.	:										
Zinc	mg/kg-dry	T	99.1	J			109.	J										

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID	Sample Date	Sample ID	Exposure Area											
			TD43	5/6/2004	TD43-T01N-SOL	TD	TD43	5/6/2004	STD43-T01N-SOL	STD	TD44	5/7/2004	TD44-T01N-SOL	TD	TD44	5/7/2004	STD44-T01N-SOL	STD
General Chemistry																	
Ammonia	mg/kg-dry	T	23.9	:			<7.4	:			<10.5	:			22.2	:	
Chloride	mg/kg-dry	T	4.8	J			3.6	J			3.7	J			3.1	J	
Fluoride	mg/kg-dry	T	11.9	:			2.1	:			3.8	:			2.1	:	
Nitrate	mg/kg-dry	T	<2.1	J			6.8	J			<2.2	J			4.7	J	
Phosphorus	mg/kg-dry	T	830.	J			195.	J			325.	J			909.	J	
Sulfate	mg/kg-dry	T	390.	J			16.	J			16.7	J			65.	J	
Total Kjeldahl Nitrogen	mg/kg-dry	T	198.	:			123.	:			160.	:			243.	:	
Total Organic Carbon	mg/kg-dry	T	1560.	:			2010.	:			6120.	:			4290.	:	
Laboratory Parameters																	
pH	SU	T	5.2	J			7.8	J			7.1	J			7.6	J	
Solids, Percent	%	T	94.3	:			92.7	:			90.6	:			88.8	:	
Specific Conductance	umhos/cm	T	475.	J			62.5	J			92.2	J			136.	J	
Geotechnical																	
Organic Soils	%	T	1.4	:			1.3	:			1.8	:			1.6	:	
Physical Properties																	
Cation-Exchange Capacity	meq/100g	T	5.8	:			9.	:			12.5	:			12.2	:	
Sodium Absorption Ratio	ratio	T	0.11	:			0.26	:			0.34	:			0.19	:	
Metals																	
Aluminum	mg/kg-dry	T	8560.	:			5260.	:			7480.	:			9260.	:	
Antimony	mg/kg-dry	T	<1.2	J			<1.2	J			<1.2	J			<1.3	J	
Arsenic	mg/kg-dry	T	2.3	:			2.	:			3.2	:			3.4	:	
Barium	mg/kg-dry	T	82.8	:			46.7	:			105.	:			89.	:	
Beryllium	mg/kg-dry	T	0.61	J			0.56	J			0.78	J			0.96	J	
Boron	mg/kg-dry	T	<0.79	:			<0.94	:			<1.3	:			<1.2	:	
Cadmium	mg/kg-dry	T	0.83	:			0.19	:			0.86	:			1.6	:	
Calcium	mg/kg-dry	T	5630.	:			1780.	:			3860.	:			6570.	:	
Chromium	mg/kg-dry	T	45.9	:			9.8	:			24.	:			38.9	:	
Cobalt	mg/kg-dry	T	13.9	:			3.1	:			10.1	:			11.5	:	
Copper	mg/kg-dry	T	147.	:			10.2	:			94.2	:			147.	:	
Iron	mg/kg-dry	T	22400.	:			10700.	:			21200.	:			18000.	:	
Lead	mg/kg-dry	T	81.4	:			23.5	:			65.6	:			227.	:	
Magnesium	mg/kg-dry	T	8240.	:			2020.	:			4550.	:			6720.	:	
Manganese	mg/kg-dry	T	491.	:			483.	:			572.	:			718.	:	

Parameter	Units	Exposure Area Fraction	Site ID	Sample Date	Sample ID	Exposure Area											
			TD45A	5/7/2004	TD45A-T01N-SOL	TD	TD45A	5/7/2004	STD45A-T01N-SOL	STD							
General Chemistry																	
Ammonia	mg/kg-dry	T	50.2	:			8.5	:									
Chloride	mg/kg-dry	T	2.7	J			3.9	J									
Fluoride	mg/kg-dry	T	10.4	:			3.5	:									
Nitrate	mg/kg-dry	T	5.1	J			4.4	J									
Phosphorus	mg/kg-dry	T	132.	J			527.	J									
Sulfate	mg/kg-dry	T	73.4	J			18.	J									
Total Kjeldahl Nitrogen	mg/kg-dry	T	238.	:			77.8	:									
Total Organic Carbon	mg/kg-dry	T	3080.	:			<890.	:									
Laboratory Parameters																	
pH	SU	T	5.5	J			6.6	J									
Solids, Percent	%	T	89.7	:			95.6	:									
Specific Conductance	umhos/cm	T	105.	J			74.5	J									
Geotechnical																	
Organic Soils	%	T	1.4	:			1.5	:									
Physical Properties																	
Cation-Exchange Capacity	meq/100g	T	10.4	:			11.4	:									
Sodium Absorption Ratio	ratio	T	0.57	:			0.32	:									
Metals																	
Aluminum	mg/kg-dry	T	5900.	:			5300.	:									
Antimony	mg/kg-dry	T	<1.3	J			<1.2	J									
Arsenic	mg/kg-dry	T	2.3	:			2.	:									
Barium	mg/kg-dry	T	48.4	:			93.6	:									
Beryllium	mg/kg-dry	T	1.2	J			0.68	J									
Boron	mg/kg-dry	T	<0.76	:			<0.74	:									
Cadmium	mg/kg-dry	T	1.7	:			0.38	:									
Calcium	mg/kg-dry	T	3980.	:			1700.	:									
Chromium	mg/kg-dry	T	14.9	:			13.7	:									
Cobalt	mg/kg-dry	T	5.8	:			4.4	:									
Copper	mg/kg-dry	T	129.	:			36.	:									
Iron	mg/kg-dry	T	10900.	:			12900.	:									
Lead	mg/kg-dry	T	153.	:			50.2	:									
Magnesium	mg/kg-dry	T	3050.	:			3480.	:									
Manganese	mg/kg-dry	T	894.	:			271.	:									

J = Qualified as estimated during data validation

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T = Total Fraction

Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID	Sample Date	Sample ID											
			TD43	5/6/2004	TD43-T01N-SOL	TD	TD43	5/6/2004	STD43-T01N-SOL	STD	TD44	5/7/2004	TD44-T01N-SOL	TD	TD44	5/7/2004	STD44-T01N-SOL	STD	TD45A	5/7/2004	TD45A-T01N-SOL	TD	TD45A	5/7/2004	STD45A-T01N-SOL	STD
Mercury	mg/kg-dry	T	<0.016	:			<0.018	:			<0.018	:			<0.019	:			<0.018	:			<0.017	:		
Molybdenum	mg/kg-dry	T	256.	:			5.3	:			214.	:			381.	:			243.	:			24.9	:		
Nickel	mg/kg-dry	T	32.4	J			6.	J			19.2	J			29.9	J			12.1	J			11.7	J		
Potassium	mg/kg-dry	T	4360.	J			1310.	J			2500.	J			3140.	J			1790.	J			1400.	J		
Selenium	mg/kg-dry	T	<0.72	:			<0.74	:			<0.74	:			<0.79	:			<0.77	:			<0.72	:		
Silver	mg/kg-dry	T	0.57	:			0.11	:			0.39	:			0.73	:			0.89	:			0.3	:		
Sodium	mg/kg-dry	T	<20.3	J			<49.5	:			<43.2	:			<19.2	J			<80.9	:			<85.1	:		
Thallium	mg/kg-dry	T	0.4	:			0.17	:			0.25	:			0.32	:			0.27	:			0.17	:		
Vanadium	mg/kg-dry	T	44.1	:			9.7	:			23.4	:			36.3	:			16.7	:			13.4	:		
Zinc	mg/kg-dry	T	131.	J			49.5	J			110.	J			375.	J			235.	J			103.	J		

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID		TD46A 5/7/2004 TD46A-T01N-SOL TD		TD46A 5/7/2004 STD46A-T01N-SOL STD		TD46B 5/7/2004 TD46B-T01N-SOL TD		TD46B 5/7/2004 STD46B-T01N-SOL STD		TD50A 5/8/2004 TD50A-T01N-SOL TD		TD50A 5/8/2004 STD50A-T01N-SOL STD	
General Chemistry																				
Ammonia	mg/kg-dry	T							<8.1	:	19.3	:	21.4	:	16.9	:	12.3	:	20.	:
Chloride	mg/kg-dry	T							3.	J	3.7	J	4.1	J	5.3	J	29.4	:	9.	J
Fluoride	mg/kg-dry	T							0.26	:	1.1	:	2.5	:	4.7	:	19.6	:	73.7	:
Nitrate	mg/kg-dry	T							2.7	J	4.4	J	2.5	J	4.2	J	<2.1	J	<2.2	J
Phosphorus	mg/kg-dry	T							245.	J	845.	J	366.	J	374.	J	737.	J	735.	J
Sulfate	mg/kg-dry	T							60.1	J	24.7	J	85.8	J	12.7	J	203.	J	783.	J
Total Kjeldahl Nitrogen	mg/kg-dry	T							147.	:	235.	:	190.	:	168.	:	104.	:	131.	:
Total Organic Carbon	mg/kg-dry	T							1690.	:	3100.	:	3940.	:	6820.	:	<1340.	:	2700.	:
Laboratory Parameters																				
pH	SU	T							7.8	J	7.8	J	6.9	J	6.9	J	3.8	J	4.9	J
Solids, Percent	%	T							95.4	:	91.6	:	94.5	:	92.3	:	95.4	:	91.6	:
Specific Conductance	umhos/cm	T							148.	J	72.7	J	204.	J	62.	J	1920.	J	2030.	J
Inorganics																				
Cyanide	mg/kg-dry	T							-		-		-		-		<0.52	:	<0.53	:
Geotechnical																				
Organic Soils	%	T							1.3	:	2.1	:	1.7	:	1.6	:	2.9	:	1.9	:
Physical Properties																				
Cation-Exchange Capacity	meq/100g	T							6.2	:	12.7	:	10.4	:	11.5	:	8.6	:	9.7	:
Sodium Absorption Ratio	ratio	T							0.1	:	0.1	:	0.12	:	0.68	:	0.16	:	0.16	:
Metals																				
Aluminum	mg/kg-dry	T							9360.	:	8610.	:	9250.	:	6640.	:	5790.	:	7470.	:
Antimony	mg/kg-dry	T							<1.2	J	<1.3	J	<1.2	J	<1.2	J	<0.4	J	<0.43	J
Arsenic	mg/kg-dry	T							2.6	:	4.1	:	3.7	:	2.2	:	5.2	:	3.8	:
Barium	mg/kg-dry	T							92.8	:	131.	:	90.2	:	46.5	:	92.9	:	161.	:
Beryllium	mg/kg-dry	T							0.72	J	0.56	J	0.86	J	0.74	J	0.26	J	0.78	J
Boron	mg/kg-dry	T							<0.61	:	<1.1	:	<1.3	:	<1.2	:	<0.18	J	<0.42	:
Cadmium	mg/kg-dry	T							1.7	:	1.5	:	1.1	:	0.31	:	0.37	J	0.95	:
Calcium	mg/kg-dry	T							11000.	:	3330.	:	7880.	:	2280.	:	4960.	:	3790.	:
Chromium	mg/kg-dry	T							37.9	:	24.	:	46.1	:	9.7	:	45.	:	22.8	:
Cobalt	mg/kg-dry	T							8.6	:	7.2	:	16.7	:	3.5	:	6.7	:	9.3	:
Copper	mg/kg-dry	T							122.	:	55.7	:	193.	:	15.6	:	97.1	:	69.8	:
Iron	mg/kg-dry	T							15900.	:	21500.	:	30800.	:	12500.	:	32200.	:	19100.	:

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID	Sample Date	Sample ID		Site ID	Sample Date	Sample ID		Site ID	Sample Date	Sample ID		Site ID	Sample Date	Sample ID		Site ID	Sample Date	Sample ID	
			TD46A	5/7/2004	TD46A-T01N-SOL	TD	TD46A	5/7/2004	STD46A-T01N-SOL	STD	TD46B	5/7/2004	TD46B-T01N-SOL	TD	TD46B	5/7/2004	STD46B-T01N-SOL	STD	TD50A	5/8/2004	TD50A-T01N-SOL	TD	TD50A	5/8/2004	STD50A-T01N-SOL	STD
Lead	mg/kg-dry	T	65.3	:	50.5	:	51.1	:	28.8	:	123.	:	65.3	:								
Magnesium	mg/kg-dry	T	7610.	:	4930.	:	8810.	:	2320.	:	5860.	:	4750.	:								
Manganese	mg/kg-dry	T	633.	:	312.	:	593.	:	627.	:	262.	:	502.	:								
Mercury	mg/kg-dry	T	<0.017	:	<0.017	:	<0.018	:	<0.016	:	<0.016	J	<0.018	:								
Molybdenum	mg/kg-dry	T	211.	:	47.6	:	232.	:	6.6	:	433.	:	108.	:								
Nickel	mg/kg-dry	T	25.3	J	15.1	J	38.5	J	8.5	J	18.8	J	20.9	J								
Potassium	mg/kg-dry	T	3260.	J	2080.	J	4850.	J	1430.	J	3870.	J	2140.	J								
Selenium	mg/kg-dry	T	<0.71	:	<0.75	:	<0.71	:	<0.74	:	1.1	J	<0.76	:								
Silver	mg/kg-dry	T	0.24	:	0.28	:	0.51	:	0.13	:	0.71	:	<0.25	:								
Sodium	mg/kg-dry	T	<42.2	:	<73.3	:	<139.	:	<39.9	:	<137.	:	<159.	:								
Thallium	mg/kg-dry	T	0.28	:	0.23	:	0.48	:	0.19	:	0.25	:	<0.11	J								
Vanadium	mg/kg-dry	T	34.9	:	22.9	:	46.1	:	9.9	:	44.6	:	22.5	:								
Zinc	mg/kg-dry	T	213.	J	74.4	J	151.	J	89.8	J	47.9	J	112.	J								

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID	Sample Date	Sample ID		Site ID	Sample Date	Sample ID		Site ID	Sample Date	Sample ID		Site ID	Sample Date	Sample ID	
			TD7	5/8/2004	TD7-T01N-SOL	TD	TD7	5/8/2004	STD7-T01N-SOL	STD	TD8-1	5/7/2004	TD8-1-T01N-SOL	TD	TD8-1	5/7/2004	STD8-1-T01N-SOL	STD
General Chemistry																		
Ammonia	mg/kg-dry	T	51.3	:			34.6	:			23.5	:			31.6	:		
Chloride	mg/kg-dry	T	14.3	J			5.4	J			2.9	:			3.9	:		
Fluoride	mg/kg-dry	T	9.4	:			63.6	:			0.98	:			0.6	:		
Nitrate	mg/kg-dry	T	<2.	J			2.3	J			2.6	J			<2.3	J		
Phosphorus	mg/kg-dry	T	1090.	J			682.	J			156.	J			581.	J		
Sulfate	mg/kg-dry	T	217.	J			152.	J			113.	J			258.	J		
Total Kjeldahl Nitrogen	mg/kg-dry	T	311.	:			495.	:			132.	:			658.	:		
Total Organic Carbon	mg/kg-dry	T	7260.	:			16100.	:			2480.	:			15900.	:		
Laboratory Parameters																		
pH	SU	T	3.2	J			5.4	J			7.8	J			7.2	J		
Solids, Percent	%	T	99.1	:			91.4	:			95.4	:			87.6	:		
Specific Conductance	umhos/cm	T	2600.	J			2110.	J			370.	J			834.	J		
Geotechnical																		
Organic Soils	%	T	5.	:			2.9	:			1.6	:			4.1	:		
Physical Properties																		
Cation-Exchange Capacity	meq/100g	T	18.1	:			21.	:			10.	:			19.1	:		
Sodium Absorption Ratio	ratio	T	<0.02	:			0.04	:			<0.04	:			0.05	:		
Metals																		
Aluminum	mg/kg-dry	T	8170.	:			8550.	:			8800.	:			7510.	:		
Antimony	mg/kg-dry	T	<0.39	J			<0.43	J			<1.2	J			<0.45	J		
Arsenic	mg/kg-dry	T	22.4	:			4.5	:			1.5	:			3.6	:		
Barium	mg/kg-dry	T	106.	:			90.3	:			82.9	:			192.	:		
Beryllium	mg/kg-dry	T	0.38	J			0.76	J			0.81	J			0.62	J		
Boron	mg/kg-dry	T	<0.17	:			<1.7	:			<0.18	:			<0.2	J		
Cadmium	mg/kg-dry	T	2.	:			2.	:			0.47	:			0.32	J		
Calcium	mg/kg-dry	T	4590.	:			4130.	:			10800.	:			4380.	:		
Chromium	mg/kg-dry	T	57.4	:			20.1	:			40.4	:			23.	:		
Cobalt	mg/kg-dry	T	28.5	:			7.2	:			7.2	:			7.5	:		
Copper	mg/kg-dry	T	171.	:			38.	:			153.	:			51.1	:		
Iron	mg/kg-dry	T	55500.	:			19100.	:			14400.	:			21400.	:		
Lead	mg/kg-dry	T	306.	:			75.3	:			23.6	:			44.3	:		
Magnesium	mg/kg-dry	T	8020.	:			3980.	:			8190.	:			4550.	:		
Manganese	mg/kg-dry	T	463.	:			835.	:			412.	:			361.	:		

Parameter	Units	Exposure Area Fraction	Site ID	Sample Date	Sample ID		Site ID	Sample Date	Sample ID	
			TD8-2	5/7/2004	TD8-2-T01N-SOL	TD	TD8-2	5/7/2004	STD8-2-T01N-SOL	STD
General Chemistry										
Ammonia	mg/kg-dry	T	155.	:			42.9	:		
Chloride	mg/kg-dry	T	4.4	J			4.1	J		
Fluoride	mg/kg-dry	T	0.44	:			0.54	:		
Nitrate	mg/kg-dry	T	6.3	J			9.2	J		
Phosphorus	mg/kg-dry	T	743.	J			360.	J		
Sulfate	mg/kg-dry	T	80.8	J			43.4	J		
Total Kjeldahl Nitrogen	mg/kg-dry	T	2310.	:			918.	:		
Total Organic Carbon	mg/kg-dry	T	32300.	:			18900.	:		
Laboratory Parameters										
pH	SU	T	7.5	J			8.	J		
Solids, Percent	%	T	98.3	:			88.6	:		
Specific Conductance	umhos/cm	T	336.	J			186.	J		
Geotechnical										
Organic Soils	%	T	7.1	:			4.5	:		
Physical Properties										
Cation-Exchange Capacity	meq/100g	T	28.7	:			24.5	:		
Sodium Absorption Ratio	ratio	T	0.09	:			0.12	:		
Metals										
Aluminum	mg/kg-dry	T	13500.	:			8780.	:		
Antimony	mg/kg-dry	T	<1.2	J			<1.3	J		
Arsenic	mg/kg-dry	T	3.5	:			3.6	:		
Barium	mg/kg-dry	T	200.	:			251.	:		
Beryllium	mg/kg-dry	T	1.3	J			0.7	J		
Boron	mg/kg-dry	T	3.3	:			2.4	:		
Cadmium	mg/kg-dry	T	0.97	:			0.45	:		
Calcium	mg/kg-dry	T	7430.	:			4940.	:		
Chromium	mg/kg-dry	T	43.6	:			23.	:		
Cobalt	mg/kg-dry	T	10.6	:			7.7	:		
Copper	mg/kg-dry	T	125.	:			56.8	:		
Iron	mg/kg-dry	T	22700.	:			21300.	:		
Lead	mg/kg-dry	T	80.3	:			54.1	:		
Magnesium	mg/kg-dry	T	9200.	:			5160.	:		
Manganese	mg/kg-dry	T	680.	:			381.	:		

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Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Site ID			TD7		TD7		TD8-1		TD8-1		TD8-2		TD8-2	
Sample Date			5/8/2004		5/8/2004		5/7/2004		5/7/2004		5/7/2004		5/7/2004	
Sample ID			TD7-T01N-SOL		STD7-T01N-SOL		TD8-1-T01N-SOL		STD8-1-T01N-SOL		TD8-2-T01N-SOL		STD8-2-T01N-SOL	
Exposure Area			TD		STD		TD		STD		TD		STD	
Parameter	**Units**	**Fraction**												
Mercury	mg/kg-dry	T	<0.016	:	<0.016	:	<0.017	:	<0.015	J	0.026	:	0.019	:
Molybdenum	mg/kg-dry	T	536.	:	56.8	:	163.	:	40.3	:	103.	:	17.4	:
Nickel	mg/kg-dry	T	59.8	:	16.7	J	24.7	J	18.9	J	30.3	J	19.4	J
Potassium	mg/kg-dry	T	4940.	:	2370.	J	4990.	J	1680.	J	5130.	J	1900.	J
Selenium	mg/kg-dry	T	2.4	J	<0.75	:	<0.73	:	<0.79	:	<0.69	:	<0.77	:
Silver	mg/kg-dry	T	3.9	J	1.	:	0.18	J	0.16	:	0.65	:	0.25	:
Sodium	mg/kg-dry	T	<16.7	J	<57.	:	<17.4	:	<119.	:	<36.	:	<76.7	:
Thallium	mg/kg-dry	T	0.16	J	<0.11	J	0.41	:	0.15	:	0.45	:	0.26	:
Vanadium	mg/kg-dry	T	53.9	:	20.9	:	42.7	:	22.8	:	42.9	:	23.	:
Zinc	mg/kg-dry	T	215.	J	122.	J	89.6	J	72.3	J	163.	J	98.3	J

J = Qualified as estimated during data validation
R = Qualified as rejected value from data validation and results are considered unusable for any purpose
T = Total Fraction

Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID	TD8-3	TD8-3	TD8-4	TD8-4	TD8-5	TD8-5
			Sample Date	5/7/2004	5/7/2004	5/7/2004	5/7/2004	5/7/2004	5/7/2004
			Sample ID	TD8-3-T01N-SOL	STD8-3-T01N-SOL	TD8-4-T01N-SOL	STD8-4-T01N-SOL	TD8-5-T01N-SOL	STD8-5-T01N-SOL
			Exposure Area	TD	STD	TD	STD	TD	STD
General Chemistry									
Ammonia	mg/kg-dry	T		105. :	27.7 :	118. :	10.4 :	79.1 :	43.7 :
Chloride	mg/kg-dry	T		4.5 :	2.8 J	4.7 :	3.2 :	4.3 :	3.4 :
Fluoride	mg/kg-dry	T		0.58 :	0.56 :	0.71 :	0.35 :	0.27 :	0.98 :
Nitrate	mg/kg-dry	T		4. J	2.7 J	8.4 J	<2.1 J	5.3 J	3.4 J
Phosphorus	mg/kg-dry	T		97.2 J	586. J	83.5 J	506. J	93.1 J	65.7 J
Sulfate	mg/kg-dry	T		8.2 J	5.5 J	16.5 J	4.2 J	3. J	9.7 J
Total Kjeldahl Nitrogen	mg/kg-dry	T		1310. :	396. :	1170. :	88.4 :	943. :	501. :
Total Organic Carbon	mg/kg-dry	T		31400. :	9510. :	20100. :	<1610. :	15700. :	14800. :
Laboratory Parameters									
pH	SU	T		7.6 J	7.4 J	7.6 J	8.2 J	8. J	7.8 J
Solids, Percent	%	T		98.9 :	93.9 :	98.8 :	96.4 :	93.6 :	92.4 :
Specific Conductance	umhos/cm	T		300. J	49.4 J	362. J	30.5 J	205. J	120. J
Geotechnical									
Organic Soils	%	T		5.2 :	2.9 :	4.4 :	2. :	3.8 :	3.6 :
Physical Properties									
Cation-Exchange Capacity	meq/100g	T		20.1 :	16.4 :	18. :	7.8 :	26.3 :	21. :
Sodium Absorption Ratio	ratio	T		<0.03 :	0.23 :	<0.03 :	0.07 :	<0.04 :	<0.06 :
Metals									
Aluminum	mg/kg-dry	T		9080. :	7360. :	9770. :	5740. :	8600. :	8200. :
Antimony	mg/kg-dry	T		<1.1 J	<1.2 J	<1.1 J	<0.4 J	<1.2 J	<1.2 J
Arsenic	mg/kg-dry	T		3. :	3.1 :	2.8 :	2.5 J	3. :	4.2 :
Barium	mg/kg-dry	T		148. :	224. :	146. :	104. :	121. :	201. :
Beryllium	mg/kg-dry	T		0.83 J	0.61 J	0.91 J	0.47 J	1. J	0.67 J
Boron	mg/kg-dry	T		<0.18 :	<1.2 :	<0.18 :	<0.18 :	<0.18 :	<0.19 :
Cadmium	mg/kg-dry	T		0.57 :	0.3 :	0.64 :	0.18 :	0.55 :	0.28 :
Calcium	mg/kg-dry	T		5980. :	3010. :	7800. :	2310. :	7730. :	3950. :
Chromium	mg/kg-dry	T		30.4 :	20.8 :	36.2 :	17.6 :	32.1 :	22.5 :
Cobalt	mg/kg-dry	T		7.6 :	6.9 :	8.9 :	5.2 :	6.4 :	7.1 :
Copper	mg/kg-dry	T		82.1 :	51.2 :	118. :	40. :	78.9 :	54. :
Iron	mg/kg-dry	T		18200. :	18200. :	19100. :	16400. :	15700. :	21000. :
Lead	mg/kg-dry	T		59.6 :	45.5 :	53.6 :	28.2 :	69.1 :	54.2 :
Magnesium	mg/kg-dry	T		6410. :	4540. :	7210. :	4210. :	5970. :	4960. :
Manganese	mg/kg-dry	T		447. :	284. :	480. :	296. :	593. :	358. :

J = Qualified as estimated during data validation
R = Qualified as rejected value from data validation and results are considered unusable for any purpose
T = Total Fraction

Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID / Sample Date / Sample ID											
			TD8-3 5/7/2004 TD8-3-T01N-SOL		TD8-3 5/7/2004 STD8-3-T01N-SOL		TD8-4 5/7/2004 TD8-4-T01N-SOL		TD8-4 5/7/2004 STD8-4-T01N-SOL		TD8-5 5/7/2004 TD8-5-T01N-SOL		TD8-5 5/7/2004 STD8-5-T01N-SOL	
			TD		STD		TD		STD		TD		STD	
Mercury	mg/kg-dry	T	<0.017	:	<0.015	:	0.018	:	<0.017	J	<0.018	:	<0.017	:
Molybdenum	mg/kg-dry	T	92.6	:	17.3	:	99.2	:	12.7	:	96.1	:	25.8	:
Nickel	mg/kg-dry	T	20.8	J	16.9	J	23.5	J	13.9	J	18.	J	17.6	J
Potassium	mg/kg-dry	T	3590.	J	1420.	J	4280.	J	1320.	J	2840.	J	2040.	J
Selenium	mg/kg-dry	T	<0.69	:	<0.72	:	<0.69	:	<0.7	:	<0.72	:	<0.73	:
Silver	mg/kg-dry	T	0.27	J	0.11	:	0.28	J	<0.1	:	0.25	J	0.26	J
Sodium	mg/kg-dry	T	<60.7	:	<55.8	:	<35.7	:	<103.	:	<39.9	:	<111.	:
Thallium	mg/kg-dry	T	0.29	:	0.22	:	0.34	:	0.11	:	0.23	:	0.2	:
Vanadium	mg/kg-dry	T	31.6	:	20.6	:	36.9	:	16.3	:	28.9	:	23.7	:
Zinc	mg/kg-dry	T	114.	J	76.7	J	117.	J	53.6	J	106.	J	83.9	J

J = Qualified as estimated during data validation
R = Qualified as rejected value from data validation and results are considered unusable for any purpose
T = Total Fraction

Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Fraction	TD8-6	TD8-6	TD8-7	TD8-7	TD8-8	TD8-8
Sample Date			5/8/2004	5/8/2004	5/7/2004	5/7/2004	5/7/2004	5/7/2004
Sample ID			TD8-6-T01N-SOL	STD8-6-T01N-SOL	TD8-7-T01N-SOL	STD8-7-T01N-SOL	TD8-8-T01N-SOL	STD8-8-T01N-SOL
Exposure Area			TD	STD	TD	STD	TD	STD
General Chemistry								
Ammonia	mg/kg-dry	T	12.4 :	24.6 :	33.1 :	127. :	186. :	88.5 :
Chloride	mg/kg-dry	T	4.4 :	3.7 :	3.3 :	3.4 :	4.3 :	5.2 :
Fluoride	mg/kg-dry	T	1.5 :	0.42 :	2.5 :	6.5 :	1.1 :	4.5 :
Nitrate	mg/kg-dry	T	2.3 J	4.9 J	2.4 J	3.1 J	2.1 J	<2.3 J
Phosphorus	mg/kg-dry	T	566. J	868. J	80.2 J	68.8 J	936. J	605. J
Sulfate	mg/kg-dry	T	119. J	138. J	136. J	217. J	152. J	188. J
Total Kjeldahl Nitrogen	mg/kg-dry	T	184. J	651. :	423. :	1030. :	1380. :	960. :
Total Organic Carbon	mg/kg-dry	T	2940. :	16800. :	8740. :	17900. :	26600. :	20200. :
Laboratory Parameters								
pH	SU	T	8.4 J	7.6 J	6.1 J	5.5 J	3.4 J	4.2 J
Solids, Percent	%	T	96.2 :	90.3 :	99.1 :	89.7 :	95.3 :	85.2 :
Specific Conductance	umhos/cm	T	275. J	223. J	594. J	422. J	303. J	277. J
Geotechnical								
Organic Soils	%	T	2.1 :	4.5 :	2.7 :	4.5 :	6.8 :	5.5 :
Physical Properties								
Cation-Exchange Capacity	meq/100g	T	8.3 :	18.3 :	11.3 :	22. :	18.3 :	19.6 :
Sodium Absorption Ratio	ratio	T	0.37 :	0.15 :	0.04 :	0.05 :	0.15 :	0.12 :
Metals								
Aluminum	mg/kg-dry	T	8410. :	8780. :	8550. :	8830. :	6070. :	8530. :
Antimony	mg/kg-dry	T	<0.4 J	<0.43 J	<1.3 J	<1.2 J	<0.47 J	<0.45 J
Arsenic	mg/kg-dry	T	2.1 J	4. :	3.8 :	3.9 :	29. :	6.3 :
Barium	mg/kg-dry	T	58.7 :	211. :	103. :	170. :	172. :	217. :
Beryllium	mg/kg-dry	T	1.6 J	0.69 J	0.6 J	0.77 J	0.29 J	0.69 J
Boron	mg/kg-dry	T	<0.18 :	<0.2 J	<0.18 :	<0.19 :	<0.19 :	<0.21 J
Cadmium	mg/kg-dry	T	0.85 :	0.62 J	0.65 :	0.59 :	0.49 :	0.56 J
Calcium	mg/kg-dry	T	10700. J	4810. :	6310. :	3270. :	876. :	1240. :
Chromium	mg/kg-dry	T	35.4 J	22.8 J	42.5 :	19.7 :	30.2 :	22. :
Cobalt	mg/kg-dry	T	5.3 :	9.4 :	15.9 :	7.5 :	4.6 :	10.6 :
Copper	mg/kg-dry	T	110. :	54.2 :	159. :	46. :	70.4 :	72.4 :
Iron	mg/kg-dry	T	14000. J	22800. :	31000. :	21200. :	41600. :	25100. :
Lead	mg/kg-dry	T	71.5 J	55.7 J	77.3 :	64.5 :	132. :	55.4 :
Magnesium	mg/kg-dry	T	6200. :	4980. :	7340. :	4190. :	4470. :	4320. :
Manganese	mg/kg-dry	T	719. J	516. :	655. :	616. :	268. :	476. :

Site ID row above gives column headers (TD8-6, TD8-6, TD8-7, TD8-7, TD8-8, TD8-8).

J = Qualified as estimated during data validation
R = Qualified as rejected value from data validation and results are considered unusable for any purpose
T = Total Fraction

Appendix A-8a
Historic Tailings Spill - Soils and Tailings
Validated Analytical Results

Parameter	Units	Exposure Area Fraction	Site ID		Sample Date		Sample ID															
			TD8-6		TD8-6		TD8-7		TD8-7		TD8-8		TD8-8									
			5/8/2004		5/8/2004		5/7/2004		5/7/2004		5/7/2004		5/7/2004									
			TD8-6-T01N-SOL		STD8-6-T01N-SOL		TD8-7-T01N-SOL		STD8-7-T01N-SOL		TD8-8-T01N-SOL		STD8-8-T01N-SOL									
			TD		STD		TD		STD		TD		STD									
Mercury	mg/kg-dry	T	<0.014	J	<0.016	J	<0.015	:	<0.019	:	<0.016	J	<0.018	J								
Molybdenum	mg/kg-dry	T	167.	J	34.6	:	203.	:	49.7	:	132.	:	15.4	:								
Nickel	mg/kg-dry	T	17.3	J	18.3	J	34.7	J	17.	J	15.9	J	19.4	J								
Potassium	mg/kg-dry	T	3150.	J	1970.	J	3850.	J	2290.	J	3540.	:	2010.	J								
Selenium	mg/kg-dry	T	<0.71	:	<0.75	J	0.71	J	<0.77	:	1.3	J	<0.79	:								
Silver	mg/kg-dry	T	0.22	:	0.29	:	0.39	J	<0.11	J	2.	:	0.33	:								
Sodium	mg/kg-dry	T	<56.2	:	<127.	:	<17.1	:	<70.7	:	<184.	:	<148.	:								
Thallium	mg/kg-dry	T	0.26	:	0.15	:	0.36	:	0.19	:	0.26	:	0.15	:								
Vanadium	mg/kg-dry	T	28.4	:	24.3	:	38.8	:	21.3	:	32.7	:	22.3	:								
Zinc	mg/kg-dry	T	129.	J	109.	J	108.	J	107.	J	91.8	J	104.	J								

J = Qualified as estimated during data validation
R = Qualified as rejected value from data validation and results are considered unusable for any purpose
T = Total Fraction

Appendix A-8b
Historic Tailings Spill - Tailings SPLP
Validated Analytical Results

Parameter	Units	Site ID / Sample Date / Sample ID / Exposure Area / Fraction	TD24 5/8/2004 TD24-T01N-SOL TDSPLP		TD7 5/8/2004 TD7-T01N-SOL TDSPLP		TD8-C 5/7/2004 TD8-T01N-SOL TDSPLP		----	----	----
General Chemistry											
Ammonia	mg/L	T	<0.066	:	<0.15	:	<0.15	:	-	-	-
Bicarbonate (as CaCO3)	mg/L	T	25.9	:	<1.	:	55.6	:	-	-	-
Carbonate (as CaCO3)	mg/L	T	20.7	:	<1.	:	1.5	:	-	-	-
Chloride	mg/L	T	<0.41	:	<0.45	:	1.6	:	-	-	-
Fluoride	mg/L	T	0.81	:	15.3	:	0.49	:	-	-	-
Hydroxide (as CaCO3)	mg/L	T	<1.	:	<1.	:	<1.	:	-	-	-
Nitrate	mg/L	T	<0.2	:	0.21	:	0.6	:	-	-	-
Nitrite	mg/L	T	0.063	:	<0.005	:	0.048	:	-	-	-
Phosphate, Ortho As P	mg/L	T	0.01	:	0.012	:	0.083	:	-	-	-
Phosphorus	mg/L	T	<0.014	:	0.065	:	0.068	:	-	-	-
Sulfate	mg/L	T	131.	:	184.	:	12.	:	-	-	-
Total Alkalinity	mg/L	T	46.5	:	<1.	:	57.1	:	-	-	-
Total Kjeldahl Nitrogen	mg/L	T	0.4	:	0.4	:	1.1	:	-	-	-
Inorganics											
Cyanide	mg/L	T	<0.01	:	<0.01	:	0.0119	:	-	-	-
Metals											
Aluminum	mg/L	T	0.0483	:	12.6	:	0.0258	:	-	-	-
Antimony	mg/L	T	<0.0004	:	<0.0004	:	<0.0004	:	-	-	-
Arsenic	mg/L	T	<0.0002	:	0.00068	:	0.00071	:	-	-	-
Barium	mg/L	T	0.0459	:	0.0246	:	0.0132	:	-	-	-
Beryllium	mg/L	T	<0.0002	:	0.0026	:	<0.0002	:	-	-	-
Boron	mg/L	T	<0.0126	:	<0.0121	:	<0.0168	:	-	-	-
Cadmium	mg/L	T	<0.0002	:	0.0061	:	<0.0002	:	-	-	-
Calcium	mg/L	T	52.8	:	55.6	:	23.6	:	-	-	-
Chromium	mg/L	T	<0.0008	J	<0.0008	J	<0.0008	J	-	-	-
Cobalt	mg/L	T	<0.0011	:	0.0592	:	<0.0011	:	-	-	-
Copper	mg/L	T	0.00099	J	0.314	:	0.0116	:	-	-	-
Iron	mg/L	T	<0.0192	:	0.695	:	0.065	:	-	-	-
Lead	mg/L	T	<0.0004	:	0.0113	:	0.00062	:	-	-	-
Magnesium	mg/L	T	1.41	:	7.86	:	0.829	:	-	-	-
Manganese	mg/L	T	0.0616	:	1.74	:	0.0084	:	-	-	-
Mercury	mg/L	T	<0.0001	:	<0.0001	:	<0.0001	:	-	-	-
Molybdenum	mg/L	T	0.82	:	0.002	:	0.158	:	-	-	-

J = Qualified as estimated during data validation

R = Qualified as rejected value from data validation and results are considered unusable for any purpose

T = Total Fraction

Appendix A-8b
Historic Tailings Spill - Tailings SPLP
Validated Analytical Results

Parameter	Units	Fraction	Site ID	Sample Date	Sample ID	Exposure Area								
			TD24	5/8/2004	TD24-T01N-SOL	TDSPLP	TD7	5/8/2004	TD7-T01N-SOL	TDSPLP	TD8-C	5/7/2004	TD8-T01N-SOL	TDSPLP	----	----	----
Nickel	mg/L	T	<0.0009	J			0.124	:			<0.0009	J			-	-	-
Potassium	mg/L	T	3.74	:			1.16	:			4.26	:			-	-	-
Selenium	mg/L	T	<0.0007	:			<0.0007	:			<0.0007	:			-	-	-
Silver	mg/L	T	<0.0001	:			0.00013	:			<0.0001	:			-	-	-
Sodium	mg/L	T	<1.24	:			<1.43	:			<1.29	:			-	-	-
Thallium	mg/L	T	<0.0001	:			<0.00018	:			<0.0001	:			-	-	-
Vanadium	mg/L	T	<0.0002	:			0.00023	:			<0.0002	:			-	-	-
Zinc	mg/L	T	<0.0027	:			0.643	:			<0.0083	:			-	-	-

J = Qualified as estimated during data validation
R = Qualified as rejected value from data validation and results are considered unusable for any purpose
T = Total Fraction