Ionic Water Technologies, Inc.
P.O. Box 3336
Reno, NV USA 89505
Telephone: (775) 321-8100
WWW.IWTechnologies.com

TREATABILITY REPORT

AND

FEASIBILITY ASSESMENT

FOR

A CAUSTIC DRIP SYSTEM AT THE ALMEDA MINE

ALMEDA MINE, JOSEPHINE COUNTY, OREGON

Submitted to:
Bureau of Land Management
2164 N.E. Spalding Ave.
Grants Pass, OR 97526

Submitted by:

Ionic Water Technologies, Inc.
P.O. Box 3336
Reno, NV 89505

January 2010 L09PS00720

TABLE OF CONTENTS

1.0 INTRODUCTION ……..……..2
2.0 TREATABILITY STUDY ……..…….5
3.0 DAILY OPERATIONS……..……...7
4.0 RESULTS……14
5.0 DISCUSSION……..28
6.0 COST ESTIMATE……..……....29
7.0 APPENDIX A. Laboratory Report ……...…….33

1.0 INTRODUCTION

Ionic Water Technologies, Inc. (IWT) was contracted to conduct a treatability study at the Almeda Mine, Oregon. Acid Mine Drainage (AMD) generated by this abandoned mine currently flows directly to the Rogue River. The demonstration was performed to assess the applicability of a sodium hydroxide (caustic) drip system for treating AMD at the site. This system has been identified as a potentially applicable technology for on-site treatment of AMD. The temporary caustic delivery system was mobilized to the Almeda Mine on November 30, 2009 and treated AMD at a flow rate of approximately 7.5 gallons per minute, over a five day period.

The objectives of this project were to:

Objective 1: Demonstrate that caustic can be delivered consistently on site at the appropriate flow rate.

Objective 2: Determine if caustic can be used to effectively treat the AMD from the Almeda Mine and estimate the optimum operating pH.

Objective 3: Develop a cost estimate for implementation of a caustic drip system.

This report summarizes the treatability study activities, field measurements, and laboratory results from samples collected during the study.

1.1 Location

The Almeda Mine site is located approximately 30 miles by road northwest of Grants Pass, Oregon, along the Rogue River in Josephine County near the rural community of Galice, Oregon (Township 34 S., Range 8 W., Section 13 of the Willamette Meridian). The mine site is within the Recreational section of the National Wild and Scenic Rogue River and is just upstream of the Wild Section. Both river segments are important for their rafting, scenic and fishing values.

1.2 Site Background

The Bureau of Land Management (BLM) began investigating the AMD emanating from the 520 adit in 2001. The estimated flow rate of the AMD discharge ranges from 3 to 25 gallons per minute

(gpm). The pH of the water ranges from 2.5 to 3.6 and the principal metal component concentrations are aluminum, iron, and zinc with average values of 19.9, 94.3, 9.4 mg/L, respectively. Of these principal metals, zinc is the most toxic to aquatic life. BLM reports, no significant human health risks. In an initial phase, BLM performed a pilot study with a lime dispenser (Aquafix), which was discontinued. BLM then installed open limestone channels as an interim measure to treat water prior to entering the Rogue River.

Underground investigations have taken place from 2002 to the present to determine the suitability of a mine seal (bulkhead). The ore body of the Almeda Mine is located in volcanic massive sulfide materials of the Rogue Formation. Sulfide lies over lava domes and formations and is in contact with the Galice Formation, deep-marine sediments which are also exposed on the flood plain. The contact bisects the center of the site and is visible. The Almeda Mine consists of a series of adits and stopes, connected by crosscuts and raises, driven in the hillside from elevations over 300 feet above and even below the Rogue River level. The adits have various names from various published sources, however, the lowest flowing adit is called the 520 adit; a collapsed adit just above the 520 adit is called the 0 adit; and the open adit at the access road level is called the 620 adit. Figure 1 shows the relationships between the adits and their elevations. Two monitoring wells (2 inches diameter) were drilled into the stope (B2) and the 520 level adit (B1). BLM opened the 520 level adit prior to the treatability study.

Figure 1 – 520 Adit Cross Section

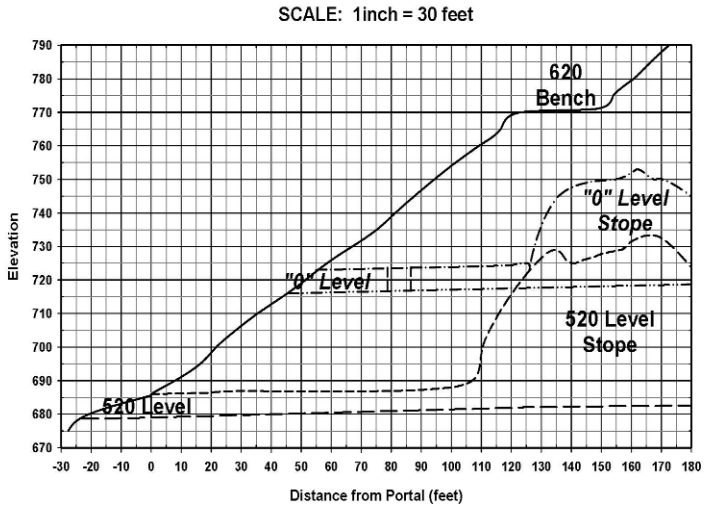


Figure 2 - 520 Adit with weir installed

1.3 Contaminants of Concern

The contaminants aluminum, cadmium, copper, iron, and zinc were observed at concentrations above Oregon water quality standards during this study. One objective of this demonstration was to assess the effectiveness of adding sodium hydroxide at varying concentrations with the purpose of identifying the optimum pH necessary to meet standards for all metals and to more accurately calculate costs associated with a permanent treatment system utilizing sodium hydroxide.

1.4 Caustic Neutralization

Caustic is often used for neutralization and precipitation of metals from AMD at remote sites because it can be delivered consistently with little maintenance and it takes extremely low temperatures (<20°F) to freeze 15% to 25% solutions. The disadvantages of using caustic rather than lime are: 1) chemical cost, 2) the addition of sodium to the water, 3) the corrosive hazards, and 4) the settling properties and resulting sludge volume of the precipitates.

2.0 TREATABILITY STUDY

2.1 Caustic Drip System Description

The temporary caustic drip system included:

- Caustic solution (30%) stored in 5 gallon carboys;
- A peristaltic delivery pump Cole Parmer (model # 7520-50) (approximately165 watts); and
- A 12 volt deep cycle battery and inverter (12VDC to 120VAC) to power the peristaltic pump.

The caustic solution was dripped into the mine stream at a location approximately 85 feet within the mine (Figure 3). The caustic mixed with the mine stream as it flowed to the 520 adit via gravity flow along the floor of the mine. Treated samples (DIS) were taken outside the mine approximately 20 feet from the entrance of the 520 adit. Untreated samples (INF or ADIT) were taken from the stream prior to adding sodium hydroxide.

Figure 3 - Caustic drip system located within the 520 adit directly below the B1 monitoring well.

2.2 Sampling and Monitoring Activities

The system was monitored by IWT personnel with oversight from the BLM. IWT performed system set-up, recorded field observations and measurements, and collected samples for laboratory analysis. Monitoring activities performed by IWT were executed in accordance with the work plan, with few exceptions (see section 3.4).

2.3 Field Parameter Measurement

Field parameters monitored during the Treatability Study included dissolved oxygen, temperature, oxidation reduction potential (ORP), pH, and specific conductance. The treatment flow rate and sodium hydroxide flow rate were measured using a stopwatch and volumetric measurement method.

A YSI 556 multimeter was used to record field parameters. The meter was calibrated daily using standard calibration solutions. pH calibrations were performed as three-point calibrations, using pH 4, 7, and 10 buffers. A calibration drift check was performed at least once per day, when the probe was placed in a calibration solution to check the reading. If a discrepancy was observed between the measurement and the solution value, the probe was recalibrated.

Field parameters were measured by placing the multimeter probe directly into the stream.

2.3.1 Sample Collection Methodology

Untreated and treated water samples were taken in dedicated sample containers. Samples were filtered using disposable tygon tubing, and a disposable 0.45 micron filter. Samples collected for analysis of target metals were field-preserved to pH <2 using nitric acid. A field blank sample was collected using distilled water purchased from Reno, Nevada. Blind duplicate samples were collected at the same time as the regular sample, using the same procedures.

Laboratory samples were placed on-ice, and transported to Neilson Research Corporation laboratory in Medford, Oregon under chain of custody protocols. Laboratory Reports are presented in Appendix A (see Section 7, below).

3.0 DAILY OPERATIONS

Caustic soda was injected into the stream from within the mine below the B1 monitoring well for 4-8 hours a day over a continuous 5 day period. The application rate was varied to achieve a pH in the range 8.7 to 10.1. The flow rate was measured several times over the five days at approximately 7.5 gpm.

The water flowing from the 520 adit was monitored for temperature, pH, dissolved oxygen, oxidation/reduction potential and specific conductance. Water samples were collected approximately 20 feet from the entrance of 520 adit opening after a period of at least one hour of stabilized pH had been observed.

Field measurements and sample collection information were recorded in a logbook that included the following information: sampler's name and title, date, time, sample number, field equipment identification, equipment calibration descriptions, observable characteristics (i.e. odor, color, etc.) site conditions/weather and any problems or issues. Recorded information was legibly written in indelible waterproof ink. Corrections were made by crossing out the error with a single horizontal line, initialing the correction, and entering the correct information above, below, or in the margin next to the error. The crossed-out information was readable. Notes were transferred to daily log sheets for organization and transfer to electronic format.

3.1.1 11-30-09 Operations (See Table 1)

The caustic drip system was mobilized to the site, installed, and operated from 12:00 until 3:45 p.m. (approximately 3 hours and 45 minutes of continuous operation) treating approximately 1,688 gallons of AMD. The first day of operation included a project kick-off meeting with the BLM, system installation and treatment.

IWT met with BLM prior to mobilization to the site. IWT and BLM personnel arrived onsite at 10:30 a.m. The multiparameter meter was calibrated at 10:45 a.m. The system was set-up at the opening of

the 520 adit and began operating at 12:00 p.m. At 10:47 a.m. a sample was taken from the adit upstream from the caustic delivery and at 3:30 p.m. a second sample was taken from the treated stream approximately 10 feet within the adit at pH 9.57. At 3:45 p.m. the system was shut down.

Table 1 - Daily Field Log 11/30/2009

NAME:	Tim Tsukamoto					Project: Almeda Mine Treatability Study		
DATE :	11/30/2009					Weather: foggy		
								Notes
Sample Location	Time	pH	Temp	Cond	DO	ORP	Flow Rate	
end of limestone channel	2:24:00 PM	3.16	10	1164	7.7	485.00		
Samples Taken								
001adit001	10:47:00 AM	3.24	13	1018	7.28	429		
001dis002	3:30:00 PM	9.57	13	1074	5.43	221		
Safety Meeting								
Narrow roads, caustic soda, slippery conditions.								
General Notes								
Met at BLM office at 8 a.m.. Jim Berge escorted us to the site. Onsite at 10:30. YSI Meter was calibrated at 10:45.								
pH ranged between 9.3 and 9.7 during the day.								
Caustic flow 23 mL/min at 15:20.								
Left site to order new tubing and ensure that we traveled the unfamiliar dirt road during the daylight.								

3.1.2 12-1-09 Operations (See Table 2)

The caustic drip system was operated from 9:15 a.m. until 4:30 p.m. (approximately 7 hours and 15 minutes of continuous operation) treating approximately 3,263 gallons of AMD. IWT and the BLM were onsite at 8:30 a.m. The multiparameter meter was calibrated at 8:45. The system was operating at 9:15 a.m. At 16:00 a sample was taken from the treated stream approximately 20 feet outside of the adit at pH 9.83. At 4:30 p.m. the system was shutdown.

Table 2 - Daily Field Log 12/1/2009

NAME:	Tim Tsukamoto				Project: Almeda Mine Treatability Study			
DATE :	12/1/2009				Weather: foggy			
								Notes
Sample Location	Time	pH	Temp	Cond	DO	ORP	Flow Rate	
	9:15:00 AM	9.50						set pH
DIS	10:15:00 AM	10.89	13	1255	5.57	76		
DIS	10:30:00 AM	9.86	13	1178	6.3	135		
	10:40:00 AM							caustic flow 27 ml/min
DIS	10:50:00 AM	9.74	13	1172	6.62	79		took settling sample 100 mL
DIS	11:30:00 AM	9.73	13	1401	1085	6.79		12 mL settled sludge
Pool in channel	11:40:00 AM	7.85	13	1193	7.73	102		
Bottom of channel	11:40:00 AM	4.30	9	1242	8.58	339		
DIS	12:40:00 PM	9.63	13	1163	6.48	99		
DIS	1:00:00 PM	9.75	13	1115	6.55	-12		
DIS	1:30:00 PM	9.77	13	1052	6.7	4.5		8.5 ml sludge
Pool in channel		7.66						
Bottom of channel		5.64						
DIS	2:00:00 PM	9.80	13	1158	6.44	15		
DIS	2:30:00 PM	9.81	13	1165	6.85	0		
DIS	3:00:00 PM	9.79	13	1049	7.38	0		
DIS	3:30:00 PM	9.81	13	1031	6.8	-1		
	4:28:00 PM							pH drift check
ADIT	4:30:00 PM	3.70	13	943	8.04	356		
Samples Taken								
002dis003	4:00:00 PM	9.83	13	1155	7.16	-1		
Safety Meeting								
icy roads, falling objects, caustic								
General Notes								
Arrive onsite at 8:30. Calibrate meter at 8:45. system set up at 9:15.								

3.1.3 12-2-09 Operations (See Table 3)

IWT and the BLM were onsite at 9:00 a.m. The multiparameter meter was calibrated at 9:10. The caustic drip system was operated from 9:30 a.m. until 4:30 p.m. (approximately 7 hours of continuous operation) treating approximately 3,150 gallons of AMD. At 9:15 a sample was taken from the untreated stream approximately 20 feet outside of the adit at pH 3.20. At 12:30 p.m. duplicate samples were taken from the treated stream approximately 20 feet outside of the adit at pH 9.47. At 4:20 p.m. a sample was taken from the treated stream approximately 20 feet outside of the adit at pH 9.98. At 4:30 p.m. the system was shutdown.

Table 3 - Daily Field Log 12/2/2009

NAME:	Tim Tsukamoto					Project: Almeda Mine Treatability Study		
DATE :	12/2/2009					Weather: foggy		
								Notes
Sample Location	Time	pH	Temp	Cond	DO	ORP	Flow Rate	
weir	9:10:00 AM						8.5	measured flow
	9:30:00 AM							caustic turned on
dis	10:45:00 AM	9.63	13	1156	4.17	35		
dis	11:30:00 AM	9.46	13	1153	4.1	34		
dis	12:00:00 PM	9.46	13	1127	4.85	32		
weir							7.5	measured flow
dis	2:30:00 PM	10.11	13	1165	5.7	20		
pool in limestone channel	2:36:00 PM	8.86	13	1191	5.87	52		
dis	3:30:00 PM	10.14	13	1168	5.46	17		
	4:30:00 PM							measured caustic flow 35.5 ml/min
	4:40:00 PM							9 ml sludge out oif 100 ml
Samples Taken								
003inf004	9:15:00 AM	3.20	13	1046	8.94	385		
003dis005	12:30:00 PM	9.47	13	1153	5.2	30		duplicate
003dis006								duplicate
003dis007	4:20:00 PM	9.98	13	1151	5.75	22		
Safety Meeting								
caustic, slips trips and falls								
General Notes								
Arrive onsite at 9:00. Calibrate meter at 9:15.								

3.1.4 12-3-09 Operations (See Table 4)

IWT and the BLM were onsite at 8:15 a.m. The multiparameter meter was calibrated at 8:25. The system was operating at 8:30 a.m. The caustic drip system was operated from 8:30 until 15:30 (approximately 7 hours of continuous operation) treating approximately 3,150 gallons of AMD. At 12:00 a sample was taken from the treated stream approximately 20 feet outside of the adit at pH 9.00. At 15:30 a sample was taken from the treated stream approximately 20 feet outside of the adit at pH 9.25. At 16:30 the system was shutdown.

Table 4 - Daily Field Log 12/3/2009

NAME:	Tim Tsukamoto				Project: Almeda Mine Treatability Study			
DATE :	12/3/2009				Weather: foggy			
								Notes
Sample Location	Time	pH	Temp	Cond	DO	ORP	Flow Rate	
Inf	8:25:00 AM	3.20	13	1046	3.94	392		swiched tubing and carboy
Dis	10:05:00 AM	9.03	13	1135	9.43	39		
Dis	10:30:00 AM	9.02	13	1134	9.28	39		
Dis	11:00:00 AM	8.96	13	1134	9.26	34		
Dis	11:30:00 AM	9.00	13	1140	10.41	31		
	12:00:00 PM						7.5	caustic flow 23 ml/min
Dis	12:30:00 PM	9.23	13	1150	10.41	15		
Dis	1:00:00 PM	9.23	13	1149	10.5	22		
Dis	1:30:00 PM	9.24	13	1130	10.46	26		
Dis	2:00:00 PM	9.24	13	1122	10.56	27		DO recalibrated
Dis	2:30:00 PM	9.24	13	1140	6.86	28		
Dis	3:00:00 PM	9.22	13	1117	6.77	27		
	3:30:00 PM							caustic flow 25 ml/min
Samples Taken								
004dis008	12:00:00 PM	9.00	13	1148	11.15	30		
004dis009	3:30:00 PM	9.25	13	1128	6.89	30		
Safety Meeting								
caustic, driving windy roads								
General Notes								
Arrive onsite at 8:15. Calibrate meter at 8:20.								

3.1.5 12-4-09 Operations (See Table 5)

IWT and the BLM were onsite at 7:00 a.m. The multiparameter meter was calibrated at 7:10. The system was operating at 7:45 a.m. The caustic drip system was operated from 7:45 until 12:10 (approximately 4 hours and 25 minutes of continuous operation) treating approximately 1,988 gallons of AMD. At 7:15 a blank sample was taken and field filtered. At 7:30 a sample was taken from the untreated stream approximately 20 feet outside of the adit at pH 3.17. At 12:00 a sample was taken from the treated stream approximately 20 feet outside of the adit at pH 8.72. At 12:10 the system was shutdown.

Table 5 – Operations Log 12/4/2009

NAME:	Tim Tsukamoto				Project: Almeda Mine Treatability Study			
DATE :	12/4/2009				Weather: foggy			
								Notes
Sample Location	Time	pH	Temp	Cond	DO	ORP	Flow Rate	
Dis	9:30:00 AM	8.73	13	1063	6.35	27		
Dis	10:30:00 AM	8.76	13	1098	6.22	78		
Dis	11:00:00 AM	8.89	13	1107	6.38	49		
Dis	11:30:00 AM	8.82	13	1102	6.26	46		
	12:05:00 PM						7.5	
Samples Taken								
005dis010	7:10:00 AM							Blank
005inf011	7:30:00 AM	3.17	13	1017	4.13	396		
005dis012	12:00:00 PM	8.72	13	1105	6.32	44		
Safety Meeting								
caustic, removal of equipment								
General Notes								
Arrive onsite at 7:00. Calibrate meter at 7:05.								

3.4 Field Changes to Work Plan

The following field changes were performed during the project. The field changes were approved by the onsite BLM coordinators.

- The work plan called for delivery of sodium hydroxide to the B1 monitoring well near the 620 adit. The delivery point remained directly below the B1 monitoring well, however the caustic delivery system was installed within the mine rather than on the hillside adjacent to the B2 monitoring well. The well was tested to ensure water drained freely.

- The work plan called for delivery of 10 gallons of sodium hydroxide delivered over an 8 hour period. This would have resulted in a very high pH in the treated water. The decision was made to deliver caustic at a rate that would achieve a desired pH.

- The work plan called for the delivery of caustic at a consistent rate over the 5 day test. The decision was made to deliver caustic at different flow rates in order to learn the operating pH range of a caustic drip system.

- The work plan called for the delivery of caustic at a consistent rate for an 8 hour period. The decision was made to operate the system as long as practically possible; however the more important determinant for the duration of the daily caustic delivery was that the treatment pH was stable for a period of at least one hour prior to sampling events.

- The work plan stated that the samples would be analyzed for 9 metals. BLM requested that this list be expanded.

- IWT conducted a titration in order to produce a titration curve. In addition, IWT measured sludge generation. These measurements were necessary to provide a cost estimate.

- An additional study was conducted in IWT's laboratory in Reno due to the higher than expected reported concentrations of iron and aluminum in the initial laboratory report from Neilson Research Corporation.

3.5 Field Measurements

Field measurements included measuring stream flow, caustic dose rates, and monitoring field parameters including pH, ORP, temperature, conductivity, and dissolved oxygen. Field parameter measurements were recorded during sample collection activities.

Field sludge volume measurements were conducted to estimate the volume of sludge that would be produced for caustic neutralization. Generally, the bulk of solids produced by the system settled from solution within 30 minutes. Near complete settling was observed after approximately 4 hours.

3.6 Laboratory Analyses

All samples were hand delivered at 15:00 12/4/2009 to Nielson Research Corporation laboratory in Medford, Oregon under chain of custody protocols.

Nielson Research Corporation is an ORELAP (Oregon Laboratory Accreditation Program) certified laboratory. Laboratory analyses that were performed are presented in Table 6.

Table 6 - Laboratory Analysis and Methods

	Analyte	Method
(Low metals concentrations pH>7.0)	Hg	EPA 245.1
	Al, Fe, Ca, Mg, Na	EPA 200.7
	As, Ba, Cd, Co, Cu, Cr, Mn, Ni, Na, Pb, Sb, Se, Zn	EPA 200.8

4.0 RESULTS

4.1 Sample Results

Aqueous laboratory results were prepared by Nielson Research Corporation. Laboratory reports are presented in Appendix A.

4.2 Field Parameter Results

Results from the Almeda Treatability Study field measurements are presented below.

4.2.1 Standard Water Chemistry Parameters

Temperature. During the demonstration, the water temperature was measured and recorded throughout the day. Water temperature was fairly consistent throughout the testing with slight

increases as each day progressed. The water temperature ranged from a low of 12.84^{o}C to a high of 13.44 ^{o}C.

pH. Raising the pH of AMD facilitates the formation of metal-hydroxide precipitates. All AMD has unique chemistry and it is often necessary to determine the pH range that results in acceptable treatment and at the same time monitor chemical dosing rates so that the process can be optimized. Influent pH measurements ranged from 3.17 to 3.24. Target discharge pH measurements ranged from 8.75 to 10.0.

Oxidation reduction potential and Dissolved Oxygen. Dissolved oxygen and ORP measurements provide an indicator of the transition in oxidation state of iron and manganese from reduced to oxidized. Although oxidation is necessary to achieve the lowest solubility for these two metals, it is not always critical to physically oxidize the water with aeration to achieve discharge standards, particularly if the pH can be raised above 9.0 and there is sufficient reaction time throughout the system. The DO was measured between 4.17 and 10.56 mg/L in the discharge. The ORP ranged from -12 to 135 mV.

Specific Conductance. Conductivity provides a general indication of the presence of dissolved solids in the sampled water. The specific conductance ranged from 1046 to 1255 in the treated water.

4.2.2 Supplemental Field Observations

Sodium Hydroxide Consumption Sodium hydroxide flow measurements were taken in the field. A pH of 9.00 required 23 mL/min (323 mg/L), pH of 9.25 required 25 mL/min (351 mg/L), pH of 9.83 required 27 ml/min (379 mg/L) and a pH of 9.98 required 35.5 mL/min (499 mg/L).

(Note: A titration was also conducted at the IWT laboratory in Reno on 1-13-09. A description is provided in section 4.3.4. Figure 12 displays the pH vs. sodium hydroxide titration curve)

Power Consumption. Power consumption was not measured in the field. However the power draw for the pump that would be utilized is approximately 75 watts.

4.3 Laboratory Results

4.3.1 Influent/Adit

Results from untreated samples that were collected during the treatability study were consistent with the historic data. These samples were collected from the existing weir on 11-30-09 and from the sampling point approximately 20 feet outside the mine on 12-2-09 and 12-4-09. All influent samples were collected prior to the addition of caustic. The influent analytical results are displayed in (Tables 7 and 8).

Table 7 Laboratory results for metals that were detected in the untreated water. Concentrations in mg/L. (OWQS=Oregon Water Quality Standard)

	Date	Time	pH	Conductivity	Aluminum	Cadmium	Cobalt	Copper	Iron	Manganese	Nickel	Zinc
OWQS					0.750 (0.087)	0.001		0.012	1		0.16	0.12
001adit001	11/30/2009	10:47	3.24	1018	**13.8**	**0.0465**	0.0611	**2.41**	**73.2**	1.61	0.0486	**7.06**
003inf004	12/2/2009	9:15	3.2	1046	**13.4**	**0.0431**	0.0576	**2.14**	**73.6**	1.45	0.0429	**6.47**
005inf011	12/4/2009	7:30	3.17	1017	**13.5**	**0.0424**	0.0583	**2.14**	**73.9**	1.47	0.043	**6.43**
005dis012	12/4/2009	12:00	8.72	1105	0.184	0.000254	0.000848	0.000197	0.0138	0.171	0.00242	0.00616
004dis008	12/3/2009	12:00	9.00	1148	0.238	0.000165	0.000407	0.002	0.0794	0.0858	0.00195	0.00864
004dis009	12/3/2009	15:30	9.25	1128	0.295	0.000153	0.000365	0.00383	0.158	0.0662	0.00164	0.0152
003dis005	12/2/2009	12:30	9.47	1151	0.468	0.00011	0.000222	0.00177	0.0541	0.0381	0.00147	0.00527
003dis006	12/2/2009	12:30	9.47	1151	0.471	<0.000102	0.00021	0.000582	0.0105	0.037	0.00153	0.00244
001dis002	11/30/2009	15:30	9.57	1074	0.593	0.000172	0.000379	0.00782	0.143	0.0561	0.00177	0.0131
002dis003	12/1/2009	16:00	9.83	1155	0.599	<0.00102	0.00021	0.00213	0.0705	0.022	0.00141	0.00702
003dis007	12/2/2009	16:20	9.98	1151	0.8	<0.000102	0.000196	0.00151	0.0549	0.0194	0.00151	0.00604
Blank	12/4/2009	7:00			<0.0102	<0.000102	<0.000102	<0.000102	<0.0102	<0.0051	<0.00051	<0.00051

Table 8 - Laboratory results for metals that were not detected or regulated for in the untreated water. Concentrations in mg/L.

	Date	Time	Antimony	Arsenic	Barium	Calcium	Chromium	Lead	Magnesium	Selenium	Sodium	Mercury
OWQS			1.6	0.19			0.21	0.003		0.035		0.000012
001adit001	11/30/2009	10:47	<0.05	0.0577	<0.05	167	<0.005	<0.05	24.4	<0.02	14.8	<0.0002
003inf004	12/2/2009	9:15	<0.05	<0.05	<0.05	154	<0.005	<0.05	23	<0.02	14.2	<0.0002
005inf011	12/4/2009	7:30	<0.05	0.0556	<0.05	160	<0.005	<0.05	23.4	<0.02	14.3	<0.0002
005dis012	12/4/2009	12:00	0.000539	0.00809	0.00383	151	<0.00051	<0.000102	18.4	<0.00051	188	<0.0002
004dis008	12/3/2009	12:00	0.000577	0.000805	0.00294	146	<0.00051	<0.000102	17.4	0.000563	190	<0.0002
004dis009	12/3/2009	15:30	0.000562	0.00085	0.00258	154	<0.00051	<0.000102	16.2	0.000586	201	<0.0002
003dis005	12/2/2009	12:30	0.000579	0.00108	0.00258	149	<0.00051	<0.000102	15.6	0.000633	202	<0.0002
003dis006	12/2/2009	12:30	0.000567	0.00112	0.00245	144	<0.00051	<0.000102	12.9	0.000642	198	<0.0002
001dis002	11/30/2009	15:30	0.000598	0.00133	0.00772	148	<0.00051	0.00015	19.8	<0.00177	177	<0.0002
002dis003	12/1/2009	16:00	0.000532	0.000893	0.00232	152	<0.00051	0.000102	13	0.000772	214	<0.0002
003dis007	12/2/2009	16:20	0.000609	0.00104	0.00244	142	<0.00051	<0.000102	13.1	0.000611	205	<0.0002
Blank	12/4/2009	7:00	<0.000204	<0.00051	<0.00051	<0.0102	<0.00051	<0.000102	<0.0102	<0.00051	<0.0102	<0.0002

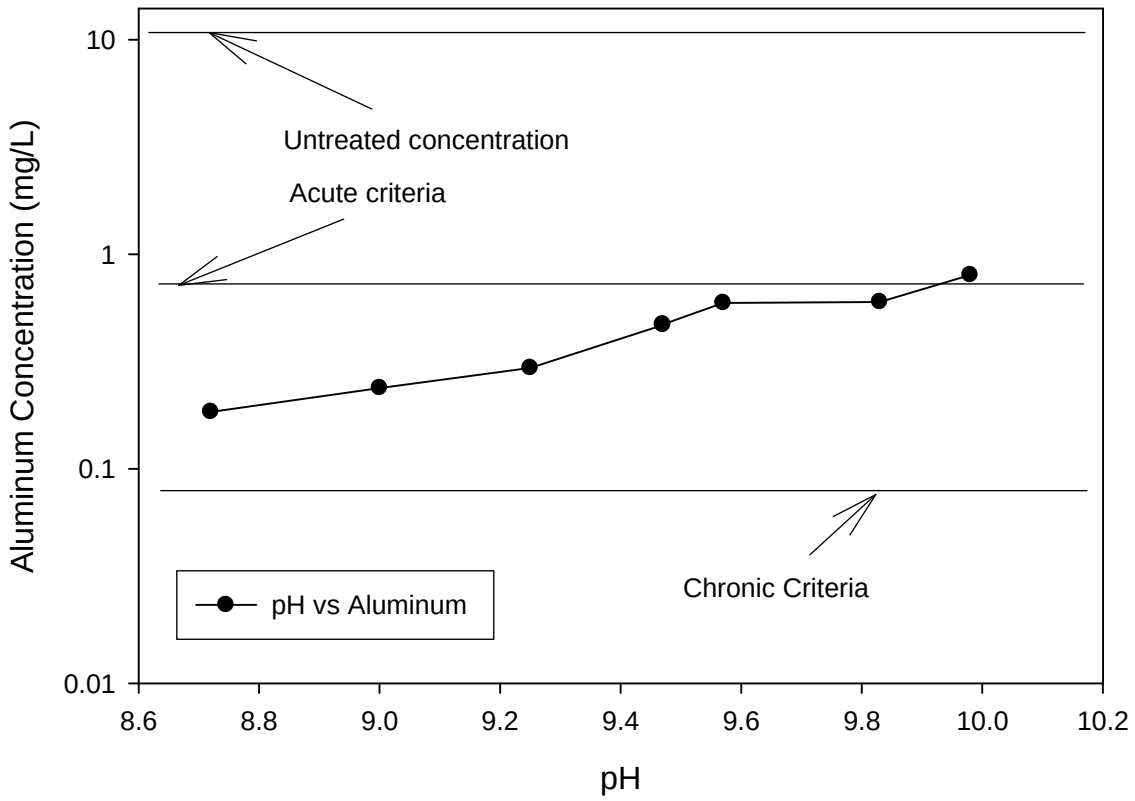
4.3.2 Discharge/DIS

Analytical results from the field treatability study are summarized on Tables 7 and 8. Dissolved metals concentrations in the treated water were below the target regulatory criteria for all metals sampled at all pH values (with the exception of the chronic criteria for aluminum at all pH values tested and the acute criteria for aluminum at pH 9.98).

A discussion of results including graphs is presented below for each of the metals that were detected in the untreated water.

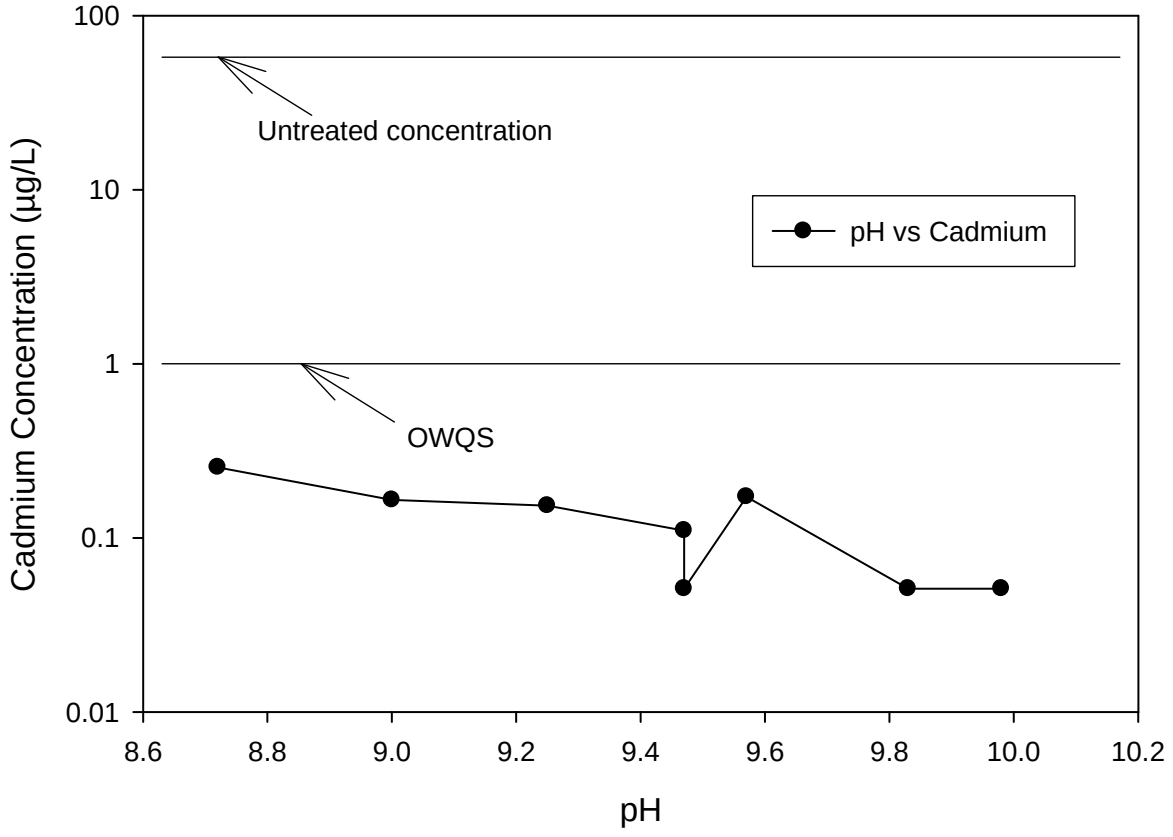
Aluminum (Figure 4) **–** The average dissolved aluminum concentration in the untreated water was 13.6 mg/L during the study. Dissolved aluminum concentrations in the treated water were less than the 0.75 mg/L acute limit for all samples except the pH 9.98 samples. All field samples (at all pH values tested) had dissolved aluminum concentrations that were greater than the 0.087 mg/L chronic criteria. Additional laboratory testing showed aluminum concentrations at less than 0.05 mg/L for pH 9.0 and 9.45 titrated samples that were allowed to settle prior to decanting the sample from the sludge. See section 4.3.4 and table 9.

Figure 4. Dissolved aluminum concentrations from field study vs pH.



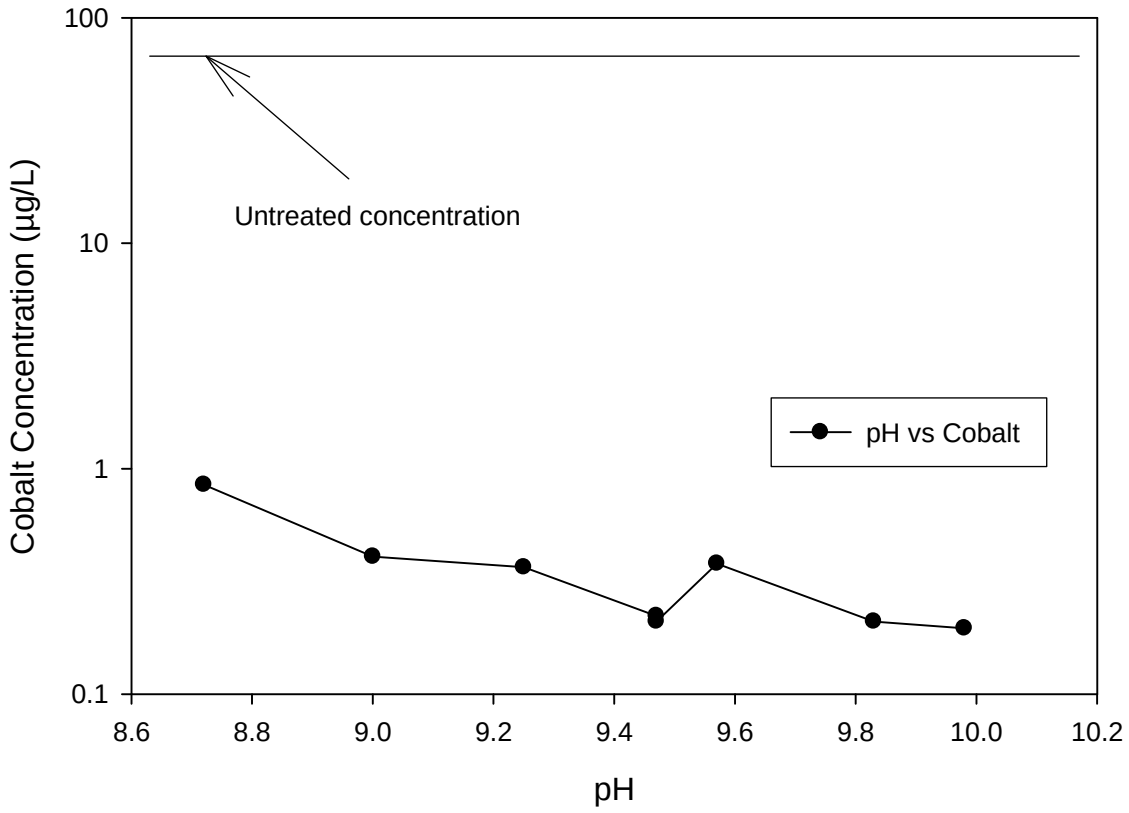
Cadmium (Figure 5) The average dissolved cadmium concentration in the untreated water was 0.0044 mg/L during the study. Dissolved cadmium concentrations in the treated water were less than the 1.00 µg/L Oregon Water Quality Standard (OWQS). Dissolved cadmium concentrations at all pH values were less than 0.254 µg/L.

Figure 5. Dissolved cadmium concentrations from field study vs pH. (values graphed at 0.051 **µg/L** are graphed at 1/2 the reporting limit of 0.102 **µg/L)**



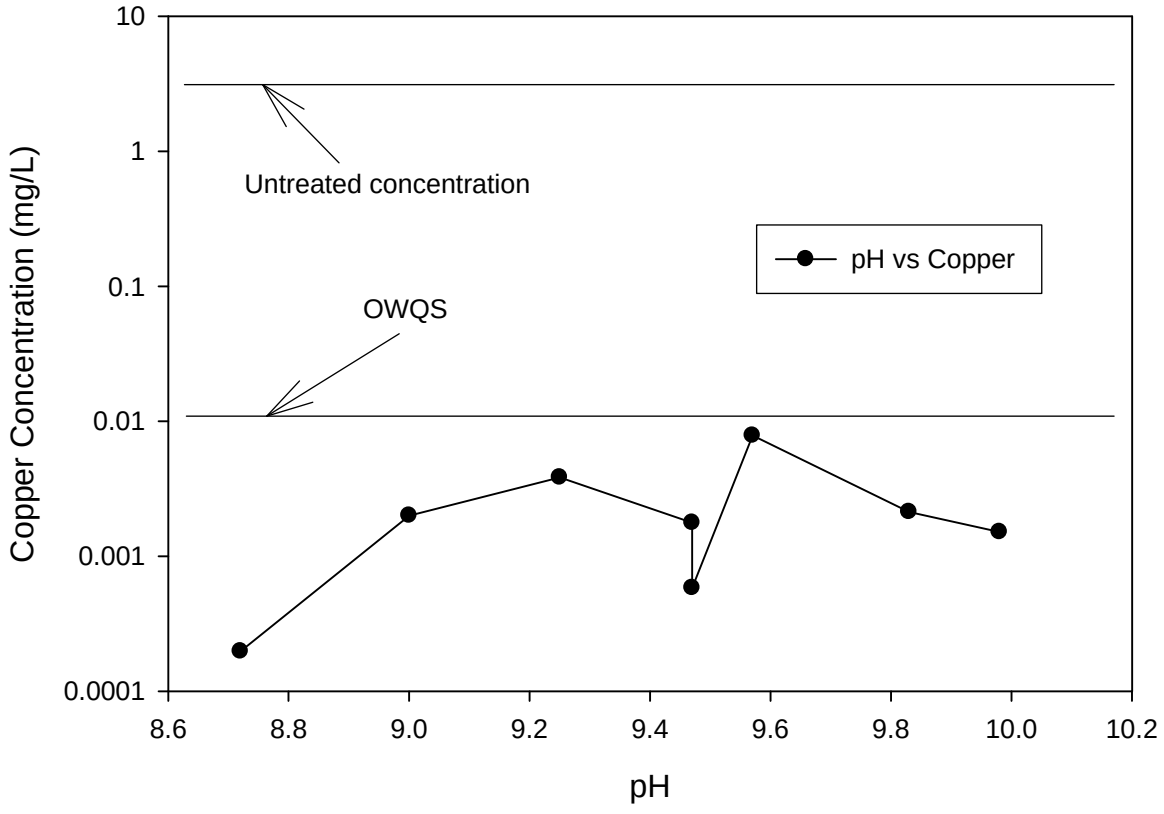
Cobalt (Figure 6) The average dissolved cobalt concentration in the untreated water was 0.0590 mg/L during the study. Dissolved cobalt concentrations at all pH values were less than 0.00041 mg/L.

Figure 6. Dissolved cobalt concentrations from field study vs pH (values graphed at 0.051 µg/L are graphed at 1/2 thereporting limit of 0.102 µg/L)**µg/L** are graphed at 1/2 the reporting limit of 0.102 **µg/L)**



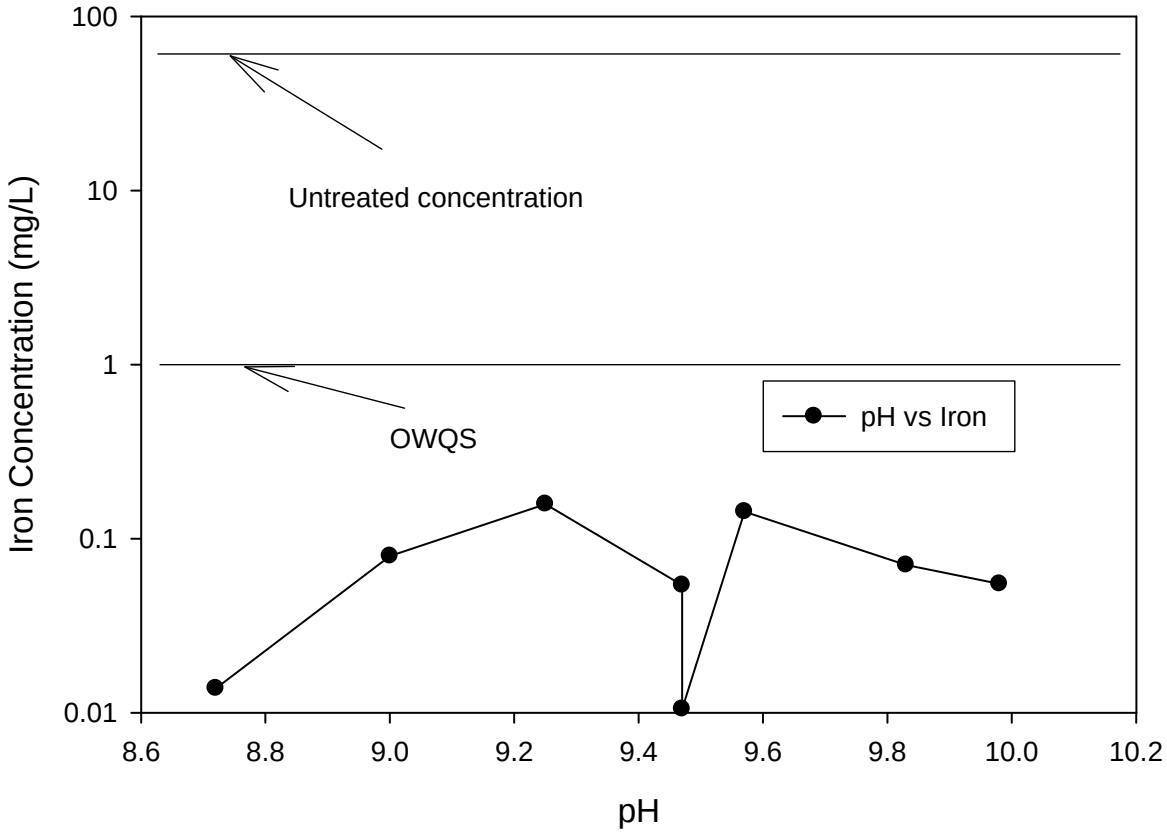
Copper (Figure 7) **–** The average dissolved copper concentration in the untreated water was 2.23 mg/L during the study. Copper concentrations at all pH values in the treated water were less than the 0.012 mg/L OWQS.

Figure 7. Dissolved copper concentrations from field study vs pH



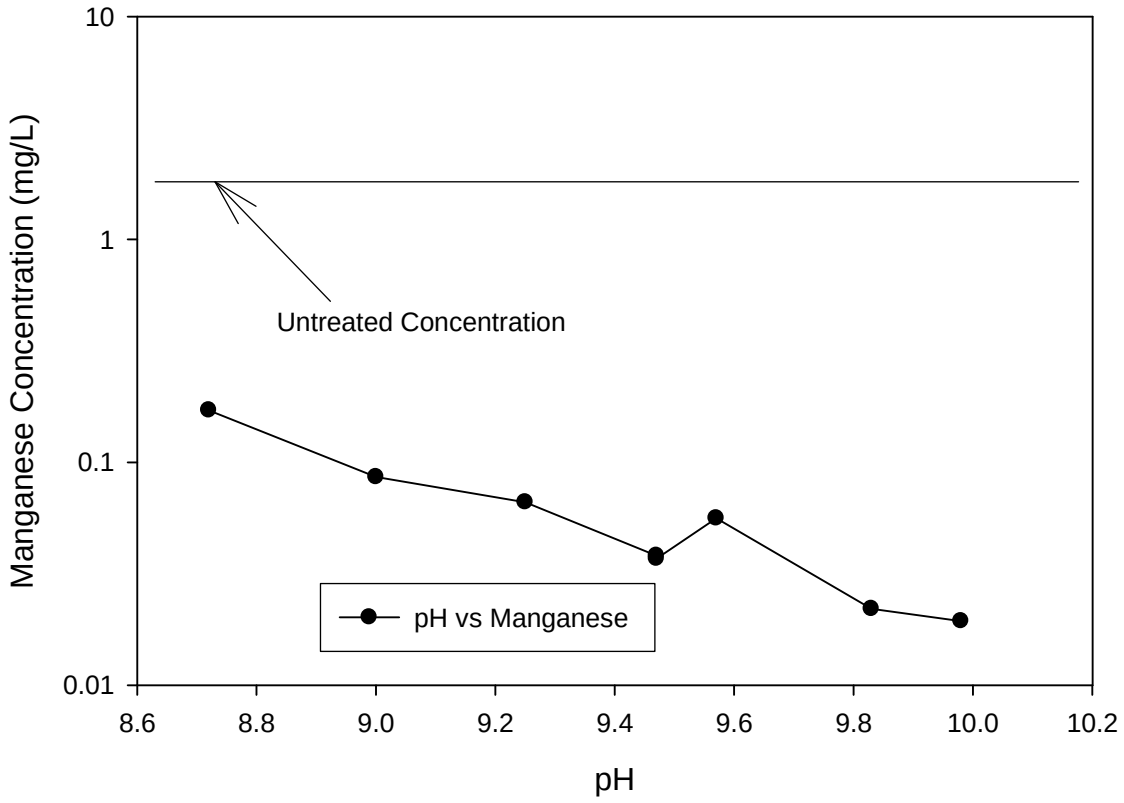
Iron (Figure 8) **– –** The average dissolved iron concentration in the untreated water was 73.6 mg/L during the study. Dissolved iron concentrations at all pH values in the treated water were less than the 1.0 mg/L OWQS. Additional, laboratory testing confirmed dissolved iron concentrations at less than 0.05 mg/L for pH 9.0 and 9.45 titrated samples that were allowed to settle prior to decanting the sample from the sludge. See section 4.3.4 and table 9.

Figure 8. Dissolved iron concentrations from field study vs pH



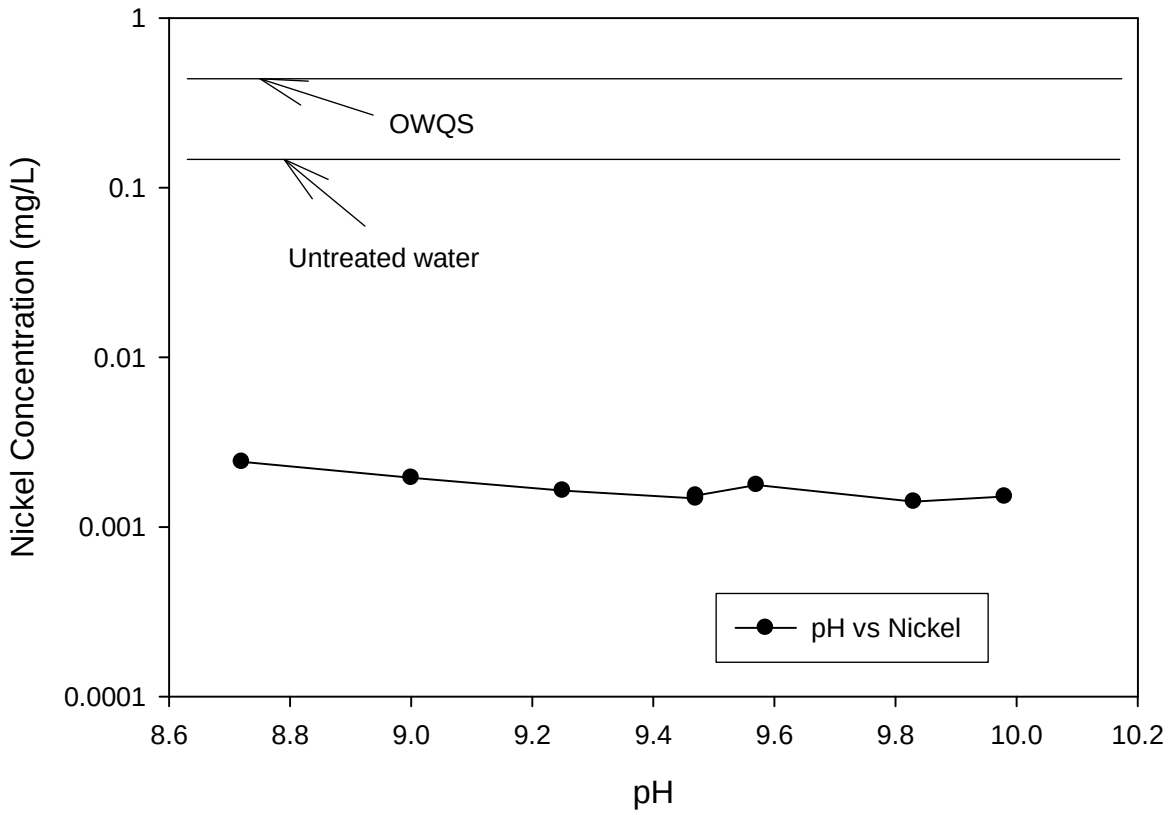
Manganese (Figure 9) **–** The average dissolved manganese concentration in the untreated water was 1.51 mg/L during the study. Dissolved manganese concentrations at all pH values in the treated water were less than the 0.86 mg/L. Additional, laboratory testing showed dissolved manganese concentrations at less than 0.42 mg/L for pH 9.0 and 0.24 mg/L for pH9.45 titrated samples that were allowed to settle prior to decanting the sample from the sludge. See section 4.3.4 and table 9. Oregon does not have a water quality standard for manganese.

Figure 9. Dissolved Manganese concentrations from field study vs pH



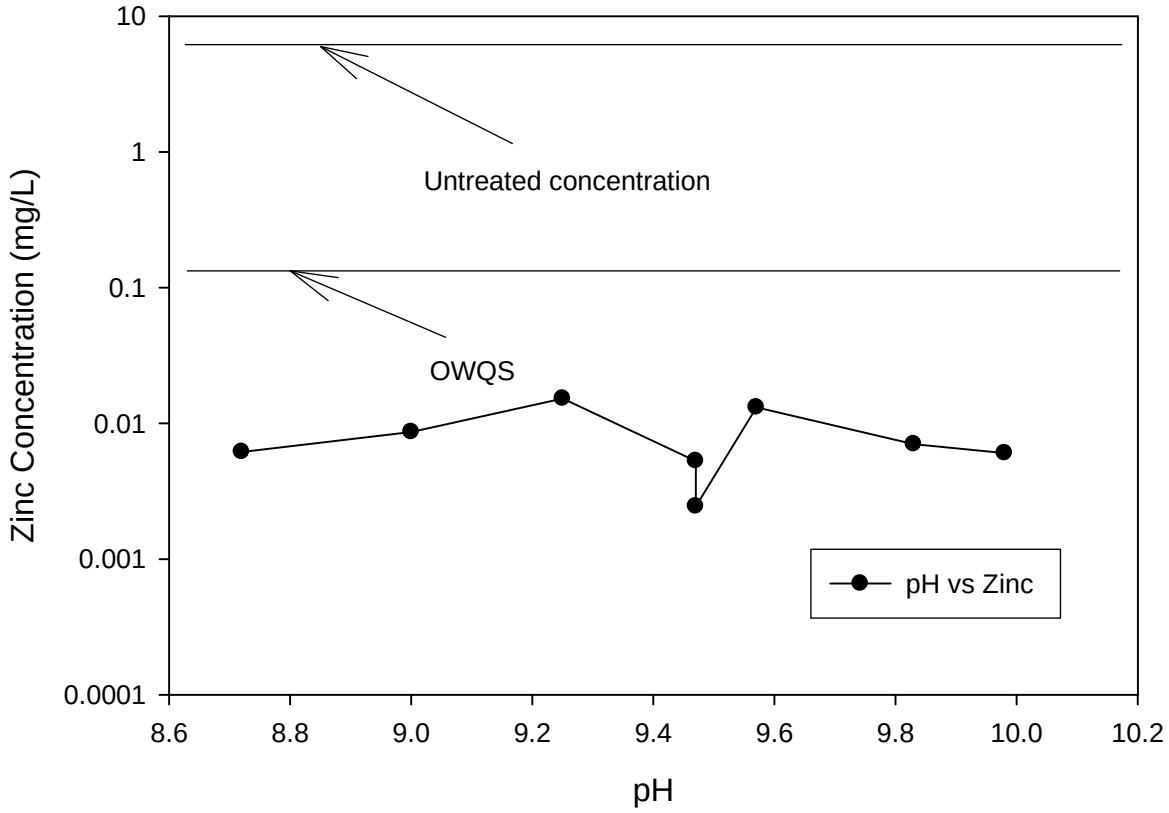
Nickel (Figure 10) – The average dissolved nickel concentration in the untreated water was 0.0448 mg/L during the study. Dissolved nickel concentrations at all pH values in the treated water were less than the 0.16 mg/L OWQS.

Figure 10. Dissolved nickel concentrationsfrom field study vs pH



Zinc (Figure 11) **–** The average dissolved zinc concentration in the untreated water was 6.65 mg/L during the study. Dissolved zinc concentrations at all pH values in the treated water were less than the 0.12 mg/L OWQS.

Figure 11. Dissolved zinc concentrations from field study vs pH



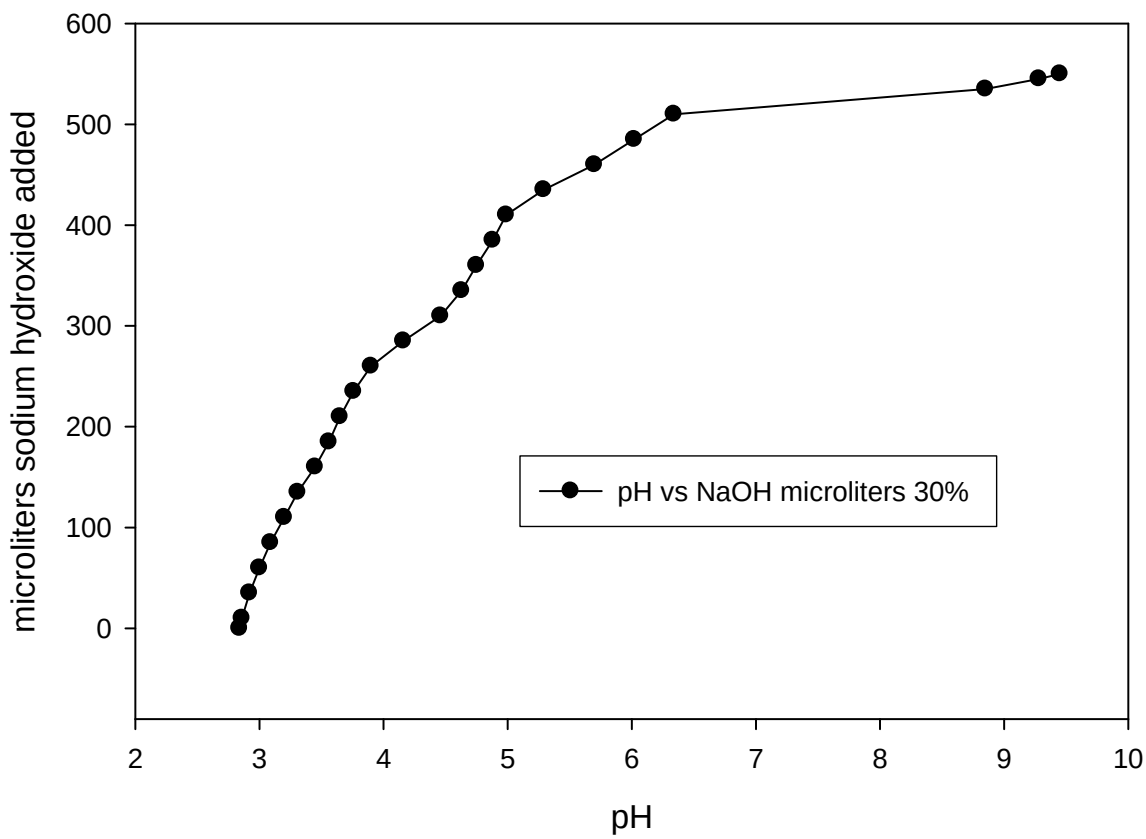
4.3.3 Sludge Analysis (field).

At 11:30 a.m. on 12-1-09 a sample was taken from the treated stream at the Dis sampling point. The sample was allowed to settle to determine sludge volume. At 13:30 the sludge had settled to a volume of 8.5 ml. The sample was allowed to settle overnight and at 9:15 the following day the sludge volume remained at 8.5 mL.

4.3.4 Sludge Analysis Additional Laboratory Titration and Sampling.

On 1-13-10, sludge volume was again measured at the IWT laboratory using Imhoff cones. The sludge volume generated by caustic precipitation was compared to sludge volume generated by lime precipitation at the same pH. Two 1 liter samples were titrated in 2 liter beakers that were mixed with a stir bar to pH of 9.45. A total of 0.550 mL of 30% sodium hydroxide was added to achieve a pH of 9.45. The titration curve for the sodium hydroxide sample is displayed in figure 12.

Figure 12. Titration Curve for the Almeda mine water titrated with 30% caustic at the IWT laboratory.

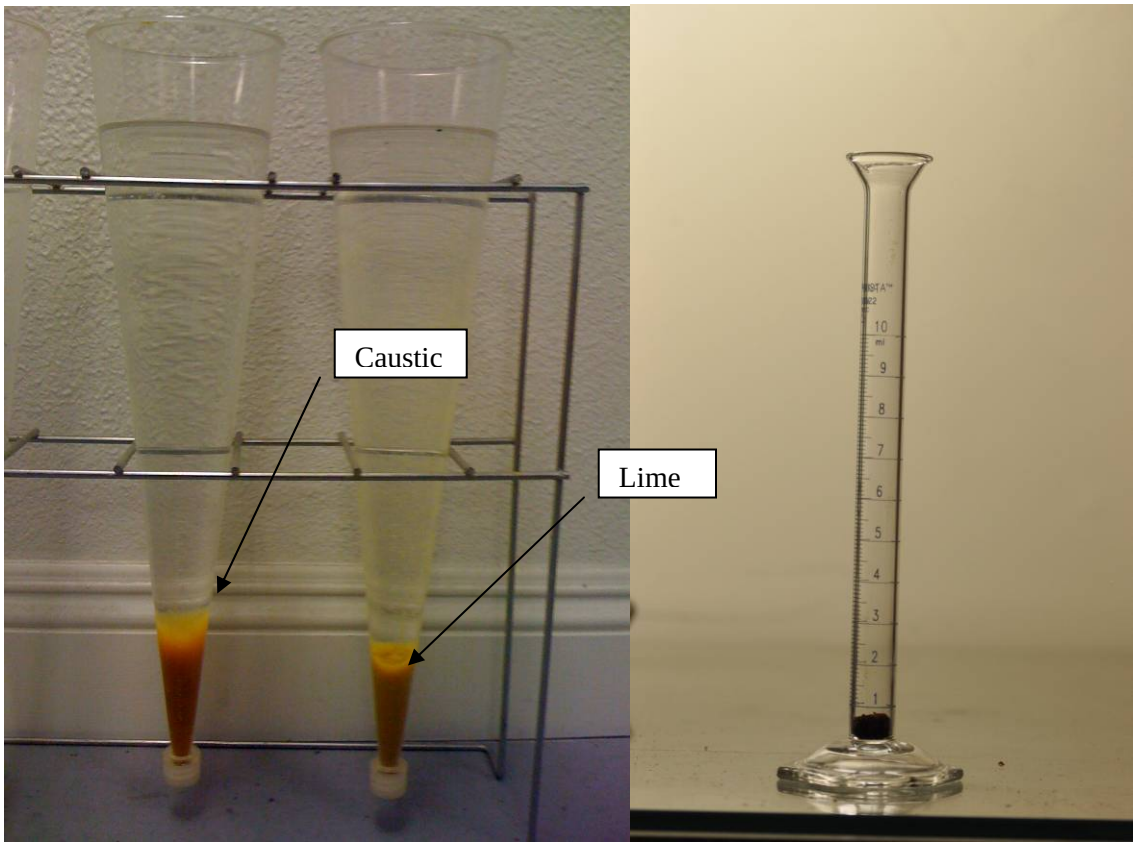


The solution was then transferred to Imhoff cones for settled sludge measurements. The volume of sludge measured after 4 hours of settling was 35 mL for the caustic treated water and after 24 hours it was 28 mL. The sludge volume for the lime treated water was 13 mL (Figure 13a).

Following settling, the caustic treated sample was filtered and was allowed to air dry. The sludge was then scraped from the filter and the volume of loose sludge was measured at approximately 0.75 mL in a 10 mL graduated cylinder (Figure 13b).

Figure 13a and b. Laboratory titrated sample to pH 9.45. Volume of sludge settled in a 1 L Imhoff cone after 4 hours was 35 mL and after 24 hours was 28 mL. The sludge was air dried and the volume of dry sludge was measured at 0.75 cubic centimeters.

13a. 13b.



After 24 hours of settling, samples were decanted and measured for total and dissolved iron, manganese and aluminum. An additional, sample was titrated to pH 9.00 and was allowed to settle for one hour prior to decanting and measuring total and dissolved iron, manganese and aluminum. Metals were analyzed by Atomic Absorption Spectrophotometry (AA) and by the HACH "Ferrover method" (HACH) as listed in Table 9.

Table 9. Metals concentrations in laboratory titrated samples. Following titration the sludge was allowed to settle and water samples were decanted and analyzed for total and dissolved metals.

	Iron Concentration (mg/L)		Manganese Concentration (mg/L)		Aluminum Concentration (mg/L)	
	Total	Dissolved	Total	Dissolved	Total	Dissolved
pH 9 Sample Settled 0 hours (HACH)		0.48				
pH 9 Sample Settled 1 hour (HACH)		0.10				
pH 9 Sample Settled 1 hour (AA)	0.26	<0.05	0.25	0.24	<0.05	<0.05
pH 9.45 Sample Settled 24 hours (AA)	0.67	<0.05	0.44	0.42	<0.05	<0.05

5.0 DISCUSSION

The delivery of caustic with the use of a peristaltic pump was shown to produce consistent pH at the adit tunnel opening for periods of up to 5 hours with no adjustment. In addition, the water that was neutralized with caustic in the field achieved OWQS for all metals except aluminum at pH 9.98 and the chronic standard for aluminum at all pH values tested.

The initial laboratory results showed higher than expected concentrations of iron and aluminum, particularly at these high pH values. Therefore the water samples were again titrated to pH 9.00 and 9.48 at the IWT laboratory in Reno to confirm or deny the results. Samples for dissolved metals were taken after 0, 1 hour and 24 hours. All of these laboratory titrated samples met the OWQS for iron and aluminum.

In addition, IWT requested that Neilson Research Corporation rerun the samples to confirm or deny the report results. On January 22, 2010, Neilson Research Corporation sent IWT a revised report that confirmed the analytical error. Neilson reported a dilution error on one set of samples and matrix interferences on the instrument on the initial run. The iron was subsequently run by EPA 200.7 which was not affected by the matrix interferences and thus those values are reported in the revised report.

The 30% sodium hydroxide solution consumption rates in the field were 3.07 mL per L of water treated to pH 9.00. The 30% sodium hydroxide solution consumption rate in the laboratory titration was 0.535 mL per L of water treated to pH 9.00, a significantly lower consumption rate. The differences are likely due to a combination of incomplete mixing and consumption of alkalinity by acidic salts in the sediments on the floor of the mine. The laboratory consumption rate is likely more representative of long term neutralization with an engineered caustic drip system.

One hour of settling time appears to be sufficient under static condition, however sizing of a settling pond will be based on sludge management intervals rather than settling time. The volume of sludge generated by the caustic neutralized water was more than double that of the lime neutralized water. Although not tested in this study, typically lime neutralized sludge also dewaters much easier than caustic neutralized sludge, leaving a smaller volume for hauling and disposal.

In summary, the caustic drip field study demonstrated that the technology is capable of treating water from the Almeda Mine to OWQSs for all metals with the exception of the aluminum chronic standard. A lower operating pH will likely result in all of the OWQS being met, particularly if there is sufficient time for precipitation and oxidation reactions to take place and for sludge settling.

A much lower volume of sludge is generated by lime precipitation; however, lime treatment systems require significantly more power and are more labor intensive to operate. Other semi-passive systems such as the Aquafix system have been tested on site previously. The maintenance requirements were higher than expected and a high percentage of the lime did not react resulting in higher volumes of high pH sludge. However this system remains an alternative option for treatment and a more thorough comparison of maintenance, chemical and O&M costs should be evaluated.

6.0 COST ESTIMATE

The following cost estimate is provided which includes capital and installation costs for a caustic drip system, powered by solar power and battery backup, a sludge settling pond, an adjacent sludge drying bed, and annual operation and maintenance costs.

This conceptual system is provided as a result of field work and the review of materials provided by the BLM. This system recommendation is based on professional judgment.

The solar array will power a caustic drip system located within the 520 or zero adit. The drip system will supply caustic to a mixing chamber located within the 520 adit. Neutralized water will flow to a settling pond where solids will settle to the bottom and untreated water will overflow to discharge. The settling pond is sized to pump and remove sludge to a sludge drying bed two times per year. The sludge drying bed will allow water to drain from the sludge. Sludge will need to be removed from the drying beds annually and transported to a repository.

Other options that can be considered are:

1. Replace the caustic drip system with an Aquafix.

Advantages: no power required, lime less expensive than caustic
Disadvantages: typically not efficient with respect to chemical utilization and treatment efficiency; results in higher sludge volume and chemical consumption; delivery system may not be reliable particularly at lower flows, sludge may be considered hazardous due to high pH.

2. Replace the caustic drip system with lime precipitation.

Advantages: less sludge produced; lower chemical costs; robust treatment
Disadvantages: requires more power and more maintenance.

3. Treat with caustic behind a bulkhead and use the mine pool as a settling pond.

Advantage: less chance of sludge being washed away during flood events; provides additional volume for settling.
Disadvantages: Requires additional mixing of caustic with mine pool water resulting in higher power demands; requires installation of a bulkhead which has other inherent risks and costs associated; sludge removal is more complex.

4. Transport wet sludge to drying beds at another location

Advantage: less space needed. Drying beds located out of the flood plane.

Disadvantage: large expense to transport wet sludge.

6.1 Settling Pond and Drying Bed Estimated Cost

The settling pond capacity is calculated based on estimated sludge accumulation rates, (bi-annual sludge removal), design max flow rate of 25 gpm and settling pond retention time.

A sludge accumulation rate of 35mL/L will result in 1260 gallons of sludge generated per day or approximately 225,000 gallons per 6 months. IWT recommends an additional 75,000 gallons storage capacity for additional residence time, pond freeboard, and pond maintenance flexibility. The resulting 300,000 gallon pond capacity equates to 1500 cubic yards of excavation.

A sludge drying bed will be constructed of approximately ½ the size of the settling pond, or 750 cubic yards of excavation. The total excavation of the settling pond and drying bed is therefore calculated at 2250 cubic yards.

IWT has included an estimation of liner material and installation costs as an option for the settling pond and sludge drying bed should a liner be required. The use of a liner will require additional sand fill material to be utilized for bi-annual excavation of the sludge drying bed should the decision be made to line the sludge drying bed (prevention of liner puncture). Given the limited space at the site, a geo-textile bag sludge separation design may be a viable option, but would require additional capital investment and labor.

6.2 Chemical Feed Equipment Estimated Cost

The caustic drip system will incorporate a solar powered chemical feed metering system, sodium hydroxide storage tanks (Narrow Vertical Tanks, 29” wide for placement inside the adit), a weir (flow measurement and caustic mixing zone), and associated equipment.

The solar powered chemical feed system which is estimated incorporates off the shelf components available from Cole-Palmer including an L/S Economy Variable-Speed Digital Drive Peristaltic pump. The system would require additional manufacturing labor for assembly and installation into an appropriate watertight enclosure (NEMA4X or equivalent). IWT has concerns that a single solar system of this size may not provide the power required to operate the chemical feed pump

continuously due to site location. A combination of inclement weather, fog, winter lighting conditions may effect the operation of the system. As such IWT is including a secondary solar power system and pump as a redundant system. The individual cost associated with each component of the system is also listed should a redundant system prove unnecessary.

IWT is working with a local vendor on a design that would incorporate a dual alternative energy source through a combination of a wind and solar power generation. At the time of this report generation IWT had not received the quote and it will be forwarded as soon as possible. We estimate that this system would be in the same range (10K-15K) but may be much more reliable.

6.3 Chemical Feed System Installation Estimated Cost

IWT estimates that the chemical feed system can be installed with a 2 person field technician crew in 4 days. Travel and expense estimates are also included.

6.3.1 Annual Estimated Operation and Maintenance Costs

It is estimated that approximately 4500 gallons of 25% sodium hydroxide will be consumed each year in operation of the system. IWT estimates a delivered price of $2.50 per gallon with deliveries occurring four times per year. Pricing is subject to verification with a local vendor.

Maintenance labor is calculated based on 6 site visits per year, 1 day on site per visit ($1,000.00) per day, for the purpose of caustic delivery, system checks, and labor associated with equipment maintenance. Additional labor may be required for pumping sludge. This labor does not include dry sludge removal and transportation to a repository.

An equipment maintenance cost is included which is calculated at 15% of the capital equipment cost.

Sampling and Analysis is not included in the estimated operation and maintenance costs here. It is assumed that caustic delivery checks could be made on a monthly basis to coincide with monthly sampling.

6.3.2 Estimated Capital, Installation, O&M Year 1

IWT estimates the estimated capital, installation, and operation and maintenance costs for the first year of operation at approximately $130K.

Settling Pond and Drying Bed Estimated Cost

Part Number	Description	Qty	Cost Each	Extended Cost
Pond Excavation	300,000 Gallon Capacity Pond 1500 cy 1/2 Capacity Drying Bed 750 cy	2250	25 per cubic yard	56250
Liner Materials and Installation	Liner Material and Installation Cost 1100 sq yards Sand 200 cy	1100	30 per square yard	33000
Total Estimated Settling Pond and Drying Bed Installation Cost				**$ 89,250.00**

Chemical Feed Equipment Estimated Cost

EW-73803-90	Solar Power Option Kit	2	1,980.00	3,960.00
EW-07524-40	L/S Economy Variable-Speed Digital Drive Pump	2	1,145.00	2,290.00
NPN	Watertight Enclosure / Solar Components	1	650.00	650.00
Tubing	L/S 25 peristaltic pump tubing	4	30.00	120.00
10017-Caustic Storage Tank	Snyder Narrow Vertical Storage Tank 400 Gallon 60Lx29Wx71H -Total Capacity 1200 gallons	3	900.00	2,700.00
Tank Fill Line	Valves, Piping, Couplings, Misc	1	300.00	300.00
Weir	Construct Custom Weir/Caustic Mix Zone	1	450.00	450.00
Solar Installation Equipment	Concrete, sonotube, electrical cable as required	1	200.00	200.00
Assembly Labor	System Assembly prior to site installation	4	75.00	300.00
Total Estimated Equipment Cost with Redundancy				**$ 10,970.00**

Chemical Feed System Installation Estimated Cost

Travel	Travel and Expenses (2 men)	1	3500	3500
Installation	Install Weir, Solar Panel, Equipment Install and run (2 man Field Tech Rate)	4	1500	6000
Total Estimated Installation Cost				**$ 9,500.00**

Annual Estimated Operation and Maintenance Costs

Equipment	Calculated at 15% of Capital Cost	1	1500	1500
Sodium Hydroxide	Sodium Hydroxide 25% solution Assumes 30mL/min average 1200 gallon storage capacity 4500 Gallons Caustic per Year includes transportation costs	4500	2.5	11250
Maintenance Labor	Caustic Delivery, System Checks, Sludge Maintenance 6 site visits, 1 man, 1000 per day	6	1000	6000
Total Estimated Annual Operation and Maintenance Cost				**$ 18,750.00**

Estimated Capital, Installation, Operation and Main. Year 1 $ 128,470.00

7.0 APPENDIX A. Laboratory Report

NEILSON RESEARCH CORPORATION

Environmental Testing Laboratory

1/22/10

Tim Tsukamoto
Ionic Water Technologies
PO Box 3336
Reno, NV 89501

TEL: (775) 321-8101
FAX:

RE: Almeda Mine

Order No.: 0912133

Dear Tim Tsukamoto:

Neilson Research Corporation received 12 sample(s) on 12/4/09 for the analyses presented in the following report.

The results relate only to the parameters tested or to the sample as received by the laboratory. This report shall not be reproduced except in full, without the written approval of Neilson Research Corporation. If you have any questions regarding these test results, please feel free to call.

Sincerely,
Neilson Research Corporation

Fay L. Fowler
Project Manager

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

CLIENT: Ionic Water Technologies
Project: Almeda Mine
Lab Order: 0912133

Date: 22-Jan-10

CASE NARRATIVE

The analyses were performed according to the guidelines in the Neilson Research Corporation Quality Assurance Program. This report contains analytical results for the sample(s) as received by the laboratory.

Neilson Research Corporation certifies that this report is in compliance with the requirements of NELAP. No unusual difficulties were experienced during analysis of this batch except as noted below or qualified with data flags on the reports.

Notes: Change order - T. Tsukamoto - OK to run ICP 200.7 Dissolved for Dissolved Field Filtered metals and cancel 200.8 request. Compounds are at elevated concentration for 200.8 calibration and data may be compromised. FF/NRC.

Analytical Comments for METHOD ICP_W_DISS, SAMPLE 0912133-04A: Calcium is out of the control limits in the matrix spike duplicate and matrix spikes for calcium can't be accurately calculated due to the calcium content of the sample.

Notes: 1/22/10 -
In response to a phone call from the client, Tim Tsukamoto @ Ionic Water Technologies, concerning aluminum and iron results that were not consistant with historical data. The data obtained from ICP and ICPMS analytical runs were reviewed.
Iron results for the ICPMS were found to be higher due to the more sensitive nature of the instrument setup and typical calibration. The ICP-MS analysis for Iron by 200.8 is not appropriate for the matrix involved. The iron results are historically excellent on the ICP and will be reported from that instrument which is set-up to report environmental analytes at higher levels that are typical interferents, particularly on the ICPMS instrument. The Iron data has been removed from the ICP-MS (200.8) results and reported under ICP- (200.7) for -02, -03, -05, -06, -07,-08, -09, -10, and -12.

Analytical Comments for METHOD ICPMS_200.8_DISS, SAMPLE 0912133-12A: Aluminum was reported incorrectly due to a dilution factor error.

A complete reprint of the report is attached.

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

Ionic Water Technologies
PO Box 3336
Reno, NV 89501
Client Sample ID: **001ADIT001**
Sample Location:
Project: **Almeda Mine**

Lab Order: **0912133**
NRC Sample ID **0912133-01**
Collection Date: **11/30/09 3:30:00 PM**
Received Date: **12/4/09 3:00:00 PM**
Reported Date: **1/22/10 4:32:44 PM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
Dissolved Mercury by EPA 245.1 by EPA 245.1							*Analyst:* ***BAR***
Mercury	A	**ND**		0.0002	mg/L	1	12/9/09
Dissolved Trace Metals by EPA 200.7							*Analyst:* ***BAR***
Aluminum	A	**13.8**		0.01	mg/L	1	12/8/09
Antimony	A	**ND**		0.05	mg/L	1	12/8/09
Arsenic	A	**0.0577**		0.05	mg/L	1	12/8/09
Barium	A	**ND**		0.05	mg/L	1	12/8/09
Cadmium	A	**0.0465**		0.001	mg/L	1	12/8/09
Calcium	A	**167**		20	mg/L	20	12/8/09
Chromium	A	**ND**		0.005	mg/L	1	12/8/09
Cobalt	A	**0.0611**		0.01	mg/L	1	12/8/09
Copper	A	**2.41**		0.01	mg/L	1	12/8/09
Iron	A	**73.2**		0.005	mg/L	1	12/8/09
Lead	A	**ND**		0.05	mg/L	1	12/8/09
Magnesium	A	**24.4**		1	mg/L	1	12/8/09
Manganese	A	**1.61**		0.02	mg/L	1	12/8/09
Nickel	A	**0.0486**		0.005	mg/L	1	12/8/09
Selenium	A	**ND**		0.02	mg/L	1	12/8/09
Sodium	A	**14.8**		1	mg/L	1	12/8/09
Zinc	A	**7.06**		0.05	mg/L	1	12/8/09

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
MRL - Minimum Reporting Limit

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

Ionic Water Technologies
PO Box 3336
Reno, NV 89501
Client Sample ID: **001DIS002**
Sample Location:
Project: **Almeda Mine**

Lab Order: **0912133**
NRC Sample ID **0912133-02**
Collection Date: **11/30/09 10:52:00 AM**
Received Date: **12/4/09 3:00:00 PM**
Reported Date: **1/22/10 4:32:44 PM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
Dissolved Trace Metals by EPA 200.8 (ICP-MS) by EPA 200.8							*Analyst:* ***BAR***
Antimony	A	**0.000598**		0.000204	mg/L	1	12/11/09
Arsenic	A	**0.00133**		0.00051	mg/L	1	12/11/09
Barium	A	**0.00772**		0.00051	mg/L	1	12/11/09
Cadmium	A	**0.000172**		0.000102	mg/L	1	12/11/09
Chromium	A	**ND**		0.00051	mg/L	1	12/11/09
Cobalt	A	**0.000379**		0.000102	mg/L	1	12/11/09
Copper	A	**0.00782**		0.000102	mg/L	1	12/11/09
Lead	A	**0.000150**		0.000102	mg/L	1	12/11/09
Manganese	A	**0.0561**		0.0051	mg/L	1	12/11/09
Nickel	A	**0.00177**		0.00051	mg/L	1	12/11/09
Selenium	A	**ND**		0.00051	mg/L	1	12/11/09
Zinc	A	**0.0131**		0.00051	mg/L	1	12/11/09
Dissolved Mercury by EPA 245.1 by EPA 245.1							*Analyst:* ***BAR***
Mercury	A	**ND**		0.0002	mg/L	1	12/9/09
Dissolved Trace Metals by EPA 200.7							*Analyst:* ***BAR***
Aluminum	A	**0.593**		0.01	mg/L	1	12/8/09
Calcium	A	**148**		20	mg/L	20	12/10/09
Iron	A	**0.143**		0.005	mg/L	1	12/8/09
Magnesium	A	**19.8**		1	mg/L	1	12/8/09
Sodium	A	**177**		20	mg/L	20	12/10/09

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
MRL - Minimum Reporting Limit

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

Ionic Water Technologies
PO Box 3336
Reno, NV 89501
Client Sample ID: **002DIS003**
Sample Location:
Project: **Almeda Mine**

Lab Order: **0912133**
NRC Sample ID **0912133-03**
Collection Date: **12/1/09 4:00:00 PM**
Received Date: **12/4/09 3:00:00 PM**
Reported Date: **1/22/10 4:32:44 PM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
Dissolved Trace Metals by EPA 200.8 (ICP-MS) by EPA 200.8							*Analyst:* ***BAR***
Antimony	A	**0.000532**		0.000204	mg/L	1	12/11/09
Arsenic	A	**0.000893**		0.00051	mg/L	1	12/11/09
Barium	A	**0.00232**		0.00051	mg/L	1	12/11/09
Cadmium	A	**ND**		0.000102	mg/L	1	12/11/09
Chromium	A	**ND**		0.00051	mg/L	1	12/11/09
Cobalt	A	**0.000210**		0.000102	mg/L	1	12/11/09
Copper	A	**0.00213**		0.000102	mg/L	1	12/11/09
Lead	A	**ND**		0.000102	mg/L	1	12/11/09
Manganese	A	**0.0220**		0.0051	mg/L	1	12/11/09
Nickel	A	**0.00141**		0.00051	mg/L	1	12/11/09
Selenium	A	**0.000772**		0.00051	mg/L	1	12/11/09
Zinc	A	**0.00702**		0.00051	mg/L	1	12/11/09
Dissolved Mercury by EPA 245.1 by EPA 245.1							*Analyst:* ***BAR***
Mercury	A	**ND**		0.0002	mg/L	1	12/9/09
Dissolved Trace Metals by EPA 200.7							*Analyst:* ***BAR***
Aluminum	A	**0.599**		0.01	mg/L	1	12/8/09
Calcium	A	**152**		20	mg/L	20	12/10/09
Iron	A	**0.0705**		0.005	mg/L	1	12/8/09
Magnesium	A	**13.0**		1	mg/L	1	12/8/09
Sodium	A	**214**		20	mg/L	20	12/10/09

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
MRL - Minimum Reporting Limit

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

Ionic Water Technologies
PO Box 3336
Reno, NV 89501
Client Sample ID: **003INF004**
Sample Location:
Project: **Almeda Mine**

Lab Order: **0912133**
NRC Sample ID **0912133-04**
Collection Date: **12/2/09 9:15:00 AM**
Received Date: **12/4/09 3:00:00 PM**
Reported Date: **1/22/10 4:32:44 PM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
Dissolved Mercury by EPA 245.1 by EPA 245.1							*Analyst:* ***BAR***
Mercury	A	**ND**		0.0002	mg/L	1	12/9/09
Dissolved Trace Metals by EPA 200.7							*Analyst:* ***BAR***
Aluminum	A	**13.4**		0.01	mg/L	1	12/8/09
Antimony	A	**ND**		0.05	mg/L	1	12/8/09
Arsenic	A	**ND**		0.05	mg/L	1	12/8/09
Barium	A	**ND**		0.05	mg/L	1	12/8/09
Cadmium	A	**0.0431**		0.001	mg/L	1	12/8/09
Calcium	A	**154**	N	20	mg/L	20	12/8/09
Chromium	A	**ND**		0.005	mg/L	1	12/8/09
Cobalt	A	**0.0576**		0.01	mg/L	1	12/8/09
Copper	A	**2.14**		0.01	mg/L	1	12/8/09
Iron	A	**73.6**		0.005	mg/L	1	12/8/09
Lead	A	**ND**		0.05	mg/L	1	12/8/09
Magnesium	A	**23.0**		1	mg/L	1	12/8/09
Manganese	A	**1.45**		0.02	mg/L	1	12/8/09
Nickel	A	**0.0429**		0.005	mg/L	1	12/8/09
Selenium	A	**ND**		0.02	mg/L	1	12/8/09
Sodium	A	**14.2**		1	mg/L	1	12/8/09
Zinc	A	**6.47**		0.05	mg/L	1	12/8/09

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
MRL - Minimum Reporting Limit

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

Ionic Water Technologies
PO Box 3336
Reno, NV 89501
Client Sample ID: **003DIS005**
Sample Location:
Project: **Almeda Mine**

Lab Order: **0912133**
NRC Sample ID **0912133-05**
Collection Date: **12/2/09 12:30:00 PM**
Received Date: **12/4/09 3:00:00 PM**
Reported Date: **1/22/10 4:32:44 PM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
Dissolved Trace Metals by EPA 200.8 (ICP-MS) by EPA 200.8							*Analyst:* ***BAR***
Antimony	A	**0.000579**		0.000204	mg/L	1	12/11/09
Arsenic	A	**0.00108**		0.00051	mg/L	1	12/11/09
Barium	A	**0.00258**		0.00051	mg/L	1	12/11/09
Cadmium	A	**0.000110**		0.000102	mg/L	1	12/11/09
Chromium	A	**ND**		0.00051	mg/L	1	12/11/09
Cobalt	A	**0.000222**		0.000102	mg/L	1	12/11/09
Copper	A	**0.00177**		0.000102	mg/L	1	12/11/09
Lead	A	**ND**		0.000102	mg/L	1	12/11/09
Manganese	A	**0.0381**		0.0051	mg/L	1	12/11/09
Nickel	A	**0.00147**		0.00051	mg/L	1	12/11/09
Selenium	A	**0.000633**		0.00051	mg/L	1	12/11/09
Zinc	A	**0.00527**		0.00051	mg/L	1	12/11/09
Dissolved Mercury by EPA 245.1 by EPA 245.1							*Analyst:* ***BAR***
Mercury	A	**ND**		0.0002	mg/L	1	12/9/09
Dissolved Trace Metals by EPA 200.7							*Analyst:* ***BAR***
Aluminum	A	**0.468**		0.01	mg/L	1	12/8/09
Calcium	A	**149**		20	mg/L	20	12/10/09
Iron	A	**0.0541**		0.005	mg/L	1	12/8/09
Magnesium	A	**15.6**		1	mg/L	1	12/8/09
Sodium	A	**202**		20	mg/L	20	12/10/09

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
MRL - Minimum Reporting Limit

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

Ionic Water Technologies
PO Box 3336
Reno, NV 89501
Client Sample ID: **003DIS006**
Sample Location:
Project: **Almeda Mine**

Lab Order: **0912133**
NRC Sample ID **0912133-06**
Collection Date: **12/2/09 12:30:00 PM**
Received Date: **12/4/09 3:00:00 PM**
Reported Date: **1/22/10 4:32:44 PM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
Dissolved Trace Metals by EPA 200.8 (ICP-MS) by EPA 200.8							*Analyst:* ***BAR***
Antimony	A	**0.000567**		0.000204	mg/L	1	12/11/09
Arsenic	A	**0.00112**		0.00051	mg/L	1	12/11/09
Barium	A	**0.00245**		0.00051	mg/L	1	12/11/09
Cadmium	A	**ND**		0.000102	mg/L	1	12/11/09
Chromium	A	**ND**		0.00051	mg/L	1	12/11/09
Cobalt	A	**0.000210**		0.000102	mg/L	1	12/11/09
Copper	A	**0.000582**		0.000102	mg/L	1	12/11/09
Lead	A	**ND**		0.000102	mg/L	1	12/11/09
Manganese	A	**0.0370**		0.0051	mg/L	1	12/11/09
Nickel	A	**0.00153**		0.00051	mg/L	1	12/11/09
Selenium	A	**0.000642**		0.00051	mg/L	1	12/11/09
Zinc	A	**0.00244**		0.00051	mg/L	1	12/11/09
Dissolved Mercury by EPA 245.1 by EPA 245.1							*Analyst:* ***BAR***
Mercury	A	**ND**		0.0002	mg/L	1	12/9/09
Dissolved Trace Metals by EPA 200.7							*Analyst:* ***BAR***
Aluminum	A	**0.471**		0.01	mg/L	1	12/8/09
Calcium	A	**144**		20	mg/L	20	12/8/09
Iron	A	**0.0105**		0.005	mg/L	1	12/8/09
Magnesium	A	**12.9**		1	mg/L	1	12/8/09
Sodium	A	**198**		20	mg/L	20	12/8/09

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
MRL - Minimum Reporting Limit

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

Ionic Water Technologies
PO Box 3336
Reno, NV 89501
Client Sample ID: **003DIS007**
Sample Location:
Project: **Almeda Mine**

Lab Order: **0912133**
NRC Sample ID **0912133-07**
Collection Date: **12/2/09 4:20:00 PM**
Received Date: **12/4/09 3:00:00 PM**
Reported Date: **1/22/10 4:32:44 PM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
Dissolved Trace Metals by EPA 200.8 (ICP-MS) by EPA 200.8							*Analyst:* ***BAR***
Antimony	A	**0.000609**		0.000204	mg/L	1	12/11/09
Arsenic	A	**0.00104**		0.00051	mg/L	1	12/11/09
Barium	A	**0.00244**		0.00051	mg/L	1	12/11/09
Cadmium	A	**ND**		0.000102	mg/L	1	12/11/09
Chromium	A	**ND**		0.00051	mg/L	1	12/11/09
Cobalt	A	**0.000196**		0.000102	mg/L	1	12/11/09
Copper	A	**0.00151**		0.000102	mg/L	1	12/11/09
Lead	A	**ND**		0.000102	mg/L	1	12/11/09
Manganese	A	**0.0194**		0.0051	mg/L	1	12/11/09
Nickel	A	**0.00151**		0.00051	mg/L	1	12/11/09
Selenium	A	**0.000611**		0.00051	mg/L	1	12/11/09
Zinc	A	**0.00604**		0.00051	mg/L	1	12/11/09
Dissolved Mercury by EPA 245.1 by EPA 245.1							*Analyst:* ***BAR***
Mercury	A	**ND**		0.0002	mg/L	1	12/9/09
Dissolved Trace Metals by EPA 200.7							*Analyst:* ***BAR***
Aluminum	A	**0.800**		0.01	mg/L	1	12/8/09
Calcium	A	**142**		20	mg/L	20	12/10/09
Iron	A	**0.0549**		0.005	mg/L	1	12/8/09
Magnesium	A	**13.1**		1	mg/L	1	12/8/09
Sodium	A	**205**		20	mg/L	20	12/10/09

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
MRL - Minimum Reporting Limit

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

Ionic Water Technologies
PO Box 3336
Reno, NV 89501
Client Sample ID: **004DIS008**
Sample Location:
Project: **Almeda Mine**

Lab Order: **0912133**
NRC Sample ID **0912133-08**
Collection Date: **12/3/09 12:00:00 PM**
Received Date: **12/4/09 3:00:00 PM**
Reported Date: **1/22/10 4:32:44 PM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
Dissolved Trace Metals by EPA 200.8 (ICP-MS) by EPA 200.8							*Analyst:* ***BAR***
Aluminum		**0.238**		0.102	mg/L	10	12/11/09
Antimony	A	**0.000577**		0.000204	mg/L	1	12/11/09
Arsenic	A	**0.000805**		0.00051	mg/L	1	12/11/09
Barium	A	**0.00294**		0.00051	mg/L	1	12/11/09
Cadmium	A	**0.000165**		0.000102	mg/L	1	12/11/09
Chromium	A	**ND**		0.00051	mg/L	1	12/11/09
Cobalt	A	**0.000407**		0.000102	mg/L	1	12/11/09
Copper	A	**0.00200**		0.000102	mg/L	1	12/11/09
Lead	A	**ND**		0.000102	mg/L	1	12/11/09
Manganese	A	**0.0858**		0.0051	mg/L	1	12/11/09
Nickel	A	**0.00195**		0.00051	mg/L	1	12/11/09
Selenium	A	**0.000563**		0.00051	mg/L	1	12/11/09
Zinc	A	**0.00864**		0.00051	mg/L	1	12/11/09
Dissolved Mercury by EPA 245.1 by EPA 245.1							*Analyst:* ***BAR***
Mercury	A	**ND**		0.0002	mg/L	1	12/9/09
Dissolved Trace Metals by EPA 200.7							*Analyst:* ***BAR***
Calcium	A	**146**		20	mg/L	20	12/10/09
Iron	A	**0.0794**		0.005	mg/L	1	12/8/09
Magnesium	A	**17.4**		1	mg/L	1	12/8/09
Sodium	A	**190**		20	mg/L	20	12/10/09

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
MRL - Minimum Reporting Limit

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

Ionic Water Technologies
PO Box 3336
Reno, NV 89501
Client Sample ID: **004DIS009**
Sample Location:
Project: **Almeda Mine**

Lab Order: **0912133**
NRC Sample ID **0912133-09**
Collection Date: **12/3/09 3:30:00 PM**
Received Date: **12/4/09 3:00:00 PM**
Reported Date: **1/22/10 4:32:44 PM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
Dissolved Trace Metals by EPA 200.8 (ICP-MS) by EPA 200.8							*Analyst:* ***BAR***
Aluminum		**0.295**		0.102	mg/L	10	12/11/09
Antimony	A	**0.000562**		0.000204	mg/L	1	12/11/09
Arsenic	A	**0.000850**		0.00051	mg/L	1	12/11/09
Barium	A	**0.00258**		0.00051	mg/L	1	12/11/09
Cadmium	A	**0.000153**		0.000102	mg/L	1	12/11/09
Chromium	A	**ND**		0.00051	mg/L	1	12/11/09
Cobalt	A	**0.000365**		0.000102	mg/L	1	12/11/09
Copper	A	**0.00383**		0.000102	mg/L	1	12/11/09
Lead	A	**ND**		0.000102	mg/L	1	12/11/09
Manganese	A	**0.0662**		0.0051	mg/L	1	12/11/09
Nickel	A	**0.00164**		0.00051	mg/L	1	12/11/09
Selenium	A	**0.000586**		0.00051	mg/L	1	12/11/09
Zinc	A	**0.0152**		0.00051	mg/L	1	12/11/09
Dissolved Mercury by EPA 245.1 by EPA 245.1							*Analyst:* ***BAR***
Mercury	A	**ND**		0.0002	mg/L	1	12/9/09
Dissolved Trace Metals by EPA 200.7							*Analyst:* ***BAR***
Calcium	A	**154**		20	mg/L	20	12/10/09
Iron	A	**0.158**		0.005	mg/L	1	12/8/09
Magnesium	A	**16.2**		1	mg/L	1	12/8/09
Sodium	A	**201**		20	mg/L	20	12/10/09

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
MRL - Minimum Reporting Limit

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

Ionic Water Technologies
PO Box 3336
Reno, NV 89501
Client Sample ID: **005DIS010**
Sample Location:
Project: **Almeda Mine**

Lab Order: **0912133**
NRC Sample ID **0912133-10**
Collection Date: **12/4/09 7:00:00 AM**
Received Date: **12/4/09 3:00:00 PM**
Reported Date: **1/22/10 4:32:44 PM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
Dissolved Trace Metals by EPA 200.8 (ICP-MS) by EPA 200.8							*Analyst:* ***BAR***
Aluminum		**ND**		0.0102	mg/L	1	12/11/09
Antimony	A	**ND**		0.000204	mg/L	1	12/11/09
Arsenic	A	**ND**		0.00051	mg/L	1	12/11/09
Barium	A	**ND**		0.00051	mg/L	1	12/11/09
Cadmium	A	**ND**		0.000102	mg/L	1	12/11/09
Calcium		**ND**		0.0102	mg/L	1	12/11/09
Chromium	A	**ND**		0.00051	mg/L	1	12/11/09
Cobalt	A	**ND**		0.000102	mg/L	1	12/11/09
Copper	A	**ND**		0.000102	mg/L	1	12/11/09
Lead	A	**ND**		0.000102	mg/L	1	12/11/09
Magnesium		**ND**		0.0102	mg/L	1	12/11/09
Manganese	A	**ND**		0.0051	mg/L	1	12/11/09
Nickel	A	**ND**		0.00051	mg/L	1	12/11/09
Selenium	A	**ND**		0.00051	mg/L	1	12/11/09
Sodium		**ND**		0.0102	mg/L	1	12/14/09
Zinc	A	**ND**		0.00051	mg/L	1	12/11/09
Dissolved Mercury by EPA 245.1 by EPA 245.1							*Analyst:* ***BAR***
Mercury	A	**ND**		0.0002	mg/L	1	12/9/09
Dissolved Trace Metals by EPA 200.7							*Analyst:* ***BAR***
Iron	A	**ND**		0.005	mg/L	1	12/8/09

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
MRL - Minimum Reporting Limit

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

Ionic Water Technologies
PO Box 3336
Reno, NV 89501
Client Sample ID: **005INF011**
Sample Location:
Project: **Almeda Mine**

Lab Order: **0912133**
NRC Sample ID **0912133-11**
Collection Date: **12/4/09 7:30:00 AM**
Received Date: **12/4/09 3:00:00 PM**
Reported Date: **1/22/10 4:32:44 PM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
Dissolved Mercury by EPA 245.1 by EPA 245.1							*Analyst:* ***BAR***
Mercury	A	**ND**		0.0002	mg/L	1	12/9/09
Dissolved Trace Metals by EPA 200.7							*Analyst:* ***BAR***
Aluminum	A	**13.5**		0.01	mg/L	1	12/8/09
Antimony	A	**ND**		0.05	mg/L	1	12/8/09
Arsenic	A	**0.0556**		0.05	mg/L	1	12/8/09
Barium	A	**ND**		0.05	mg/L	1	12/8/09
Cadmium	A	**0.0424**		0.001	mg/L	1	12/8/09
Calcium	A	**160**		20	mg/L	20	12/8/09
Chromium	A	**ND**		0.005	mg/L	1	12/8/09
Cobalt	A	**0.0583**		0.01	mg/L	1	12/8/09
Copper	A	**2.14**		0.01	mg/L	1	12/8/09
Iron	A	**73.9**		0.005	mg/L	1	12/8/09
Lead	A	**ND**		0.05	mg/L	1	12/8/09
Magnesium	A	**23.4**		1	mg/L	1	12/8/09
Manganese	A	**1.47**		0.02	mg/L	1	12/8/09
Nickel	A	**0.0430**		0.005	mg/L	1	12/8/09
Selenium	A	**ND**		0.02	mg/L	1	12/8/09
Sodium	A	**14.3**		1	mg/L	1	12/8/09
Zinc	A	**6.43**		0.05	mg/L	1	12/8/09

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
MRL - Minimum Reporting Limit

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

Ionic Water Technologies
PO Box 3336
Reno, NV 89501
Client Sample ID: **005DIS012**
Sample Location:
Project: **Almeda Mine**

Lab Order: **0912133**
NRC Sample ID **0912133-12**
Collection Date: **12/4/09 12:00:00 PM**
Received Date: **12/4/09 3:00:00 PM**
Reported Date: **1/22/10 4:32:44 PM**
Matrix: **Aqueous**

ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
Dissolved Trace Metals by EPA 200.8 (ICP-MS) by EPA 200.8							*Analyst:* ***BAR***
Aluminum		**0.184**	N	0.0102	mg/L	1	12/11/09
Antimony	A	**0.000539**		0.000204	mg/L	1	12/11/09
Arsenic	A	**0.000809**		0.00051	mg/L	1	12/11/09
Barium	A	**0.00383**		0.00051	mg/L	1	12/11/09
Cadmium	A	**0.000254**		0.000102	mg/L	1	12/11/09
Chromium	A	**ND**		0.00051	mg/L	1	12/11/09
Cobalt	A	**0.000848**		0.000102	mg/L	1	12/11/09
Copper	A	**0.000197**		0.000102	mg/L	1	12/11/09
Lead	A	**ND**		0.000102	mg/L	1	12/11/09
Manganese	A	**0.171**		0.0051	mg/L	1	12/11/09
Nickel	A	**0.00242**		0.00051	mg/L	1	12/11/09
Selenium	A	**ND**		0.00051	mg/L	1	12/11/09
Zinc	A	**0.00616**		0.00051	mg/L	1	12/11/09
Dissolved Mercury by EPA 245.1 by EPA 245.1							*Analyst:* ***BAR***
Mercury	A	**ND**		0.0002	mg/L	1	12/9/09
Dissolved Trace Metals by EPA 200.7							*Analyst:* ***BAR***
Calcium	A	**151**		20	mg/L	20	12/10/09
Iron	A	**0.0138**		0.005	mg/L	1	12/8/09
Magnesium	A	**18.4**		1	mg/L	1	12/8/09
Sodium	A	**188**		20	mg/L	20	12/10/09

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
MRL - Minimum Reporting Limit

Neilson Research Corporation

DATA FLAGS

B	Analyte detected in the associated Method Blank.
C	Sample(s) does not meet NELAC/ORELAP sample acceptance criteria. See Case Narrative.
CU	Cleanup performed prior to analysis: either H_2SO_4/Silica Gel or Florosil.
D1	The diesel elution pattern for the sample is not typical.
D2	The sample appears to be a heavier hydrocarbon range than diesel.
D3	The sample appears to be a lighter hydrocarbon range than diesel.
D4	Detected hydrocarbons do not have pattern and range consistent with typical petroleum products and may be due to biogenic interference.
D5	Detected hydrocarbons in the diesel range appear to be weathered diesel.
E	Estimated value.
ER	Elevated reporting limit due to matrix.
G1	The gasoline elution pattern for the sample is not typical.
G2	The sample appears to be a heavier hydrocarbon range than gasoline.
G3	The sample appears to be a lighter hydrocarbon range than gasoline.
G4	Detected hydrocarbons in the gasoline range appear to be weathered gasoline.
HP	Sample re-analysis performed outside of method specified holding time.
HR	Sample received outside of method specified holding time.
HS	Sample analyzed for volatile organics contained headspace.
HT	At the client's request, the sample was analyzed outside of method specified holding time.
H	Analysis performed outside of method specified holding time.
J	Analyte detected below the Minimum Reporting Limit (MRL) and above the Method Detection Limit (MDL). The J flag result is an estimated value.
MI	Surrogate or Matrix Spike recovery is out of control limits due to matrix interference.
N	See Case Narrative.
NI	Some QA criteria may be outside control limits. Insufficient sample remains for reanalysis.
Q	Closing CCV or LCS exceeded high recovery limits, but associated samples are non-detect and the sample results are not affected. Data meets EPA/NELAC requirements.
R	RPD outside accepted recovery limits.
R1	Analyses are not controlled on RPD values from sample concentration less than 10 times the reporting limit.
R2	Analyses are not controlled on RPD values from sample concentration less than 5 times the reporting limit.
R3	The RPD and/or % recovery for the DUP or QC spike sample cannot be accurately calculated due to the high concentration of analyte already present in the sample.
R4	Duplicate analysis failed due to result being at or near method reporting limit.
RPD	Relative percent difference.

Reporting Limits: Report limits (MDLs, MRLs & PQLs) are adjusted based on variations in sample preparation amounts, analytical dilutions, and percent solids, where applicable.

S	Spike recovery outside accepted recovery limits.
S1	Surrogate or Matrix Spike recovery is outside of control limits due to dilution necessary for analysis.
SC	Sub-contracted to another laboratory for analysis.
TCLP	Toxicity Characteristic Leaching Procedure – Sample submitted contained < 0.5% solids.
X1	The motor oil elution pattern for the sample is not typical.
X2	The sample appears to be a heavier hydrocarbon range than motor oil.
X3	The sample appears to be a lighter hydrocarbon range than motor oil.
*	Value exceeds Maximum Contaminant Level
#	Value exceeds regulatory level for TCLP contaminant.

Neilson Research Corporation

Date: 22-Jan-10

CLIENT: Ionic Water Technologies
Work Order: 0912133
Project: Almeda Mine

ANALYTICAL QC SUMMARY REPORT

TestCode: HG_W_DISS

Sample ID: **MB-19636** SampType: **MBLK** TestCode: **HG_W_DISS** Units: **mg/L** Prep Date: **12/8/09** RunNo: **48317**
Client ID: **ZZZZZ** Batch ID: **19636** TestNo: **EPA 245.1** **(EPA 245.1/74** Analysis Date: **12/9/09** SeqNo: **719769**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	ND	0.000200									

Sample ID: **LCS-19636** SampType: **LCS** TestCode: **HG_W_DISS** Units: **mg/L** Prep Date: **12/8/09** RunNo: **48317**
Client ID: **ZZZZZ** Batch ID: **19636** TestNo: **EPA 245.1** **(EPA 245.1/74** Analysis Date: **12/9/09** SeqNo: **719770**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.005072	0.000200	0.005	0	101	80	120				

Sample ID: **0912133-03AMS** SampType: **MS** TestCode: **HG_W_DISS** Units: **mg/L** Prep Date: **12/8/09** RunNo: **48317**
Client ID: **002DIS003** Batch ID: **19636** TestNo: **EPA 245.1** **(EPA 245.1/74** Analysis Date: **12/9/09** SeqNo: **719783**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.005093	0.000200	0.005	0.000027	101	75	125				

Sample ID: **0912133-03AMSD** SampType: **MSD** TestCode: **HG_W_DISS** Units: **mg/L** Prep Date: **12/8/09** RunNo: **48317**
Client ID: **002DIS003** Batch ID: **19636** TestNo: **EPA 245.1** **(EPA 245.1/74** Analysis Date: **12/9/09** SeqNo: **719784**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.005151	0.000200	0.005	0.000027	102	75	125	0.005093	1.13	0	

Qualifiers:
E Value above quantitation range
ND Not Detected at the Minimum Reporting Limit
H Holding times for preparation or analysis exceeded
R RPD outside accepted recovery limits
J Analyte detected below quantitation limits
S Spike Recovery outside accepted recovery limits

Neilson Research Corporation

Date: 22-Jan-10

CLIENT: Ionic Water Technologies
Work Order: 0912133
Project: Almeda Mine

ANALYTICAL QC SUMMARY REPORT

TestCode: ICP_W_DISS

Sample ID: **MB-19626** SampType: **MBLK** TestCode: **ICP_W_DISS** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48290**
Client ID: **ZZZZZ** Batch ID: **19626** TestNo: **EPA 200.7** **(EPA 3005A)** Analysis Date: **12/8/09** SeqNo: **719522**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	0.0100									
Antimony	ND	0.0500									
Arsenic	ND	0.0500									
Barium	ND	0.0500									
Cadmium	ND	0.00100									
Calcium	ND	1.00									
Chromium	ND	0.00500									
Cobalt	ND	0.0100									
Copper	ND	0.0100									
Iron	ND	0.00500									
Lead	ND	0.0500									
Magnesium	ND	1.00									
Manganese	ND	0.0200									
Nickel	ND	0.00500									
Selenium	ND	0.0200									
Sodium	ND	1.00									
Zinc	ND	0.0500									

Sample ID: **MB-19639** SampType: **MBLK** TestCode: **ICP_W_DISS** Units: **mg/L** Prep Date: **12/8/09** RunNo: **48318**
Client ID: **ZZZZZ** Batch ID: **19639** TestNo: **EPA 200.7** **(EPA 3005A)** Analysis Date: **12/8/09** SeqNo: **719873**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	0.0100									
Iron	ND	0.00500									
Magnesium	ND	1.00									

Qualifiers:
E Value above quantitation range
ND Not Detected at the Minimum Reporting Limit
H Holding times for preparation or analysis exceeded
R RPD outside accepted recovery limits
J Analyte detected below quantitation limits
S Spike Recovery outside accepted recovery limits

Neilson Research Corporation

Date: 22-Jan-10

CLIENT: Ionic Water Technologies
Work Order: 0912133
Project: Almeda Mine

ANALYTICAL QC SUMMARY REPORT

TestCode: ICP_W_DISS

Sample ID: **MB-19639** SampType: **MBLK** TestCode: **ICP_W_DISS** Units: **mg/L** Prep Date: **12/8/09** RunNo: **48348**
Client ID: **ZZZZZ** Batch ID: **19639** TestNo: **EPA 200.7** **(EPA 3005A)** Analysis Date: **12/10/09** SeqNo: **720436**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium	ND	1.00									
Magnesium	ND	1.00									
Sodium	ND	1.00									

Sample ID: **LCS-19626** SampType: **LCS** TestCode: **ICP_W_DISS** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48290**
Client ID: **ZZZZZ** Batch ID: **19626** TestNo: **EPA 200.7** **(EPA 3005A)** Analysis Date: **12/8/09** SeqNo: **719523**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	1.014	0.0100	1	0	101	85	115				
Antimony	0.9743	0.0500	1	0	97.4	85	115				
Arsenic	1.022	0.0500	1	0	102	85	115				
Barium	0.9818	0.0500	1	0	98.2	85	115				
Cadmium	0.9877	0.00100	1	0	98.8	85	115				
Calcium	ND	1.00	1	0	99.6	85	115				
Chromium	0.9648	0.00500	1	0	96.5	85	115				
Cobalt	0.9626	0.0100	1	0	96.3	85	115				
Copper	0.9907	0.0100	1	0	99.1	85	115				
Iron	0.9945	0.00500	1	0	99.4	85	115				
Lead	0.9748	0.0500	1	0	97.5	85	115				
Magnesium	ND	1.00	1	0	95.9	85	115				
Manganese	0.9953	0.0200	1	0	99.5	85	115				
Nickel	0.9866	0.00500	1	0	98.7	85	115				
Selenium	0.9821	0.0200	1	0	98.2	85	115				
Sodium	ND	1.00	1	0	95.9	85	115				
Zinc	0.9799	0.0500	1	0	98.0	85	115				

Qualifiers:
- E Value above quantitation range
- ND Not Detected at the Minimum Reporting Limit
- H Holding times for preparation or analysis exceeded
- R RPD outside accepted recovery limits
- J Analyte detected below quantitation limits
- S Spike Recovery outside accepted recovery limits

Neilson Research Corporation

Date: 22-Jan-10

CLIENT: Ionic Water Technologies
Work Order: 0912133
Project: Almeda Mine

ANALYTICAL QC SUMMARY REPORT

TestCode: ICP_W_DISS

Sample ID: **LCS-19639** SampType: **LCS** TestCode: **ICP_W_DISS** Units: **mg/L** Prep Date: **12/8/09** RunNo: **48318**
Client ID: **ZZZZZ** Batch ID: **19639** TestNo: **EPA 200.7** **(EPA 3005A)** Analysis Date: **12/8/09** SeqNo: **719876**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	0.9791	0.0100	1	0	97.9	85	115				
Iron	0.9968	0.00500	1	0.004	99.3	85	115				
Magnesium	ND	1.00	1	0	97.1	85	115				

Sample ID: **LCS-19639** SampType: **LCS** TestCode: **ICP_W_DISS** Units: **mg/L** Prep Date: **12/8/09** RunNo: **48348**
Client ID: **ZZZZZ** Batch ID: **19639** TestNo: **EPA 200.7** **(EPA 3005A)** Analysis Date: **12/10/09** SeqNo: **720437**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium	1.007	1.00	1	0	101	85	115				
Magnesium	1.005	1.00	1	0	101	85	115				
Sodium	1.045	1.00	1	0	104	85	115				

Sample ID: **0912133-04AMS** SampType: **MS** TestCode: **ICP_W_DISS** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48290**
Client ID: **003INF004** Batch ID: **19626** TestNo: **EPA 200.7** **(EPA 3005A)** Analysis Date: **12/8/09** SeqNo: **719530**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	33.00	0.0100	21	13.44	93.1	70	130				
Antimony	0.9744	0.0500	1	0	97.4	70	130				
Arsenic	1.056	0.0500	1	0.0435	101	70	130				
Barium	0.9518	0.0500	1	0.0021	95.0	70	130				
Cadmium	0.9964	0.00100	1	0.0431	95.3	70	130				
Chromium	0.9269	0.00500	1	0	92.7	70	130				
Cobalt	0.9689	0.0100	1	0.0576	91.1	70	130				
Copper	3.068	0.0100	1	2.141	92.7	70	130				
Iron	93.23	0.00500	21	73.56	93.7	70	130				
Lead	0.9542	0.0500	1	0.0427	91.2	70	130				
Magnesium	42.81	1.00	21	23.05	94.1	70	130				
Manganese	2.333	0.0200	1	1.454	87.9	70	130				
Nickel	0.9796	0.00500	1	0.0429	93.7	70	130				

Qualifiers:
E Value above quantitation range
ND Not Detected at the Minimum Reporting Limit
H Holding times for preparation or analysis exceeded
R RPD outside accepted recovery limits
J Analyte detected below quantitation limits
S Spike Recovery outside accepted recovery limits

Neilson Research Corporation

Date: 22-Jan-10

CLIENT: Ionic Water Technologies
Work Order: 0912133
Project: Almeda Mine

ANALYTICAL QC SUMMARY REPORT

TestCode: ICP_W_DISS

Sample ID: **0912133-04AMS** SampType: **MS** TestCode: **ICP_W_DISS** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48290**
Client ID: **003INF004** Batch ID: **19626** TestNo: **EPA 200.7** **(EPA 3005A)** Analysis Date: **12/8/09** SeqNo: **719530**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Selenium	0.9950	0.0200	1	0.0076	98.7	70	130				
Sodium	37.36	1.00	21	14.19	110	70	130				
Zinc	7.516	0.0500	1	6.466	105	70	130				

Sample ID: **0912133-04AMS** SampType: **MS** TestCode: **ICP_W_DISS** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48290**
Client ID: **003INF004** Batch ID: **19626** TestNo: **EPA 200.7** **(EPA 3005A)** Analysis Date: **12/8/09** SeqNo: **719541**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium	178.6	20.0	21	154.3	116	70	130				

Sample ID: **0912133-10AMS** SampType: **MS** TestCode: **ICP_W_DISS** Units: **mg/L** Prep Date: **12/8/09** RunNo: **48318**
Client ID: **005DIS010** Batch ID: **19639** TestNo: **EPA 200.7** **(EPA 3005A)** Analysis Date: **12/8/09** SeqNo: **719887**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	20.31	0.0100	21	0	96.7	70	130				
Iron	20.39	0.00500	21	0.0036	97.1	70	130				
Magnesium	22.96	1.00	21	0	109	70	130				

Sample ID: **0912133-10AMS** SampType: **MS** TestCode: **ICP_W_DISS** Units: **mg/L** Prep Date: **12/8/09** RunNo: **48348**
Client ID: **005DIS010** Batch ID: **19639** TestNo: **EPA 200.7** **(EPA 3005A)** Analysis Date: **12/10/09** SeqNo: **720450**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium	20.70	1.00	21	0	98.6	70	130				
Sodium	20.04	1.00	21	0	95.4	70	130				

Qualifiers:
E Value above quantitation range
ND Not Detected at the Minimum Reporting Limit
H Holding times for preparation or analysis exceeded
R RPD outside accepted recovery limits
J Analyte detected below quantitation limits
S Spike Recovery outside accepted recovery limits

Neilson Research Corporation

Date: 22-Jan-10

CLIENT: Ionic Water Technologies
Work Order: 0912133
Project: Almeda Mine

ANALYTICAL QC SUMMARY REPORT

TestCode: ICP_W_DISS

Sample ID: **0912133-04AMSD** SampType: **MSD** TestCode: **ICP_W_DISS** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48290**
Client ID: **003INF004** Batch ID: **19626** TestNo: **EPA 200.7** **(EPA 3005A)** Analysis Date: **12/8/09** SeqNo: **719534**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	33.48	0.0100	21	13.44	95.4	70	130	33	1.44	20	
Antimony	0.9874	0.0500	1	0	98.7	70	130	0.9744	1.33	20	
Arsenic	1.067	0.0500	1	0.0435	102	70	130	1.056	1.04	20	
Barium	0.9654	0.0500	1	0.0021	96.3	70	130	0.9518	1.42	20	
Cadmium	1.009	0.00100	1	0.0431	96.6	70	130	0.9964	1.26	20	
Chromium	0.9401	0.00500	1	0	94.0	70	130	0.9269	1.41	20	
Cobalt	0.9785	0.0100	1	0.0576	92.1	70	130	0.9689	0.986	20	
Copper	3.103	0.0100	1	2.141	96.2	70	130	3.068	1.13	20	
Iron	94.87	0.00500	21	73.56	101	70	130	93.23	1.74	20	
Lead	0.9594	0.0500	1	0.0427	91.7	70	130	0.9542	0.543	20	
Magnesium	43.34	1.00	21	23.05	96.6	70	130	42.81	1.23	20	
Manganese	2.367	0.0200	1	1.454	91.3	70	130	2.333	1.45	20	
Nickel	0.9940	0.00500	1	0.0429	95.1	70	130	0.9796	1.46	20	
Selenium	1.007	0.0200	1	0.0076	99.9	70	130	0.995	1.20	20	
Sodium	37.72	1.00	21	14.19	112	70	130	37.36	0.959	20	
Zinc	7.584	0.0500	1	6.466	112	70	130	7.516	0.901	20	

Sample ID: **0912133-04AMSD** SampType: **MSD** TestCode: **ICP_W_DISS** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48290**
Client ID: **003INF004** Batch ID: **19626** TestNo: **EPA 200.7** **(EPA 3005A)** Analysis Date: **12/8/09** SeqNo: **719542**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium	181.8	20.0	21	154.3	131	70	130	178.6	1.81	20	R3

Sample ID: **0912133-10AMSD** SampType: **MSD** TestCode: **ICP_W_DISS** Units: **mg/L** Prep Date: **12/8/09** RunNo: **48318**
Client ID: **005DIS010** Batch ID: **19639** TestNo: **EPA 200.7** **(EPA 3005A)** Analysis Date: **12/8/09** SeqNo: **719888**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	20.91	0.0100	21	0	99.6	70	130	20.31	2.91	20	
Iron	20.94	0.00500	21	0.0036	99.7	70	130	20.39	2.66	20	

Qualifiers:
E Value above quantitation range
H Holding times for preparation or analysis exceeded
J Analyte detected below quantitation limits
ND Not Detected at the Minimum Reporting Limit
R RPD outside accepted recovery limits
S Spike Recovery outside accepted recovery limits

Neilson Research Corporation

Date: 22-Jan-10

CLIENT: Ionic Water Technologies
Work Order: 0912133
Project: Almeda Mine

ANALYTICAL QC SUMMARY REPORT

TestCode: ICP_W_DISS

Sample ID: **0912133-10AMSD** SampType: **MSD** TestCode: **ICP_W_DISS** Units: **mg/L** Prep Date: **12/8/09** RunNo: **48318**
Client ID: **005DIS010** Batch ID: **19639** TestNo: **EPA 200.7** **(EPA 3005A)** Analysis Date: **12/8/09** SeqNo: **719888**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Magnesium	23.80	1.00	21	0	113	70	130	22.96	3.59	20	

Sample ID: **0912133-10AMSD** SampType: **MSD** TestCode: **ICP_W_DISS** Units: **mg/L** Prep Date: **12/8/09** RunNo: **48348**
Client ID: **005DIS010** Batch ID: **19639** TestNo: **EPA 200.7** **(EPA 3005A)** Analysis Date: **12/10/09** SeqNo: **720451**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium	20.92	1.00	21	0	99.6	70	130	20.7	1.06	20	
Sodium	20.21	1.00	21	0	96.2	70	130	20.04	0.845	20	

Qualifiers:
E Value above quantitation range
ND Not Detected at the Minimum Reporting Limit
H Holding times for preparation or analysis exceeded
R RPD outside accepted recovery limits
J Analyte detected below quantitation limits
S Spike Recovery outside accepted recovery limits

Neilson Research Corporation

Date: 22-Jan-10

CLIENT: Ionic Water Technologies
Work Order: 0912133
Project: Almeda Mine

ANALYTICAL QC SUMMARY REPORT

TestCode: ICPMS_200.8_DISS

Sample ID: **MB-19630** SampType: **MBLK** TestCode: **ICPMS_200.8** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48370**
Client ID: **ZZZZZ** Batch ID: **19630** TestNo: **EPA 200.8** **(EPA 3005A)** Analysis Date: **12/11/09** SeqNo: **720693**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	0.0100									
Antimony	ND	0.000200									
Arsenic	ND	0.000500									
Barium	ND	0.000500									
Cadmium	ND	0.000100									
Calcium	ND	0.0100									
Chromium	ND	0.000500									
Cobalt	ND	0.000100									
Copper	ND	0.000100									
Lead	ND	0.000100									
Magnesium	ND	0.0100									
Manganese	ND	0.00500									
Nickel	ND	0.000500									
Selenium	ND	0.000500									
Zinc	ND	0.000500									

Sample ID: **MB-19630** SampType: **MBLK** TestCode: **ICPMS_200.8** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48394**
Client ID: **ZZZZZ** Batch ID: **19630** TestNo: **EPA 200.8** **(EPA 3005A)** Analysis Date: **12/14/09** SeqNo: **721021**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sodium	ND	0.0100									

Sample ID: **LCS-19630** SampType: **LCS** TestCode: **ICPMS_200.8** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48370**
Client ID: **ZZZZZ** Batch ID: **19630** TestNo: **EPA 200.8** **(EPA 3005A)** Analysis Date: **12/11/09** SeqNo: **720694**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	0.1923	0.0100	0.2	0	96.2	85	115				
Antimony	0.1006	0.000200	0.1	0.00003574	101	85	115				
Arsenic	0.09994	0.000500	0.1	0.0004771	99.5	85	115				

Qualifiers:
E Value above quantitation range
ND Not Detected at the Minimum Reporting Limit
H Holding times for preparation or analysis exceeded
R RPD outside accepted recovery limits
J Analyte detected below quantitation limits
S Spike Recovery outside accepted recovery limits

Neilson Research Corporation

Date: 22-Jan-10

CLIENT: Ionic Water Technologies
Work Order: 0912133
Project: Almeda Mine

ANALYTICAL QC SUMMARY REPORT

TestCode: ICPMS_200.8_DISS

Sample ID: **LCS-19630** SampType: **LCS** TestCode: **ICPMS_200.8** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48370**
Client ID: **ZZZZZ** Batch ID: **19630** TestNo: **EPA 200.8** **(EPA 3005A)** Analysis Date: **12/11/09** SeqNo: **720694**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Barium	0.1007	0.000500	0.1	0	101	85	115				
Cadmium	0.1002	0.000100	0.1	0.00003118	100	85	115				
Calcium	0.1009	0.0100	0.1	0	101	85	115				
Chromium	0.09941	0.000500	0.1	0.0003408	99.1	85	115				
Cobalt	0.09927	0.000100	0.1	0	99.3	85	115				
Copper	0.09926	0.000100	0.1	0	99.3	85	115				
Lead	0.1006	0.000100	0.1	0	101	85	115				
Magnesium	0.1035	0.0100	0.1	0	104	85	115				
Manganese	0.1025	0.00500	0.1	0	103	85	115				
Nickel	0.09906	0.000500	0.1	0	99.1	85	115				
Selenium	0.09971	0.000500	0.1	0.0001874	99.5	85	115				
Zinc	0.1008	0.000500	0.1	0	101	85	115				

Sample ID: **LCS-19630** SampType: **LCS** TestCode: **ICPMS_200.8** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48394**
Client ID: **ZZZZZ** Batch ID: **19630** TestNo: **EPA 200.8** **(EPA 3005A)** Analysis Date: **12/14/09** SeqNo: **721022**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sodium	0.1073	0.0100	0.1	0.001072	106	85	115				

Sample ID: **0912133-10AMS** SampType: **MS** TestCode: **ICPMS_200.8** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48370**
Client ID: **005DIS010** Batch ID: **19630** TestNo: **EPA 200.8** **(EPA 3005A)** Analysis Date: **12/11/09** SeqNo: **720712**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	0.2102	0.0104	0.2	0	105	70	130				
Antimony	0.1018	0.000207	0.1	0	102	70	130				
Arsenic	0.1041	0.000518	0.1	0	104	70	130				
Barium	0.1051	0.000518	0.1	0.000473	105	70	130				
Cadmium	0.1036	0.000104	0.1	0.00005016	104	70	130				
Calcium	0.1139	0.0104	0.1	0.006932	107	70	130				

Qualifiers:
E Value above quantitation range
H Holding times for preparation or analysis exceeded
J Analyte detected below quantitation limits
ND Not Detected at the Minimum Reporting Limit
R RPD outside accepted recovery limits
S Spike Recovery outside accepted recovery limits

Neilson Research Corporation

Date: 22-Jan-10

CLIENT: Ionic Water Technologies
Work Order: 0912133
Project: Almeda Mine

ANALYTICAL QC SUMMARY REPORT

TestCode: ICPMS_200.8_DISS

Sample ID: **0912133-10AMS** SampType: **MS** TestCode: **ICPMS_200.8** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48370**
Client ID: **005DIS010** Batch ID: **19630** TestNo: **EPA 200.8** **(EPA 3005A)** Analysis Date: **12/11/09** SeqNo: **720712**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium	0.1061	0.000518	0.1	0.000143	106	70	130				
Cobalt	0.1040	0.000104	0.1	0.00003773	104	70	130				
Copper	0.1035	0.000104	0.1	0	104	70	130				
Lead	0.1026	0.000104	0.1	0	103	70	130				
Magnesium	0.1115	0.0104	0.1	0	111	70	130				
Manganese	0.1089	0.00518	0.1	0.000108	109	70	130				
Nickel	0.1043	0.000518	0.1	0.00004343	104	70	130				
Selenium	0.1039	0.000518	0.1	0	104	70	130				
Zinc	0.1033	0.000518	0.1	0	103	70	130				

Sample ID: **0912133-10AMS** SampType: **MS** TestCode: **ICPMS_200.8** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48394**
Client ID: **005DIS010** Batch ID: **19630** TestNo: **EPA 200.8** **(EPA 3005A)** Analysis Date: **12/14/09** SeqNo: **721032**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sodium	0.1162	0.0104	0.1	0.007816	108	70	130				

Sample ID: **0912133-10AMSD** SampType: **MSD** TestCode: **ICPMS_200.8** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48370**
Client ID: **005DIS010** Batch ID: **19630** TestNo: **EPA 200.8** **(EPA 3005A)** Analysis Date: **12/11/09** SeqNo: **720713**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	0.2041	0.0104	0.2	0	102	70	130	0.2102	2.95	0	
Antimony	0.1030	0.000207	0.1	0	103	70	130	0.1018	1.13	20	
Arsenic	0.1035	0.000518	0.1	0	103	70	130	0.1041	0.608	20	
Barium	0.1052	0.000518	0.1	0.000473	105	70	130	0.1051	0.0985	20	
Cadmium	0.1025	0.000104	0.1	0.00005016	102	70	130	0.1036	1.08	20	
Calcium	0.1124	0.0104	0.1	0.006932	105	70	130	0.1139	1.28	0	
Chromium	0.1058	0.000518	0.1	0.000143	106	70	130	0.1061	0.293	20	
Cobalt	0.1013	0.000104	0.1	0.00003773	101	70	130	0.104	2.64	20	
Copper	0.1035	0.000104	0.1	0	104	70	130	0.1035	0	20	

Qualifiers:
E Value above quantitation range
H Holding times for preparation or analysis exceeded
J Analyte detected below quantitation limits
ND Not Detected at the Minimum Reporting Limit
R RPD outside accepted recovery limits
S Spike Recovery outside accepted recovery limits

Neilson Research Corporation

Date: 22-Jan-10

CLIENT: Ionic Water Technologies
Work Order: 0912133
Project: Almeda Mine

ANALYTICAL QC SUMMARY REPORT

TestCode: ICPMS_200.8_DISS

Sample ID: **0912133-10AMSD** SampType: **MSD** TestCode: **ICPMS_200.8** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48370**
Client ID: **005DIS010** Batch ID: **19630** TestNo: **EPA 200.8** **(EPA 3005A)** Analysis Date: **12/11/09** SeqNo: **720713**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.1026	0.000104	0.1	0	103	70	130	0.1026	0.0403	20	
Magnesium	0.1083	0.0104	0.1	0	108	70	130	0.1115	2.92	0	
Manganese	0.1088	0.00518	0.1	0.000108	109	70	130	0.1089	0.0951	20	
Nickel	0.1037	0.000518	0.1	0.00004343	104	70	130	0.1043	0.597	20	
Selenium	0.1019	0.000518	0.1	0	102	70	130	0.1039	1.94	20	
Zinc	0.1035	0.000518	0.1	0	104	70	130	0.1033	0.200	20	

Sample ID: **0912133-10AMSD** SampType: **MSD** TestCode: **ICPMS_200.8** Units: **mg/L** Prep Date: **12/7/09** RunNo: **48394**
Client ID: **005DIS010** Batch ID: **19630** TestNo: **EPA 200.8** **(EPA 3005A)** Analysis Date: **12/14/09** SeqNo: **721033**

Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sodium	0.1133	0.0104	0.1	0.007816	106	70	130	0.1162	2.52	0	

Qualifiers:
E Value above quantitation range
ND Not Detected at the Minimum Reporting Limit
H Holding times for preparation or analysis exceeded
R RPD outside accepted recovery limits
J Analyte detected below quantitation limits
S Spike Recovery outside accepted recovery limits

NEILSON RESEARCH CORPORATION

245 S. GRAPE ST. * MEDFORD, OR 97501-3123 * (541) 770-5678 * FAX (541) 770-2901

Environmental Testing Laboratory ORELAP 100016

Chain of Custody Record

Date 12/4/09 Page 1 of 2

Attention: Tim Tsukamoto
Results and Invoice to: IWT
Address: P.O. Box 3336
Reno, NV. 89501
Phone: 775-321-8101 Sampled By:
Fax #: P.O. #:

REPORTING REQUEST

Preliminary: Fax ☐ Verbal ☐
Final: Written ☐ Fax ☐

RUSH REQUEST: ☐ 24–48 hrs. (100% sur)
☐ 5 days (50% sur) ☐ Standard 10–14 days
☐ Other

PROJECT INFORMATION

Project Number:
Project Name: Almeda IWT
Attention: Tim Tsukamoto
Address: P.O. Box 3336
Reno, NV 89501
Phone: 775-321-8101
ttsukamoto@IWTechnologies.com

SPECIAL INSTRUCTIONS:
Al, Sb, As, Ba, Cd, Ca, Cr, Co
Cu, Fe, Pb, Mg, Mn, Ni, Se
Na, Zn

☐ 4°C
☐ EPA JARS/VIALS WITH TEFLON LIDS
☐
☐
FIELD BLANK INCLUDED: ☐ YES ☐ NO

ANALYSIS REQUEST

LAB ID	SAMPLE ID	DATE	TIME	SOIL/WATER OTHER	NO. OF CONTAINERS	200.7-Dis.	200.8-Dis	245.1 Hg-Dis	DEPTH	REMARKS/SAMPLE CONDITION
01 001ADIT001 →		11-30	15:30			X				
02	001DIS002	11-30	10:52				X			
03	002DIS003	12-1	16:00				X			
04	003INF004	12-2	9:15			X				
05	003DIS005	12-2	12:30				X			
06	003DIS006	12-2	12:30				X			
07	003DIS007	12-2	16:20				X			
08	004DIS008	12-3	12:00				X			
09	004DIS009	12-3	15:30				X			
10	005DIS010	12-4	~~12:00~~ 7:00				X			

RELINQUISHED BY (Sign and Print)	DATE/TIME	RECEIVED BY (Sign)	DATE/TIME
Tim Tsukamoto	12-4-09/15:00		
		REC'D. BY (LABORATORY)	12/4/09 15:00

SAMPLE DISPOSAL
☐ NRC disposal of non-contaminated
☐ Return ☐ Pick up

CHAIN OF CUSTODY SEALS Y/N/NA
SHIPPED VIA: UPS Fed-Ex Bus Hand

Note: See Standard Terms & Conditions on reverse side of this form.

NEILSON RESEARCH CORPORATION

245 S. GRAPE ST. * MEDFORD, OR 97501-3123 * (541) 770-5678 * FAX (541) 770-2901
Environmental Testing Laboratory ORELAP 100016

Chain of Custody Record

Date 12/4/09 Page 2 of 2

Attention: Tim Tsukamoto
Results and Invoice to: IWT
Address: PO Box 33316
Reno, NV 89501
Phone: 775-321-8101 Sampled By:
Fax #: P.O. #:

REPORTING REQUEST

Preliminary: Fax ☐ Verbal ☐
Final: Written ☐ Fax ☐

RUSH REQUEST: ☐ 24–48 hrs. (100% sur)
☐ 5 days (50% sur) ☐ Standard 10–14 days
☐ Other

PROJECT INFORMATION

Project Number:
Project Name:
Attention:
Address:
Phone:

SPECIAL INSTRUCTIONS:

☐ 4°C
☐ EPA JARS/VIALS WITH TEFLON LIDS
☐
☐
FIELD BLANK INCLUDED: ☐ YES ☐ NO

0912133

ANALYSIS REQUEST

LAB ID	SAMPLE ID	DATE	TIME	SOIL/WATER OTHER	NO. OF CONTAINERS	200.7 DIS.	200.5 - DIS.	245.1 Hg - DIS.											DEPTH	REMARKS/SAMPLE CONDITION
11	005 INF011	12-4	7:30		X	X		1												
12	005 DIS012	12-4	12:00				X	1												

RELINQUISHED BY (Sign and Print)	DATE/TIME	RECEIVED BY (Sign)	DATE/TIME
Tim Tsukamoto	12-4-09/15:00		
		REC'D. BY (LABORATORY)	12/4/09 15:00

SAMPLE DISPOSAL
☐ NRC disposal of non-contaminated
☐ Return ☐ Pick up

CHAIN OF CUSTODY SEALS Y/N/NA
SHIPPED VIA: UPS Fed-Ex Bus Hand

Note: See Standard Terms & Conditions on reverse side of this form.