A

2012 Red Devil Baseline Monitoring Report

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Final
2012 Baseline Monitoring Report
Red Devil Mine, Alaska

December 2013

Prepared for:

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Table of Contents

Section **Page**

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List of Tables

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List of Figures

List of Figures (cont.)

Figure **Page**

List of Abbreviations and Acronyms

BLM	U.S. Department of the Interior Bureau of Land Management
BTEX	benzene, toluene, ethylbenzene, and xylenes
COPC	contaminant of potential concern
DRO	diesel range organics
E & E	Ecology and Environment, Inc.
GPS	global positioning system
GRO	gasoline range organics
IDW	investigation-derived waste
QC	quality control
RDM	Red Devil Mine
RI	Remedial Investigation
RRO	residual range organics
SVOC	semi-volatile organic compound
TAL	target analyte list
TDS	total dissolved solids
TSS	total suspended solids

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1 Introduction

This report presents the results of the spring and fall 2012 baseline groundwater and surface water monitoring effort at the Red Devil Mine (RDM) site. The RDM consists of an abandoned mercury mine and ore processing facility located on public lands managed by the U.S. Department of the Interior Bureau of Land Management (BLM) in the state of Alaska. Historical mining activities included underground and surface mining. Ore processing included crushing, retorting/ furnacing, milling, and flotation. Ecology and Environment, Inc. (E & E) prepared this baseline monitoring report on behalf of the BLM under Delivery Order Number L09PD02160 and General Services Administration Contract Number GS-10F-0160J.

1.1 Purpose and Objectives

The purpose of the baseline monitoring is to augment the Remedial Investigation (RI) results and identify seasonal trends in groundwater and surface water flow. Specific objectives of the baseline monitoring are to:

- Characterize the seasonal variability in groundwater and surface water hydrology and chemistry;
- Characterize the long-term (multiple year) variability in groundwater and surface water hydrology and chemistry; and
- Characterize trends that are present in groundwater and surface water chemistry.

1.2 Project Location and Setting

The RDM site is located approximately 250 air miles west and 1,500 marine/river barge miles from Anchorage, Alaska. Located on the southwest bank of the Kuskokwim River, approximately 2 miles southeast of the village of Red Devil, the site is 75 air miles northeast of Aniak, the largest village in the region, and approximately 8 miles northwest of the village of Sleetmute. Approximately 15 villages are located downstream of Red Devil on the Kuskokwim River. The legal description for the RDM site is Township 19 North, Range 44 West, Southeast Quarter of Section 6, Sleetmute D-4 Quadrangle, Seward Meridian. The RDM site's approximate coordinates are 61° 45' 38.1" north latitude and 157° 18' 42.7" west longitude (North American Datum 1927).

The RDM site is in a remote location, and access to the site is available by boat or barge on the Kuskokwim River or by means of an airstrip at the nearby village of Red Devil. An unimproved road leads from the airstrip through the village of Red Devil and to the site.

Features of the RDM identified in this report are defined in the Red Devil Mine RI Report (E & E 2013).

2 Field Activities and Procedures

Field sampling occurred during two events in 2012. The events were designed to capture the hydrologic conditions present during the spring and fall seasons at the site. The spring 2012 baseline monitoring event was targeted for the period shortly after the breakup of ice on the Kuskokwim River. The spring 2012 event was conducted from May 24 to May 31, 2012. The fall event was conducted from September 8 to 11, 2012. Unusually high precipitation levels occurred during the fall event, resulting in higher water levels than anticipated.

E & E collected surface water samples at stream and spring locations, and groundwater at monitoring wells. Stream and spring flow rates and depth-to-groundwater measurements were measured at sampling locations.

A field logbook was maintained throughout each sampling event. Pertinent information about the sampling locations and notes regarding flow measurements were recorded in the field logbook. Additionally, field data sheets were completed for each sample collected. A resource-grade global positioning system (GPS) device was used to survey lateral sample location information. These locations were recorded in the field logbook in addition to the GPS data logger.

Field activities were performed in accordance with the Baseline Monitoring Work Plan (E & E 2012), which is generally consistent with the Red Devil Mine Remedial Investigation/Feasibility Study Work Plan (E & E 2011), except as noted below.

2.1 Spring 2012 Baseline Monitoring

2.1.1 Groundwater Monitoring

Groundwater sampling was completed at 21 existing monitoring wells during the spring 2012 baseline monitoring event. Water level measurement was performed at 31 monitoring wells. Table 2-1 provides a summary of the samples collected. Monitoring well locations are illustrated in Figure 2-1.

Groundwater samples were collected for laboratory analysis of the following:

- Total target analyte list (TAL) inorganic elements
- Total low-level mercury

- Dissolved low-level mercury
- Inorganic ions
- Nitrate/nitrite
- Carbonate/bicarbonate
- Total dissolved solids (TDS)
- Total suspended solids (TSS).

In addition, samples were collected for dissolved TAL inorganic elements plus mercury from wells MW01, MW04, MW13, MW14, MW28, and MW29. These aliquots were collected because it was not possible to achieve field turbidity values below 10 nephelometric turbidity units at the time of groundwater sample collection.

A sample collected from monitoring well MW-19 was also analyzed for semi-volatile organic compounds (SVOCs), diesel range organics (DRO), residual range organics (RRO), gasoline range organics (GRO), and benzene, toluene, ethylbenzene, and xylenes (BTEX).

Field measurements for pH, temperature, specific conductance, oxidation-reduction potential, dissolved oxygen, and turbidity were collected during purging at each monitoring well prior to sample collection.

Groundwater samples were collected using a low-flow sampling technique, except for well MW29. It was not possible to use a low flow purging/sampling technique at well MW29 because the water quality meter was not functioning. A submersible pump was used to purge this well and collect the sample. Specific sampling methodologies are described in the Baseline Monitoring Work Plan (E & E 2012).

Monitoring wells MW09, MW-11, and MW-30 were not sampled during the RI because there was insufficient water to develop the wells at that time. During the spring 2012 baseline monitoring event, well development activities were performed over multiple days at wells MW-09, MW-11, and MW-30 using a combination of mechanical surging and bailing, as described in the Baseline Monitoring Work Plan (E & E 2012). During development of monitoring wells MW11 and MW30, the top caps of the bailers broke. The remaining portions of the bailers were left stranded in the wells until the fall 2012 baseline monitoring event, when suitable equipment was available and used to remove the bailer pieces (see Section 2.2.1, below). Repeated attempts were made on multiple days to develop MW09. Multiple attempts to develop this well were necessary because the well recharged slowly. Development of well MW09 was completed on the final day of the fall 2012 field event. Because of insufficient remaining time following completion of development, the well was not sampled during the spring 2012 monitoring event.

2.1.2 Red Devil Creek Surface Water Monitoring

During baseline monitoring, surface water monitoring was conducted at seven locations along Red Devil Creek between the creek's mouth at the Kuskokwim River and the reservoir south of the Main Processing Area. The surface water samples include one sample from the seep at location RD05. Surface water monitoring locations are illustrated on Figure 2-2. Table 2-2 provides a summary of the samples collected.

For the baseline monitoring, new surface water monitoring station RD13 was established at a position approximately 50 feet upstream of seep location RD05 in order to better understand gaining/losing conditions and contaminant concentration trends in the stream independent of the seep. Water quality sampling and stream gaging were performed at station RD13 as part of the spring baseline monitoring, but not at station RD12.

Red Devil Creek surface water samples were collected for laboratory analysis of:

- Total TAL inorganic elements
- Dissolved TAL inorganic elements
- Total mercury
- Dissolved mercury
- Methylmercury
- Arsenic speciation
- Inorganic ions
- Nitrate/nitrite
- Carbonate/bicarbonate
- TDS
- TSS

Field measurements for pH, temperature, specific conductance, oxidation-reduction potential, dissolved oxygen, and turbidity were collected at each sample station.

Surface water samples were collected using a battery-operated peristaltic pump outfitted with dedicated silicone tubing or by hand-dipping the sample container directly into the creek water following sampling methodologies described in the Baseline Monitoring Work Plan (E & E 2012).

Surface water discharge was measured using the mid-section method at each monitoring location following methodologies described in the Baseline Monitoring Work Plan (E & E 2012).

2.1.3 Sample Handling

Sample handling (chain-of-custody, field documentation, etc.) during the spring 2012 baseline monitoring event was conducted as described in the Baseline Monitoring Work Plan (E & E 2012), except for station RD13. Documentation associated with monitoring and sampling (including field notes, chain-of-custody records, and laboratory results) at RD13 inadvertently identified the station as RD12 rather than RD13. The correct station identification of RD13 is used in this report.

2.1.4 Quality Control Samples

Field quality control (QC) samples were collected for all media and analytes following the requirements specified in the Baseline Monitoring Work Plan (E & E 2012).

2.1.5 Investigation-Derived Waste Management

Investigation-derived waste (IDW) generated during the spring 2012 baseline monitoring included the following:

- Monitoring well development and purge water;
- Used disposable sampling equipment, personal protective equipment, and paper towels; and
- Decontamination fluids generated during groundwater sampling.

IDW was managed in accordance with the Baseline Monitoring Work Plan (E & E 2012).

2.2 Fall 2012 Baseline Monitoring

2.2.1 Groundwater Monitoring

Groundwater sampling was completed at 17 existing monitoring wells during the fall 2012 baseline monitoring event. Water level measurement was performed at 31 monitoring wells. Table 2-3 provides a summary of the samples collected. Monitoring well locations are illustrated on Figure 2-1.

Groundwater samples were collected for laboratory analysis of:

- Total TAL inorganic elements
- Total mercury
- Dissolved mercury
- Inorganic ions
- Nitrate/nitrite
- Carbonate/bicarbonate

- TDS
- TSS

Field measurements for pH, temperature, specific conductance, oxidation-reduction potential, dissolved oxygen, and turbidity were collected during purging at each monitoring well prior to sample collection.

Groundwater samples were collected using a low-flow sampling technique. Specific sampling methodologies are described in the Baseline Monitoring Work Plan (E & E 2012).

The broken bailers stranded in monitoring wells MW11 and MW30 during the spring 2012 baseline monitoring event were successfully recovered during the fall 2012 monitoring event. Once the bailer pieces were removed, these wells were partially developed using a combination of mechanical surging and bailing, as described in the Baseline Monitoring Work Plan (E & E 2012). There was insufficient water in wells MW11 and MW30 to completely develop these wells. Neither of the wells was sampled.

2.2.2 Red Devil Creek Surface Water Monitoring

During baseline monitoring, surface water monitoring was conducted at seven locations along Red Devil Creek between the creek's mouth at the Kuskokwim River and the reservoir south of the Main Processing Area. The surface water samples include one sample from the seep at location RD05. Surface water monitoring locations are illustrated on Figure 2-2. Table 2-4 provides a summary of the samples collected. As noted in Section 2.1.2, surface water monitoring station RD13 was established for baseline monitoring at a position between the seep (RD05) and existing station RD04,. Water quality samples were collected at station RD13 as part of fall 2012 baseline monitoring, but not at station RD12.

Red Devil Creek surface water samples were collected for laboratory analysis of:

- Total TAL inorganic elements
- Dissolved TAL inorganic elements
- Total mercury
- Dissolved mercury
- Methylmercury
- Arsenic speciation
- Inorganic ions
- Nitrate/nitrite
- Carbonate/bicarbonate
- TDS

- TSS

Field measurements for pH, temperature, specific conductance, oxidation-reduction potential, dissolved oxygen, and turbidity were collected at each sample station.

Surface water samples were collected using a battery-operated peristaltic pump outfitted with dedicated silicone tubing or by hand-dipping the sample container directly into the creek water. Specific sampling methodologies are described in the Baseline Monitoring Work Plan (E & E 2012).

Surface water discharge was measured using the mid-section method at each monitoring location. Specific methodologies are described in the Baseline Monitoring Work Plan (E & E 2012).

2.2.3 Sample Handling

Sample handling (chain-of-custody, field documentation, etc.) during the fall 2012 baseline monitoring event was conducted as described in the Baseline Monitoring Work Plan (E & E 2012), except as noted below.

Documentation associated with monitoring and sampling (including field notes, chain-of-custody records, and laboratory results) at RD13 inadvertently identified the station as RD12 rather than RD13. The correct station identification of RD13 is used in this report.

During the field event, fall 2012 baseline samples were not maintained under chain-of-custody as specified in the Baseline Monitoring Work Plan (E & E 2012). During the first part of field event, sample containers were maintained in coolers stored inside a walled sample processing tent. After the tent was destroyed in a windstorm on September 16, 2012, the sample coolers were maintained in a storage area within the Red Devil Lodge building. The coolers were not custody-sealed during storage. In addition, the chain-of-custody forms for these samples did not have relinquishing signatures from the E & E staff involved with shipping the samples to the laboratory. The BLM, U.S. Environmental Protection Agency, and Alaska Department of Environmental Conservation Remedial Project Managers reviewed a summary of how fall 2012 samples were handled and concurred that the resulting data are usable for the purpose of baseline monitoring.

2.2.4 Quality Control Samples

Field QC samples were collected for all matrices and analytes following the requirements specified in the Baseline Monitoring Work Plan (E & E 2012).

2.2.5 Investigation-Derived Waste Management

IDW generated during the fall 2012 baseline monitoring event includes the following:

- Monitoring well development and purge water;
- Used dedicated sampling equipment, personal protective equipment, and paper towels; and
- Decontamination fluids generated during groundwater sampling.

IDW was managed in accordance with the Baseline Monitoring Work Plan (E & E 2012).

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Table 2-1 Summary of Groundwater Samples, Spring 2012 Baseline Monitoring

Location ID	Sampling Method	Comment	Analyses											
			Total TAL Metals	Dissolved TAL Metals	Total Mercury	Dissolved Low Level Mercury	Inorganic Ions (Cl, F, SO_4)	Total Dissolved Solids	Total Suspended Solids	Nitrate/ Nitrite	Carbonate, Bicarbonate	SVOCs	DRO/RRO	GRO/BTEX
MW01	Low flow (submersible pump)		X	X	X	X	X	X	X	X	X			
MW04	Low flow (submersible pump)		X	X	X	X	X	X	X	X	X			
MW06	Low flow (peristaltic pump)		X		X	X	X	X	X	X	X			
MW08	Low flow (peristaltic pump)		X		X	X	X	X	X	X	X			
MW09	Not sampled	Attempted to develop well. Not successful due to poor recovery.												
MW10	Low flow (submersible pump)		X		X	X	X	X	X	X	X			
MW11	Not sampled	Attempted to develop well. Abandoned effort after bailer broke in well.												
MW12	Low flow (peristaltic pump)		X		X	X	X	X	X	X	X			
MW13	Low flow (submersible pump)		X	X	X	X	X	X	X	X	X			
MW14	Low flow (submersible pump)		X	X	X	X	X	X	X	X	X			
MW15	Low flow (submersible pump)		X		X	X	X	X	X	X	X			
MW16	Low flow (peristaltic pump)		X		X	X	X	X	X	X	X			
MW17	Low flow (peristaltic pump)		X		X	X	X	X	X	X	X			
MW19	Low flow (peristaltic pump)		X		X	X	X	X	X	X	X	X	X	X
MW20	Low flow (peristaltic pump)		X		X	X	X	X	X	X	X			
MW21	Low flow (peristaltic pump)		X		X	X	X	X	X	X	X			
MW24	Low flow (peristaltic pump)		X		X	X	X	X	X	X	X			
MW25	Low flow (submersible pump)		X		X	X	X	X	X	X	X			
MW27	Low flow (submersible pump)		X		X	X	X	X	X	X	X			
MW28	Low flow (submersible pump)	Water quality parameters did not stablize. Sampled after purging 1.5 hours.	X	X	X	X	X	X	X	X	X			
MW29	Submersible pump	Water quality meter not functioning. Collected sample after purging 3 well volumes.	X	X	X	X	X	X	X	X	X			
MW30	Not sampled	Attempted to develop well. Abandoned effort after bailer broke in well.												
MW32	Low flow (submersible pump)		X		X	X	X	X	X	X	X			
MW33	Low flow (peristaltic pump)		X		X	X	X	X	X	X	X			

Key:

BTEX = benzene, toluene, ethylbenzene, and xylenes
Cl = chloride
DRO = diesel range organics
F = fluoride
GRO = gasoline range organics
PCBs = polychlorinated biphenyls
RRO = residual range organics
SO_4 = sulfate
SVOC = semivolatile organic compound
TAL = Target Analyte List

Table 2-2 Summary of Surface Water Samples, Spring 2012 Baseline Monitoring

Location ID	Analyses											
	Total TAL Metals	Dissolved TAL Metals	Total Mercury	Dissolved Mercury	Methylmercury	Arsenic Speciation	Inorganic Ions (Cl, F, SO_4)	Total Dissolved Solids	Total Suspended Solids	Nitrate/ Nitrite	Carbonate, Bicarbonate	Total Organic Carbon
RD04	X	X	X	X	X	X	X	X	X	X	X	X
RD05	X	X	X	X	X	X	X	X	X	X	X	X
RD06	X	X	X	X	X	X	X	X	X	X	X	X
RD08	X	X	X	X	X	X	X	X	X	X	X	X
RD09	X	X	X	X	X	X	X	X	X	X	X	X
RD10	X	X	X	X	X	X	X	X	X	X	X	X
RD13	X	X	X	X	X	X	X	X	X	X	X	X

Key:

Cl = chloride

F = fluoride

SO_4 = sulfate

TAL = Target Analyte List

Table 2-3 Summary of Groundwater Samples, Fall 2012 Baseline Monitoring

Location ID	Sampling Method	Comment	Analyses							
			Total TAL Metals	Total Mercury	Dissolved Mercury	Inorganic Ions (Cl, F, SO_4)	Total Dissolved Solids	Total Suspended Solids	Nitrate/ Nitrite	Carbonate, Bicarbonate
MW04	Low flow (submersible pump)		X	X	X	X	X	X	X	X
MW06	Low flow (peristaltic pump)		X	X	X	X	X	X	X	X
MW09	Low flow (submersible pump)		X	X	X	X	X	X	X	X
MW10	Low flow (submersible pump)		X	X	X	X	X	X	X	X
MW11	Not sampled	Removed broken bailer. Attempted to develop well. Not successful due to poor recovery.								
MW14	Low flow (submersible pump)		X	X	X	X	X	X	X	X
MW15	Low flow (peristaltic pump)		X	X	X	X	X	X	X	X
MW16	Low flow (peristaltic pump)		X	X	X	X	X	X	X	X
MW17	Low flow (peristaltic pump)		X	X	X	X	X	X	X	X
MW20	Low flow (peristaltic pump)		X	X	X	X	X	X	X	X
MW21	Low flow (peristaltic pump)		X	X	X	X	X	X	X	X
MW24	Low flow (peristaltic pump)		X	X	X	X	X	X	X	X
MW25	Low flow (submersible pump)		X	X	X	X	X	X	X	X
MW27	Low flow (submersible pump)		X	X	X	X	X	X	X	X
MW28	Low flow (submersible pump)		X	X	X	X	X	X	X	X
MW29	Low flow (submersible pump)		X	X	X	X	X	X	X	X
MW30	Not sampled	Removed broken bailer. Attempted to develop well. Not successful due to poor recovery.								
MW32	Low flow (peristaltic pump)		X	X	X	X	X	X	X	X
MW33	Low flow (peristaltic pump)		X	X	X	X	X	X	X	X

Key:

BTEX = benzene, toluene, ethylbenzene, and xylenes
Cl = chloride
DRO = diesel range organics
F = fluoride
GRO = gasoline range organics
PCBs = polychlorinated biphenyls
RRO = residual range organics
SO_4 = sulfate
SVOC = semivolatile organic compound
TAL = Target Analyte List

Table 2-4 Summary of Surface Water Samples, Fall 2012 Baseline Monitoring

Location ID	Analyses											
	Total TAL Metals	Dissolved TAL Metals	Total Mercury	Dissolved Mercury	Methylmercury	Arsenic Speciation	Inorganic Ions (Cl, F, SO_4)	Total Dissolved Solids	Total Suspended Solids	Nitrate/Nitrite	Carbonate, Bicarbonate	Total Organic Carbon
RD04	X	X	X	X	X	X	X	X	X	X	X	X
RD05	X	X	X	X	X	X	X	X	X	X	X	X
RD06	X	X	X	X	X	X	X	X	X	X	X	X
RD08	X	X	X	X	X	X	X	X	X	X	X	X
RD09	X	X	X	X	X	X	X	X	X	X	X	X
RD10	X	X	X	X	X	X	X	X	X	X	X	X
RD13	X	X	X	X	X	X	X	X	X	X	X	X

Key:

Cl = chloride

F = fluoride

SO_4 = sulfate

TAL = Target Analyte List

MW12 263.1
MW01 239.9
MW14 224.6
MW15 226.5
MW17 220.4
MW16 221.9
MW18 222.0
MW19 228.4
MW03 215.3
MW20 210.3
MW04 220.4
MW28 217.7
MW27 216.6
MW26 213.1
MW25 210.0
MW24 208.9
MW06 201.2
MW21 202.2
MW22 199.5
MW23 189.5
MW29 229.6
MW30 224.8
MW33 174.9
MW32 179.8
MW13 258.2
MW11 248.7
MW10 250.5
MW09 250.6
MW07 261.2
RD04 12.6
RD10 12.1
RD13 10.5
RD05
RD09 13.3
RD06 14.4
RD08 14.2
Red Devil Creek

Groundwater Contour (10 ft. interval)
Groundwater Contour (5 ft. interval)
Topographic Contour (2 ft. interval)
Topographic Contour (10 ft. interval)
May 26, 2012 Groundwater Elevation
May 26, 2012 Estimated Surface Water Discharge (cu ft/second)
Settling Pond
Monofill
Historical Structure

RED DEVIL MINE

Red Devil, Alaska

Figure 3-1
Groundwater Potentiometric Surface and Surface Water Discharge Map
Spring 2012

0 50 100 200 300 Feet
0 12.5 25 50 75 Meters

Image Source: Aero-Metric, Inc. 2010a
Topographic elevation contours source: Aero-Metric, Inc. 2010b, based on Aero-Metric, Inc. aerial photograph dated 5/29/2001

Ecology & Environment, Inc. GIS Department Project:
\\prtbhp1\projects\Red_Devil_Mine\Maps\MXDs\2012_Baseline_Monitoring\Fig3-2_GW_potentiometric_SW_discharge_Fall2012.mxd Date: 1/28/2013

MW29 221.1
MW26 211.9
MW25 205.9
MW28 214.9
MW24 207.1
MW06 199.2
MW27 214.3
RD09 3.4
MW23 188.6
RD08 3.1
MW33 172.9
RD06 3.8
MW04 218.4
RD05
MW21 201.8
RD04 3.5
MW20 209.7
MW22 197.3
RD10 4.6
RD13 3.8
MW32 179.4
MW14 221.7
MW15 226.6
MW03 213.5
MW17 217.9
MW16 219.2
MW01 238.9
MW18 218.9
MW19 223.9
MW12 262.3
MW10 249.8
MW11 247.1
MW13 252.6
MW09 249.4
MW07 260.3
Red Devil Creek

- Groundwater Contour (10ft interval)
- Groundwater Contour (5ft interval)
- Topographic Contour (2 ft. interval)
- Topographic Contour (10 ft. interval)
- September 2012 Groundwater Elevation
- September 2012 Estimated Surface Water Discharge (cu ft/second)
- Settling Pond
- Monofill
- Historical Structure

RED DEVIL MINE

Red Devil, Alaska

Figure 3-2
Groundwater Potentiometric Surface and Surface Water Discharge Map
Fall 2012

0 50 100 200 300
Feet
0 12.5 25 50 75
Meters

Image Source: Aero-Metric, Inc. 2010a
Topographic elevation contours source: Aero-Metric, Inc. 2010b, based on Aero-Metric, Inc. aerial photograph dated 5/29/2001

3 Baseline Monitoring Results

This section presents results of the spring and fall 2012 baseline groundwater and surface water monitoring events.

3.1 Groundwater Elevation and Surface Water Discharge Monitoring

3.1.1 Spring 2012

Depth to groundwater measurements and calculated groundwater elevations for wells monitored during the spring 2012 baseline monitoring event are presented in Table 3-1 and illustrated in Figure 3-1. For comparison, data collected previously and during the fall 2012 monitoring event also are presented in the table.

Estimated surface water discharge calculations for Red Devil Creek surface water stations monitored during the spring 2012 baseline monitoring event are presented in Table 3-2 and Figure 3-1. For comparison, stream gaging data collected previously and during the fall 2012 monitoring event also are presented in Table 3-2. Estimated Red Devil Creek surface water discharge ranged from 10.5 to 14.5 cubic feet per second.

Based on static water elevations, stream elevations, and discharge measurements along Red Devil Creek, a groundwater potentiometric surface and surface water discharge map for the spring 2012 baseline monitoring was generated and is presented as Figure 3-1.

During the spring 2012 baseline monitoring event, as observed during the RI monitoring events, groundwater at the site generally flowed toward Red Devil Creek, with groundwater elevations generally mimicking topography (E & E 2013). Groundwater in the Main Processing Area and much of the area downstream of the Main Processing Area emerges into Red Devil Creek and enters the Kuskokwim River as surface water rather than as groundwater.

Based on the groundwater elevations in monitoring wells, elevations of Red Devil Creek, and stream flow gauging, Red Devil Creek is gaining over most of its length below the reservoir dam, but exhibits losing conditions locally. As noted for the late August–early September 2011 monitoring (E & E 2013), Red Devil

Creek was a losing stream during the spring 2012 in the reach of the stream that extends approximately from a point a short distance upstream of station RD04 down to a location upstream of seep location RD05. The lowermost section of Red Devil Creek at the delta also exhibited losing conditions at that time (see Figure 3-1).

3.1.2 Fall 2012

Depth to groundwater measurements and calculated groundwater elevations for wells monitored during the fall 2012 baseline monitoring event are presented in Table 3-1 and illustrated in Figure 3-2. For comparison, data collected previously also are presented in the table.

Estimated surface water discharge calculations for Red Devil Creek surface water stations monitored during the fall 2012 baseline monitoring event are presented in Table 3-2 and Figure 3-1. For comparison, stream gaging data collected previously also are presented in Table 3-2. Estimated Red Devil Creek surface water discharge ranged from 3.1 to 4.6 cubic feet per second.

Based on static water elevations, stream elevations, and discharge measurements along Red Devil Creek, a groundwater potentiometric surface and surface water discharge map for the fall 2012 baseline monitoring was generated and is presented as Figure 3-2.

During the fall 2012 baseline monitoring event, as observed during the RI (E & E 2013) and spring 2012 monitoring events, groundwater at the site generally flowed toward Red Devil Creek, with groundwater elevations generally mimicking topography. Groundwater in the Main Processing Area and much of the area downstream of the Main Processing Area emerges into Red Devil Creek and enters the Kuskokwim River as surface water rather than as groundwater.

Based on the groundwater elevations in monitoring wells, elevations of Red Devil Creek, and stream flow gauging, Red Devil Creek is gaining over most of its length below the reservoir dam, but exhibits losing conditions locally. As noted for the late August–early September 2011 monitoring (E & E 2013) and the spring 2012 monitoring event, Red Devil Creek was a losing stream during the spring 2012 in the reach of the stream that extends approximately from a point a short distance upstream of station RD04 down to a location upstream of seep location RD05. The lowermost section of Red Devil Creek at the delta also exhibited losing conditions at that time (see Figure 3-2).

3.1.3 Groundwater Elevation and Surface Water Discharge Trends

Groundwater elevations during the May 2012 baseline monitoring event were higher (by 0.29 to 11.29 feet) in all monitoring wells than in September 2011, and were on average 3.9 feet higher across the site. Groundwater elevations during the May 2012 baseline monitoring event were higher (by up to 8.55 feet) in all but

one well (MW15) than during the September 2012 baseline monitoring event, and were on average 2.2 feet higher across the site. During the September 2012 baseline monitoring event, groundwater elevations were higher (by up to 6.02 feet) in all but two monitoring wells (MW07 and MW25) than in September 2011, and were on average 1.8 feet higher across the site. The largest differences in groundwater elevations between monitoring events are generally seen in the wells that are screened in bedrock. Notable exceptions are wells MW16 and MW14, both of which are screened in unconsolidated materials in the Post-1955 Main Processing Area near Red Devil Creek, and in which the differences in water levels ranged as high as 8.73 and 5.61 feet (between May 2012 and September 2011).

Water levels measured in the following paired shallow and deep wells were evaluated to assess vertical hydraulic gradient:

- MW16 (shallow, screened in native/disturbed native soil) / MW17 (deep, screened in bedrock)
- MW27 (shallow, screened in native/disturbed native soil and weathered bedrock) / MW28 (deep, screened in bedrock and suspected mine workings cavity)

During the September 2011 RI monitoring, there was an upward gradient in both the MW27/MW28 well pair and the MW16/MW17 well pair (E & E 2013). During the May 2012 and September 2012 monitoring events, there was an upward gradient in the MW27/MW28 well pair and a downward gradient in the MW16/MW17 well pair. The interpretation of vertical gradient in the MW16/MW17 well pair is complicated by possible hydraulic segregation and local losing conditions in Red Devil Creek.

Measured stream discharge rates during September 2012 were between 20 and 60 percent lower than observed in August 2011 depending on monitoring location, but generally exhibited trends of gain and loss along the length of Red Devil Creek similar to those in August 2011. In May 2012, measured discharge values were between 2 and 2.2 times those observed during August 2011, and between 2.6 and 4.6 times as high as those measured in September 2012. The May 2012 discharge was measured a short time after the beginning of breakup and thus likely approximates high flow conditions for the creek.

3.2 Spring 2012 Groundwater and Surface Water Sampling

3.2.1 Groundwater

Laboratory results of groundwater sampling conducted during the spring 2012 baseline monitoring event are presented in Table 3-3. Data quality assurance review memoranda are provided in Appendix A. Results of key constituents, total antimony, total arsenic, total mercury, dissolved antimony, dissolved arsenic, and dissolved mercury are presented as Figures 3-3 through 3-8.

3.2.2 Surface Water

Laboratory results of surface water sampling conducted during the spring 2012 baseline monitoring event are presented in Table 3-4. Data quality assurance review memoranda are provided in Appendix A. Results of key constituents, total antimony, total arsenic, total mercury, dissolved antimony, dissolved arsenic, and dissolved mercury are presented as Figures 3-3 through 3-8.

3.3 Fall 2012 Groundwater and Surface Water Sampling

3.3.1 Groundwater

Laboratory results of groundwater sampling conducted during the fall 2012 baseline monitoring event are presented in Table 3-5. Data quality assurance review memoranda are provided in Appendix A. Results of key constituents, total antimony, total arsenic, total mercury, dissolved antimony, dissolved arsenic, and dissolved mercury are presented as Figures 3-9 through 3-14.

3.3.2 Surface Water

Laboratory results of surface water sampling conducted during the fall 2012 baseline monitoring event are presented in Table 3-6. Data quality assurance review memoranda are provided in Appendix A. Results of key constituents, total antimony, total arsenic, total mercury, dissolved antimony, dissolved arsenic, and dissolved mercury are presented as Figures 3-9 through 3-14.

3.4 Groundwater and Surface Water Contaminant Concentration and Loading Trends

3.4.1 Groundwater

For those well sampled in the spring and fall baseline monitoring events the following trends were observed:

Spring 2012

Antimony and arsenic concentrations were higher in the spring 2012 samples than the fall 2011 samples in most wells. Notable exceptions were seen in samples from wells MW15 and MW16; these two wells exhibited relatively high antimony and arsenic concentrations in the fall 2011 samples.

Mercury concentrations were lower in the spring 2012 samples than the fall 2011 samples in most wells. Many of the wells showing relatively greater decreases are screened in bedrock, including MW17, MW19, MW24, MW25, MW29, and well MW28, which is screened in bedrock and a cavity apparently associated with the mine workings. These wells generally exhibited relatively higher total mercury concentrations in the fall 2011 samples.

Fall 2012

Antimony and arsenic concentrations were higher in the fall 2012 samples than the fall 2011 samples in most wells. Mercury concentrations were lower in the fall

2012 samples than the fall 2011 samples in most wells. Many of the wells showing greater decreases are screened in bedrock, including MW17, MW24, and MW29, and well MW28, which is screened in bedrock and a cavity apparently associated with the mine workings. As noted above, these wells generally showed relatively higher total mercury concentrations in the fall 2011 samples.

As noted in the RI, the greatest impacts on groundwater antimony and arsenic concentrations from tailings/waste and, to a lesser extent, flotation tailings and contaminated soils, were observed where the materials are saturated at least some of the time. Where the water table elevation fluctuates, such waste materials would likely be subjected to repeated wetting/ drying cycles, likely promoting mobilization of contaminants. Where the waste materials are above the water table, contaminants mobilized from these sources migrate downward toward groundwater (E & E 2013). The overall trend of comparatively higher groundwater antimony and arsenic concentrations during the spring 2012 and fall 2012 sampling events is likely due to increased infiltration of precipitation and higher groundwater elevations during those periods.

3.4.2 Surface Water

Baseline surface water results for spring and fall 2012 sampling indicate generally increasing total and dissolved antimony, arsenic, mercury, and methylmercury concentrations along Red Devil Creek moving downstream of the Main Processing Area (beginning approximately at station RD10). Concentration profiles along Red Devil Creek for the total and dissolved antimony, arsenic, mercury, and methylmercury for the spring 2012 and fall 2012 monitoring events are shown in Figures 3-15 through 3-18. Overall, the increases in concentrations along Red Devil Creek in spring and fall 2012 surface water samples are similar to those documented in 2010 and 2011 in the RI (E & E 2013). Specific concentrations trends are discussed below.

Total concentrations of antimony and arsenic in Red Devil Creek were generally higher in the spring 2012 samples than for the fall 2012 samples, which were in turn generally slightly higher than for the 2011 RI samples (E & E 2013).

Dissolved antimony concentrations were generally slightly higher in the spring 2012 samples than for the fall 2011 RI samples, and were similar to those in the fall 2012 samples. Dissolved arsenic concentrations in the spring 2012 samples were similar to those in the fall 2012 and fall 2011 RI samples.

Total and dissolved mercury concentrations in the spring 2012 samples were generally higher than in both the fall 2012 and fall 2011 RI samples. Results of the fall 2012 samples were generally lower than in the 2011 RI samples.

Based on contaminant concentrations in surface water samples and measured stream discharge rates, contaminant loading in Red Devil Creek surface water was estimated. Results for the spring and fall monitoring are presented in Tables 3-7 and 3-8, respectively.

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Table 3-1 Well Construction and Groundwater Depth Information

Monitoring Well ID	Soil Boring ID	Total Well Depth (feet below TOC)	Screened Interval (feet bgs)	Ground Elevation (feet NAVD88)	Top of Casing Elevation (feet NAVD88)	GW Encountrered During Drilling (feet bgs)	Static Water Level			Ground Water Elevation (feet NAVD88)
							Depth (feet below TOC)	Date	Time	
MW01	N/A	29.70	19.0 - 29.0	254.51	257.51	17.8 - TD	18.62	9/9/2012	17:05	238.89
							17.56	5/26/2012	14:32	239.95
							19.55	9/1/2011	16:03	237.96
							19.46	8/24/2011	16:38	238.05
							20.04	9/20/2010	18:18	237.47
							22.27	10/6/2009	17:30	235.24
							19.62	6/19/2009	NR	237.89
							22.16	9/18/2008	13:28	235.35
							19.87	9/5/2007	13:15	237.64
							21.72	8/14/2000	NR	235.79
MW03	N/A	27.73	14.5 - 25.5	228.37	230.77	19.0 - TD	17.24	9/9/2012	17:10	213.53
							15.47	5/26/2012	15:17	215.30
							19.96	9/1/2011	15:41	210.81
							19.44	8/26/2011	10:18	211.33
							20.95	9/20/2010	19:50	209.82
							23.01	10/7/2009	13:20	207.76
							19.51	6/19/2009	NR	211.26
							22.57	9/18/2008	14:11	208.20
							20.68	9/5/2007	14:40	210.09
							22.28	8/14/2000	NR	208.49
MW04	N/A	32.9	20.0 - 30.0	239.92	242.12	25.3 - TD	23.72	9/10/2012	14:15	218.40
							21.72	5/26/2012	16:47	220.40
							25.99	9/1/2011	15:00	216.13
							25.24	8/22/2011	16:02	216.88
							26.79	9/20/2010	16:09	215.33
							27.77	10/6/2009	18:55	214.35
							25.43	6/19/2009	NR	216.69
							26.82	9/18/2008	12:32	215.30
							26.78	9/5/2007	12:25	215.34
							27.77	8/14/2000	NR	214.35

Table 3-1 Well Construction and Groundwater Depth Information

Monitoring Well ID	Soil Boring ID	Total Well Depth (feet below TOC)	Screened Interval (feet bgs)	Ground Elevation (feet NAVD88)	Top of Casing Elevation (feet NAVD88)	GW Encountrered During Drilling (feet bgs)	Static Water Level			Ground Water Elevation (feet NAVD88)
							Depth (feet below TOC)	Date	Time	
MW06	N/A	26.14	13.0 - 23.0	214.99	217.49	20.0 - TD	18.29	9/9/2012	11:45	199.20
							16.25	5/26/2012	16:02	201.24
							18.70	9/1/2011	15:09	198.79
							18.78	8/24/2011	14:56	198.71
							19.03	9/20/2010	13:22	198.46
							19.29	10/7/2009	17:25	198.20
							17.90	6/19/2009	NR	199.59
							19.08	9/18/2008	11:35	198.41
							18.63	9/5/2007	15:30	198.86
							19.29	8/14/2000	NR	198.20
MW07	N/A	23.70	11.0 - 21.0	278.39	280.89	14.8 - TD	20.57	9/9/2012	16:45	260.32
							19.68	5/26/2012	13:36	261.21
							19.97	9/1/2011	16:14	260.92
							19.51	8/26/2011	9:12	261.38
							20.40	9/21/2010	10:20	260.49
							DRY	10/7/2009	NR	DRY
							20.10	6/19/2009	NR	260.79
							DRY	9/18/2008	NR	DRY
							20.42	9/5/2007	14:00	260.47
							DRY	8/14/2000	NR	DRY
MW08	11MP01SB	16.0	5.0 - 15.0	328.92	331.32	2.5 - 4.0, 10.5 - TD	12.74	9/9/2012	16:10	318.58
							11.64	5/26/2012	13:23	319.68
							13.65	9/1/2011	16:28	317.67
							13.70	8/30/2011	9:21	317.62
MW09	11MP17SB	31.0	20.0 - 30.0	274.88	277.28	14.0 - 16.0, 31.0 - TD	27.81	9/11/2012	11:20	249.47
							27.88	9/9/2012	15:30	249.40
							26.67	5/26/2012	14:04	250.61
							28.11	9/1/2011	16:43	249.17
							>31.56	8/29/2011	18:21	DRY
MW10	11MP14SB	61.0	50.0 - 60.0	274.31	276.21	48.0 - TD	26.88	9/10/2012	11:35	249.33
							26.39	9/9/2012	15:45	249.82
							25.62	5/26/2012	14:14	250.59
							29.17	9/1/2011	16:38	246.37
							30.60	8/29/2011	16:15	245.61

Table 3-1 Well Construction and Groundwater Depth Information

Monitoring Well ID	Soil Boring ID	Total Well Depth (feet below TOC)	Screened Interval (feet bgs)	Ground Elevation (feet NAVD88)	Top of Casing Elevation (feet NAVD88)	GW Encountrered During Drilling (feet bgs)	Static Water Level			Ground Water Elevation (feet NAVD88)
							Depth (feet below TOC)	Date	Time	
MW11	11MP12SB	23.0	12.0 - 22.0	268.70	271.30	dry	24.24	9/9/2012	16:00	247.06
							22.60	5/26/2012	14:24	248.70
							DRY	9/1/2011	16:34	DRY
							DRY	8/29/2011	> 12:00	DRY
MW12	11RD13SB	15.0	4.0 - 14.0	263.22	265.62	1.0 - TD	3.30	9/9/2012	16:39	262.32
							2.46	5/26/2012	11:04	263.16
							3.70	9/1/2011	16:20	261.92
							3.72	8/31/2011	13:34	261.90
MW13	11MP20SB	32.0	21.0 - 31.0	274.30	276.70	27.0 - TD	24.06	9/9/2012	16:50	252.64
							18.41	5/26/2012	13:45	258.29
							29.70	9/1/2011	16:09	247.00
							30.05	8/30/2011	18:04	246.65
MW14	11MP25SB	36.0	25.0 - 35.0	246.71	249.01	25.7 - TD	27.34	9/10/2012	17:35	221.67
							24.40	5/26/2012	14:45	224.61
							30.01	9/1/2011	16:00	219.00
							30.51	8/31/2011	10:05	218.50
MW15	11MP29SB	26.0	15.0 - 25.0	242.63	244.93	16.2 - TD	18.3	9/8/2012	13:00	226.63
							18.33	5/26/2012	14:56	226.60
							19.59	9/1/2011	15:56	225.34
							19.64	8/30/2011	10:35	225.29
MW16	11MP30SB	22.0	11.0 - 21.0	226.09	228.09	16.0 - TD	8.88	9/8/2012	14:30	219.21
							6.17	5/26/2012	15:08	221.92
							14.90	9/1/2011	15:50	213.19
							13.84	8/30/2011	11:35	214.25
MW17	11MP91SB	52.5	41.5 - 51.5	226.36	228.66	25.0 - 33.0, 33.0 - TD	10.79	9/8/2012	16:20	217.87
							8.20	5/26/2012	15:03	220.46
							13.78	9/1/2011	15:52	214.88
							15.00	8/30/2011	9:20	213.66
MW18	11MP31SB	40.0	29.0 - 39.0	241.33	243.83	38.0 - TD	24.83	9/9/2012	17:20	219.00
							21.82	5/26/2012	13:10	222.01
							29.87	9/1/2011	15:37	213.96
							29.66	8/31/2011	15:47	214.17

Table 3-1 Well Construction and Groundwater Depth Information

Monitoring Well ID	Soil Boring ID	Total Well Depth (feet below TOC)	Screened Interval (feet bgs)	Ground Elevation (feet NAVD88)	Top of Casing Elevation (feet NAVD88)	GW Encountrered During Drilling (feet bgs)	Static Water Level			Ground Water Elevation (feet NAVD88)
							Depth (feet below TOC)	Date	Time	
MW19	11MP33SB	43.0	32.0 - 42.0	237.70	240.00	39.0 - TD	16.02	9/9/2012	17:25	223.98
							11.54	5/26/2012	12:59	228.46
							19.47	9/1/2011	15:32	220.53
							19.38	9/1/2011	9:34	220.62
MW20	11MP38SB	15.5	4.5 - 14.5	212.90	215.20	6.5 - TD	5.53	9/9/2012	10:10	209.67
							4.82	5/26/2012	15:26	210.38
							6.97	9/1/2011	15:43	208.23
							6.89	8/31/2011	8:53	208.31
MW21	11MP39SB	17.5	6.5 - 16.5	208.23	210.13	7.0 - TD	8.29	9/8/2012	17:35	201.84
							7.91	5/26/2012	15:36	202.22
							8.82	9/1/2011	17:10	201.31
							8.80	8/31/2011	10:16	201.33
MW22	11MP40SB	15.5	4.5 - 14.5	203.10	205.10	7.8 - TD	7.77	9/9/2012	17:35	197.33
							5.55	5/26/2012	15:44	199.55
							8.48	9/1/2011	17:04	196.62
							8.20	8/31/2011	11:08	196.90
MW23	11MP66SB	29.0	18.0 - 28.0	201.96	204.16	20.0 - TD	15.56	9/9/2012	17:47	188.6
							14.60	5/26/2012	15:56	189.56
							16.01	9/1/2011	15:14	188.15
							16.02	8/30/2011	16:31	188.14
MW24	11MP62SB	30.0	19.0 - 29.0	221.41	223.51	20.0 TD	16.45	9/9/2012	14:00	207.06
							14.59	5/26/2012	16:15	208.92
							17.61	9/1/2011	15:06	205.90
							17.70	8/30/2011	14:51	205.81
MW25	11MP89SB	42.0	31.0 - 41.0	237.56	239.76	32.0 - TD	33.87	9/9/2012	10:30	205.89
							29.74	5/26/2012	16:22	210.02
							31.88	9/1/2011	14:50	207.88
							31.85	8/30/2011	18:02	207.91
MW26	11MP52SB	43.0	32.0 - 42.0	244.03	245.93	34.0 - TD	34.01	9/9/2012	17:55	211.92
							32.76	5/26/2012	16:30	213.17
							36.30	9/1/2011	14:47	209.63
							36.25	8/30/2011	11:35	209.68

Table 3-1 Well Construction and Groundwater Depth Information

Monitoring Well ID	Soil Boring ID	Total Well Depth (feet below TOC)	Screened Interval (feet bgs)	Ground Elevation (feet NAVD88)	Top of Casing Elevation (feet NAVD88)	GW Encountrered During Drilling (feet bgs)	Static Water Level			Ground Water Elevation (feet NAVD88)
							Depth (feet below TOC)	Date	Time	
MW27	11MP60SB	34.0	23.0 - 33.0	241.04	242.94	29.0 - TD	28.64	9/9/2012	12:50	214.3
							26.28	5/26/2012	16:38	216.66
							30.37	9/1/2011	14:58	212.57
							30.30	8/30/2011	16:50	212.64
MW28	11MP88SB	64.0	53.0 - 63.0	239.94	241.94	49.0 - TD	27.01	9/10/2012	15:43	214.93
							24.19	5/26/2012	16:41	217.75
							28.61	9/1/2011	14:53	213.33
							25.50	8/30/2011	14:57	216.44
MW29	11MP41SB	70.0	59.0 - 69.0	280.35	282.25	61.0 - TD	61.20	9/9/2012	16:22	221.05
							52.65	5/26/2012	17:09	229.60
							63.21	9/1/2011	13:20	219.04
							63.21	9/1/2011	13:28	219.04
MW30	11SM31SB	53.0	42.0 - 52.0	275.71	277.41	45.0 - TD	nr	9/9/2012	nr	nr
							52.63	5/26/2012	16:58	224.78
							53.53	9/1/2011	14:35	223.88
							53.44	9/1/2011	15:41	223.97
MW31	11UP11SB	44.8	33.8 - 43.8	495.79	497.99	34.0 - TD	36.29	9/9/2012	18:10	461.7
							34.12	5/26/2012	10:10	463.87
							37.51	9/1/2011	14:05	460.48
							37.75	8/29/2011	13:51	460.24
MW32	11RD05SB	25.0	14.0 - 24.0	194.38	196.58	16.5 - TD	17.21	9/8/2012	15:40	179.37
							16.71	5/26/2012	12:45	179.87
							18.86	9/1/2011	15:26	177.72
							18.90	8/31/2011	15:55	177.68
MW33	11RD20SB	23.0	12.0 - 22.0	176.62	178.92	10.5 - TD	5.97	9/8/2012	12:30	172.95
							3.98	5/26/2012	12:33	174.94
							8.19	9/1/2011	15:20	170.73
							8.14	8/31/2011	17:57	170.78
MW34	AST5 MW1	NR	NR	290.95	294.25		15.57	9/1/2011	16:49	278.68
MW35	AST5 MW2	NR	NR	285.76	289.26		41.97	9/1/2011	16:55	247.29
MW36	AST5 MW3	NR	NR	286.33	290.03		35.81	9/1/2011	16:57	254.22

Table 3-1 Well Construction and Groundwater Depth Information

Monitoring Well ID	Soil Boring ID	Total Well Depth (feet below TOC)	Screened Interval (feet bgs)	Ground Elevation (feet NAVD88)	Top of Casing Elevation (feet NAVD88)	GW Encountrered During Drilling (feet bgs)	Static Water Level			Ground Water Elevation (feet NAVD88)
							Depth (feet below TOC)	Date	Time	

Notes

Elevation datum: NAVD88 calculated using GEOID09.

Top of casing (TOC) refers to the top of PVC inner casing.

Key

NR	Not Recorded
TD	Total depth of soil boring
TOC	Top of Casing

Table 3-2 Red Devil Creek Discharge

Monitoring Location	Estimated Discharge (cfs)		
	August 18, 2011	May 26, 2012	September 12, 2012
RD10	5.5	12.2	4.6
RD04	5.9	12.7	3.5
RD13	Station not established	10.5	3.8
RD12	8.2	Station not monitored	Station not monitored
RD09	6.0	13.4	3.4
RD06	6.8	14.5	3.8
RD08	7.2	14.2	3.1

Key:

cfs = cubic feet per second

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Table 3-3 Groundwater Baseline Sample Results, Spring 2012

Analyte	Background Screening Criteria	No of Samples	No of Detections	No of Detected Results Exceeding Background	Maximum Detected Value	Minimum Detected Value	Station ID / Geographic Area / Sample ID / Method		Units	MW01 Post 1955 MPA 0512MW01GW	MW04 Post 1955 MPA 0512MW04GW	MW06 Post 1955 MPA 0512MW06GW	MW08 Post 1955 MPA 0512MW08GW	MW10 Post 1955 MPA 0512MW10GW	MW12 Post 1955 MPA 0512MW12GW	MW13 Post 1955 MPA 0512MW13GW	MW14 Post 1955 MPA 0512MW14GW	MW15 Post 1955 MPA 0512MW15GW	MW16 Post 1955 MPA 0512MW16GW	MW17 Post 1955 MPA 0512MW17GW	MW19 Post 1955 MPA 0512MW19GW	MW20 Post 1955 MPA 0512MW20GW
Total Inorganic Elements																						
Aluminum	405	21	16	2	9870	50	Total(3020) Metals by ICP - 6010C	6010C	µg/L	300	120	5.44 U	70	5.44 U	100	370	970	270	350	5.44 U	170	5.44 U
Antimony	0.505 J	21	21	20	9100	0.49	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	5.46	51.3	9.87	0.68	1.23	0.56	924	103	6440	2.2	10.7	0.49	985
Arsenic	13.5	21	18	13	7030	2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	39	12	53	0.06 U	148	21	396	7030	4570	0.06 U	3	0.06 U	662
Barium	83.3	21	21	7	380	10	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	130	60	120	30	120	120	50	280	40	40	40	50	40
Beryllium	0.018 J	21	2	2	1.3	0.4	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.4	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
Cadmium	0.017 J	21	1	1	1	1	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U
Calcium	20600	21	21	9	100000	8010	Total(3020) Metals by ICP - 6010C	6010C	µg/L	14600	71100	31700	8150	21100	18800	10900	42600	15700	8010	17400	18400	15600
Chromium	4.95	21	12	2	59.4	0.7	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	1.6	0.9	0.107 U	0.7	0.107 U	0.107 U	1	5.4	3	1.1	0.107 U	0.9	0.107 U
Cobalt	1.14	21	17	9	17.4	0.1	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.5	1.4	2	0.006 U	0.1	0.2	3.2	17.4	0.6	0.3	0.006 U	0.7	0.006 U
Copper	0.48	21	12	12	44.5	0.9	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.9	5	0.06 U	0.06 U	0.06 U	0.06 U	3.3	6.1	2	1.3	0.06 U	1	0.06 U
Iron	8990	21	21	4	36900	20	Total(3020) Metals by ICP - 6010C	6010C	µg/L	14100	220	2480	60	930	11900	940	36900	280	480	20	400	650
Lead	0.311	21	7	5	17.9	0.3	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.6	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.3	2.8	0.019 U	0.019 U	0.019 U	0.4	0.019 U
Magnesium	11300	21	21	15	125000	3780	Total(3020) Metals by ICP - 6010C	6010C	µg/L	9620	125000	32000	6130	32500	11200	16000	41300	25000	3780	13000	12800	12200
Manganese	1120	21	19	4	10100	3	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	236 J	1180 J	849	0.069 UJ	185	1070 J	830	10100 J	21 J	16	0.069 UJ	37	5
Mercury	0.0000584	6	6	6	0.00153	0.00008	Total Mercury by EPA 245.1 - Water	EPA 245.1	mg/L								0.00011	0.00153				0.00076
Nickel	2.68	21	11	10	57	2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	2	35	3	0.184 U	0.184 U	0.184 U	9	18	8	0.184 U	0.184 U	0.184 U	0.184 U
Potassium	708	21	18	10	3100	400	Total(3020) Metals by ICP - 6010C	6010C	µg/L	400	1500	800	24.9 U	1000	600	1000	1000	1200	400	24.9 U	24.9 U	400
Selenium	ND	21	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
Silicon		21	21		18900	3800	Total(3020) Metals by ICP - 6010C	6010C	µg/L	6300	6300	8200	4600	4100	8800	6100	8900	6000	4800	4800	3800	4300
Silver	0.016 J	21	1	1	0.4	0.4	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.4	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Sodium	2800	21	21	13	34300	1100	Total(3020) Metals by ICP - 6010C	6010C	µg/L	2200	34300	4400	1100	3300	2900	3200	7200	2800	2200	2300	2300	2000
Thallium	0.009 J	21	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Vanadium	0.55	21	5	5	25	2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	5	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	7	3	0.027 U	0.027 U	0.027 U	0.027 U
Zinc	1.3	21	13	12	110	10	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	10	50	5.86 U	20 J	5.86 U	5.86 U	10	30	20	5.86 U	5.86 U	30	10
Total Low Level Mercury																						
Mercury	0.0000584	15	15	7	0.0106	0.000002	Total Mercury by EPA 1631	EPA 1631	mg/L	0.000271	0.000211	0.000016	0.000009	0.000032	0.000008	0.000051			0.00133	0.000035	0.000002	
Dissolved Inorganic Elements																						
Aluminum	8.3 J	6	1	1	70	70	Dissolved Metals by ICP (6010C)	6010C	µg/L	5.48 U	5.48 U					70	5.48 U					
Antimony	0.522 J	6	6	6	32.1	1.6	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	1.6	32.1					1.6	26					
Arsenic	13.9	6	4	3	6340	7	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.044 U	7					0.044 U	6340					
Barium	87.7	6	6	2	160	30	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	60	40					30	160					
Beryllium	0.01 J	6	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.028 U	0.028 U					0.028 U	0.028 U					
Cadmium	0.008 J	6	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.1 U	0.1 U					0.1 U	0.1 U					
Calcium	20400	6	6	4	64600	7800	Dissolved Metals by ICP (6010C)	6010C	µg/L	13900	64600					7800	41900					
Chromium	1.43	6	2	1	4.2	0.6	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.096 U	0.096 U					0.096 U	0.6					
Cobalt	1.21	6	6	3	10.9	0.1	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.1	1					0.2	10.9					
Copper	0.34	6	1	1	1.8	1.8	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.033 U	1.8					0.033 U	0.033 U					
Iron	8760	6	5	1	33100	60	Dissolved Metals by ICP (6010C)	6010C	µg/L	2500	0.56 U					60	33100					
Lead	0.244	6	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.009 U	0.009 U					0.009 U	0.009 U					
Magnesium	11400	6	6	4	105000	3690	Dissolved Metals by ICP (6010C)	6010C	µg/L	9340	105000					3690	38700					
Manganese	1190	6	6	1	8780	9	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	123 J	786 J					9	8780 J					
Mercury	0.00000114	6	6	6	0.00137	0.000077	Dissolved Mercury by EPA 245.1 - Water	EPA 245.1	mg/L								0.00011	0.00137				0.00037
Nickel	1.84	6	5	0	21	2.9	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.107 U	21					2.9	7.6					
Potassium	730	6	5	0	1500	400	Dissolved Metals by ICP (6010C)	6010C	µg/L	400	1500					8.09 U	800					
Selenium	ND	21	15	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.263 U	0.263 U					0.263 U	0.263 U					
Silicon		6	6		7700	3700	Dissolved Metals by ICP (6010C)	6010C	µg/L	5500	6100					4500	7700					
Silver	0.004 J	6	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.009 U	0.009 U					0.009 U	0.009 U					
Sodium	2810	6	6	6	31200	2200	Dissolved Metals by ICP (6010C)	6010C	µg/L	2200	31200					2300	7400					
Thallium	ND	19	13	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.006 U	0.006 U					0.006 U	0.006 U					
Vanadium	0.74	6	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.026 U	0.026 U					0.026 U	0.026 U					
Zinc	0.4 J	6	3	0	30	10	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.164 U	20					0.164 U	10					
Dissolved Low Level Mercury																						
Mercury	0.00000114	15	14	11	0.000077	0.000001	Dissolved Mercury by EPA 1631	EPA 1631	mg/L	0.000005	0.000057	0.000007	0.000003	0.00000017 UJ	0.000001	0.000007			0.000077	0.000007	0.000001	
Gasoline Range Organics and BTEX																						
4-Bromofluorobenzene							AK101 GRO/BTEX - Water	AK101	%												0.5 U	
Benzene							AK101 GRO/BTEX - Water	AK101	µg/L												46.9	
Ethylbenzene							AK101 GRO/BTEX - Water	AK101	µg/L												0.5 U	
GRO by 8260 (nC6-nC10)							AK101 GRO/BTEX - Water	AK101	µg/L													
m p-Xylenes							AK101 GRO/BTEX - Water	AK101	µg/L												96.1	
Naphthalene							AK101 GRO/BTEX - Water	AK101	µg/L												1 U	
o-Xylene							AK101 GRO/BTEX - Water	AK101	µg/L												1 U	
Toluene							AK101 GRO/BTEX - Water	AK101	µg/L												20 U	
Total PAH							AK101 GRO/BTEX - Water	AK101	µg/L												2 U	
Diesel Range Organics and Residual Range Organics																					5 U	
Diesel Range Organics (nC10-nC25)							AK102DRO/103RRO	AK 102/103	mg/L												1 U	
o-Terphenyl							AK102DRO/103RRO	AK 102/103	%												1 U	
Residual Range Organics (nC25-nC36)							AK102DRO/103RRO	AK 102/103	mg/L												U	
General Chemistry																						
Bicarbonate as HCO3							Alkalinity	SM 2320B	mg/L	79	226	230	49	218	119	43	105	55	77	112	114	130
Carbonate as CO3							Alkalinity	SM 2320B	mg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloride							Anions by ION Chromatography	EPA 300.0	mg/L	0.6	0.5	1	0.7	0.6	0.4	0.7	0.8	0.8	0.7	0.6	0.4	0.5
Fluoride							Anions by ION Chromatography	EPA 300.0	mg/L	0.006 U	0.006 U	0.006 U	0.006 U	0.2	0.006 U	0.006 U	0.006 U	0.8	0.006 U	0.006 U	0.006 U	0.006 U
Nitrate-Nitrite Nitrogen (as N)							Nitrogen, Nitrate-Nitrite (as N)	EPA 353.2	mg/L	0.06	0.5	0.01 U	0.43	0.01 U	0.01 U	0.26	0.01 U	0.17	0.11	0.01 U	0.01 U	0.01 U
Sulfate							Anions by ION Chromatography	EPA 300.0	mg/L	12.4	514	20.1	3.3	9	0.6	2.5	189	81	25.6	5.3	5.5	9
Total Alkalinity (as CaCO3)							Alkalinity	SM 2320B	mg/L	64	185	189	40	179	98	36	86	45	63	91	93	107
Total Dissolved Solids (180)							Solids By SM 2540	SM 2540	mg/L	90 J	930 J	210 J	50 J	180 J	110 J	40 J	390	190 U	120 J	110 J	100	100 J
Total Suspended Solids							Solids By SM 2540	SM 2540	mg/L	47 U	9 U	2.6 U	2.6 U	8 UJ	14 U	7 UJ	171 U	2.6 U	2.6 UJ	2.6 U	17 U	
Field Parameters																						
Temperature								Field Test	oC	7.56	5.72	9.59	4.57	6.18	3.53	3.34	6.37	5.75	5.63	3.81	4.24	3.15
pH								Field Test	N/A	4.27	NR	7.12	6.01	4.8	6.32	5.1	3.3	5	5.97	6.12	6.95	7.07
Conductance								Field Test	mS/cm	0.17	1.41	0.378	0.104	0.369	0.245	0.085	0.64	0.309	0.193	0.209	0.215	0.196
Turbidity								Field Test	NTU	70.8	11.6	0.0	0.0	2.8	0.0	11	26.2	4	2.6	0.0	0.0	0.0
ORP								Field Test	mV	90	NR	-19	242	-35	-44	220	49	190	193	244	167	177
Dissolved Oxygen								Field Test	mg/L	0.00	0.00	0.00	10.84	0.00	0.00	8.08	0.00	6.9	5.97	9.59	3.28	8.31

Table 3-3 Groundwater Baseline Sample Results, Spring 2012

Analyte	Background Screening Criteria	No. of Samples	No. of Detections	No. of Detected Results Exceeding Background	Maximum Detected Value	Minimum Detected Value	Station ID / Geographic Area / Sample ID / Method		Units	MW21 Post 1955 MPA 0512MW21GW	MW24 Post 1955 MPA 0512MW24GW	MW25 Post 1955 MPA 0512MW25GW	MW27 Post 1955 MPA 0512MW27GW	MW28 Post 1955 MPA 0512MW28GW	MW29 Area 0512MW29GW	MW32 Delta 0512MW32GW	MW33 Delta 0512MW33GW
Total Inorganic Elements																	
Aluminum	405	21	16	2	9870	50	Total(3020) Metals by ICP - 6010C	6010C	µg/L	5.44 U	50	60	60	270	9870	200	160
Antimony	0.505 J	21	21	20	9100	0.49	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	9100	99	7.97	12.7	13.2	6.52	4.35	391
Arsenic	13.5	21	18	13	7030	2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	2540	4	7	37	73	102	2	31
Barium	83.3	21	21	7	380	10	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	90	10	80	70	70	380	20	30
Beryllium	0.018 J	21	2	2	1.3	0.4	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	1.3	0.012 U	0.012 U
Cadmium	0.017 J	21	1	1	1	1	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	1	0.031 U	0.031 U
Calcium	20600	21	21	9	100000	8010	Total(3020) Metals by ICP - 6010C	6010C	µg/L	28700	19100	28000	100000	38900	42500	10900	15500
Chromium	4.95	21	12	2	59.4	0.7	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.107 U	0.107 U	0.107 U	0.107 U	1.9	59.4	1	0.7
Cobalt	1.14	21	17	9	17.4	0.1	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.006 U	0.1	1.6	2.1	4.9	12.7	1.5	0.2
Copper	0.48	21	12	12	44.5	0.9	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	1.6	0.06 U	0.06 U	0.06 U	1.6	44.5	1.8	1.1
Iron	8990	21	21	4	36900	20	Total(3020) Metals by ICP - 6010C	6010C	µg/L	40	80	110	90	1480	14600	220	330
Lead	0.311	21	7	5	17.9	0.3	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.019 U	0.019 U	0.019 U	0.019 U	0.4	17.9	0.019 U	0.3
Magnesium	11300	21	21	15	125000	3780	Total(3020) Metals by ICP - 6010C	6010C	µg/L	27600	15200	21000	59500	29900	43900	8530	10900
Manganese	1120	21	19	4	10100	3	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	3	6 J	84	1710 J	1410 J	871 J	105 J	17 J
Mercury	0.0000584	6	6	6	0.00153	0.00008	Total Mercury by EPA 245.1 - Water	EPA 245.1	mg/L	0.00016		0.00008	0.00014				
Nickel	2.68	21	11	10	57	2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.184 U	0.184 U	10	57	11	39	12	0.184 U
Potassium	708	21	18	10	3100	400	Total(3020) Metals by ICP - 6010C	6010C	µg/L	2000	600	600	2600	1000	3100	400	600
Selenium	ND	21	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
Silicon		21	21		18900	3800	Total(3020) Metals by ICP - 6010C	6010C	µg/L	7600	6900	5900	7200	5100	18900	8300	9600
Silver	0.016 J	21	1	1	0.4	0.4	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Sodium	2800	21	21	13	34300	1100	Total(3020) Metals by ICP - 6010C	6010C	µg/L	3200	3700	4100	22600	10800	13600	1400	4100
Thallium	0.009 J	21	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Vanadium	0.55	21	5	5	25	2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	2	0.027 U	0.027 U	0.027 U	0.027 U	25	0.027 U	0.027 U
Zinc	1.3	21	13	12	110	10	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	5.86 U	5.86 U	30	40	10	110	10	5.86 U
Total Low Level Mercury																	
Mercury	0.0000584	15	15	7	0.0106	0.000002	Total Mercury by EPA 1631	EPA 1631	mg/L		0.0106			0.00134	0.000006	0.000151	0.00021
Dissolved Inorganic Elements																	
Aluminum	8.3 J	6	1	1	70	70	Dissolved Metals by ICP (6010C)	6010C	µg/L					5.48 U	5.48 U		
Antimony	0.522 J	6	6	6	32.1	1.6	Dissolved Metals by ICPMS (6020A)	6020A	µg/L					3.3	2.3		
Arsenic	13.9	6	4	3	6340	7	Dissolved Metals by ICPMS (6020A)	6020A	µg/L					39	20		
Barium	87.7	6	6	2	160	30	Dissolved Metals by ICPMS (6020A)	6020A	µg/L					50	150		
Beryllium	0.01 J	6	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L					0.028 U	0.028 U		
Cadmium	0.008 J	6	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L					0.1 U	0.1 U		
Calcium	20400	6	6	4	64600	7800	Dissolved Metals by ICP (6010C)	6010C	µg/L					37500	37500		
Chromium	1.43	6	2	1	4.2	0.6	Dissolved Metals by ICPMS (6020A)	6020A	µg/L					0.096 U	4.2		
Cobalt	1.21	6	6	3	10.9	0.1	Dissolved Metals by ICPMS (6020A)	6020A	µg/L					3	4		
Copper	0.34	6	1	1	1.8	1.8	Dissolved Metals by ICPMS (6020A)	6020A	µg/L					0.033 U	0.033 U		
Iron	8760	6	5	1	33100	60	Dissolved Metals by ICP (6010C)	6010C	µg/L					670	1280		
Lead	0.244	6	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L					0.009 U	0.009 U		
Magnesium	11400	6	6	4	105000	3690	Dissolved Metals by ICP (6010C)	6010C	µg/L					27800	37200		
Manganese	1190	6	6	1	8780	9	Dissolved Metals by ICPMS (6020A)	6020A	µg/L					924 J	406 J		
Mercury	0.00000114	6	6	6	0.00137	0.000077	Dissolved Mercury by EPA 245.1 - Water	EPA 245.1	mg/L	0.00015		0.000077	0.00017				
Nickel	1.84	6	5	0	21	2.9	Dissolved Metals by ICPMS (6020A)	6020A	µg/L					6	12.5		
Potassium	730	6	5	0	1500	400	Dissolved Metals by ICP (6010C)	6010C	µg/L					900	1300		
Selenium	ND	21	15	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L					0.263 U	0.263 U		
Silicon		6	6		7700	3700	Dissolved Metals by ICP (6010C)	6010C	µg/L					4700	3700		
Silver	0.004 J	6	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L					0.009 U	0.009 U		
Sodium	2810	6	6	6	31200	2200	Dissolved Metals by ICP (6010C)	6010C	µg/L					11000	12100		
Thallium	ND	19	13	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L					0.006 U	0.006 U		
Vanadium	0.74	6	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L					0.026 U	0.026 U		
Zinc	0.4 J	6	3	0	30	10	Dissolved Metals by ICPMS (6020A)	6020A	µg/L					0.164 U	30		
Dissolved Low Level Mercury																	
Mercury	0.00000114	15	14	11	0.000077	0.000001	Dissolved Mercury by EPA 1631	EPA 1631	mg/L		0.000008			0.000038	0.000001	0.000031	0.000007
Gasoline Range Organics and BTEX																	
4-Bromofluorobenzene							AK101 GRO/BTEX - Water	AK101	%								
Benzene							AK101 GRO/BTEX - Water	AK101	µg/L								
Ethylbenzene							AK101 GRO/BTEX - Water	AK101	µg/L								
GRO by 8260 (nC6-nC10)							AK101 GRO/BTEX - Water	AK101	µg/L								
m p-Xylenes							AK101 GRO/BTEX - Water	AK101	µg/L								
Naphthalene							AK101 GRO/BTEX - Water	AK101	µg/L								
o-Xylene							AK101 GRO/BTEX - Water	AK101	µg/L								
Toluene							AK101 GRO/BTEX - Water	AK101	µg/L								
Total PAH							AK101 GRO/BTEX - Water	AK101	µg/L								
Diesel Range Organics and Residual Range Organics																	
Diesel Range Organics (nC10-nC25)							AK102DRO/103RRO	AK 102/103	mg/L								
o-Terphenyl							AK102DRO/103RRO	AK 102/103	%								
Residual Range Organics (nC25-nC36)							AK102DRO/103RRO	AK 102/103	mg/L								
General Chemistry																	
Bicarbonate as HCO3							Alkalinity	SM 2320B	mg/L	188	84	133	270	233	295	58	77
Carbonate as CO3							Alkalinity	SM 2320B	mg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloride							Anions by ION Chromatography	EPA 300.0	mg/L	0.4	0.5	1	1.5	0.6	0.6	0.5	0.8
Fluoride							Anions by ION Chromatography	EPA 300.0	mg/L	0.4	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U
Nitrate-Nitrite Nitrogen (as N)							Nitrogen, Nitrate-Nitrite (as N)	EPA 353.2	mg/L	0.01 U	0.83	1.13	0.58	0.01 U	0.01 U	0.8	0.52
Sulfate							Anions by ION Chromatography	EPA 300.0	mg/L	21	37.9	41.5	360	42.8	28	12.2	18.2
Total Alkalinity (as CaCO3)							Alkalinity	SM 2320B	mg/L	154	69	109	221	191	242	48	63
Total Dissolved Solids (180)							Solids By SM 2540	SM 2540	mg/L	200 J	150 J	170 J	660 J	240	270	80	110 J
Total Suspended Solids							Solids By SM 2540	SM 2540	mg/L		2.6 U	2.6 UJ	2.6 UJ	30 U	934	2.6 U	8 U
Field Parameters																	
Temperature								Field Test	oC	2.36	4.78	14.62	9.23	7.91		4	2.45
pH								Field Test	N/A	6.97	6.26	4.11	4.82	4.94	Water quality meter not functioning.	4.61	6.11
Conductance								Field Test	mS/cm	0.37	0.25	0.258	0.925	0.464		0.139	0.193
Turbidity								Field Test	NTU	0.0	0.0	0.4	2.4	32.8		6	0.5
ORP								Field Test	mV	183	195	296	204	36		243	229
Dissolved Oxygen								Field Test	mg/L	0.27	8.36	0.00	0.00	0.00		3.66	9.93

Table 3-4 Surface Water Baseline Sample Results, Spring 2012

Analyte	Background Screening Criteria	No. of Samples	No. of Detections	No. of Detected Results Exceeding Background	Maximum Detected Value	Minimum Detected Value	Station ID / Geographic Area / Sample ID / Method		Units	RD04 Red Devil Creek 0512RD04SW	RD05 Red Devil Creek 0512RD05SW	RD06 Red Devil Creek 0512RD06SW	RD08 Red Devil Creek 0512RD08SW	RD09 Red Devil Creek 0512RD09SW	RD10 Red Devil Creek 0512RD10SW	RD12 Red Devil Creek 0512RD12SW
Total Inorganic Elements																
Aluminum	80	7	6	1	90	60	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**60**	5.44 U	**80**	**70**	**70**	**90**	**80**
Antimony	1.52	7	7	7	281	1.79	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**25.9**	**191**	**278**	**281**	**253**	**1.79**	**80.7**
Arsenic	1.1	7	6	6	1400	14	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**14**	**1400**	**113**	**112**	**109**	0.06 U	**40**
Barium	26.4	7	7	3	170	20	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**20**	**170**	**30**	**30**	**20**	**20**	**20**
Beryllium	ND	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
Cadmium	ND	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U
Calcium	18400	7	7	1	37900	11000	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**11000**	**37900**	**11900**	**11800**	**11700**	**11000**	**11100**
Chromium	0.43	7	1	1	0.6	0.6	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.107 U	0.107 U	0.107 U	0.107 U	0.107 U	0.107 U	**0.6**
Cobalt	0.066	7	4	4	9.1	0.2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.006 U	**9.1**	**0.2**	**0.2**	**0.2**	0.006 U	0.006 U
Copper	0.37	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
Iron	138	7	7	5	1990	120	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**120**	**1990**	**160**	**150**	**150**	**160**	**130**
Lead	0.021	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U
Magnesium	9680	7	7	1	41900	6200	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**6280**	**41900**	**7410**	**7370**	**7250**	**6200**	**6380**
Manganese	17.5	7	7	4	525	11	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**11 J**	**525**	**22 J**	**20**	**18**	**11**	**11**
Nickel	0.44	7	1	1	36	36	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.184 U	**36**	0.184 U	0.184 U	0.184 U	0.184 U	0.184 U
Potassium	218 J	7	1	1	1200	1200	Total(3020) Metals by ICP - 6010C	6010C	µg/L	24.9 U	**1200**	24.9 U	24.9 U	24.9 U	24.9 U	24.9 U
Selenium	0.5 J	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
Silicon		7	7		4300	3300	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**3300**	**4300**	**3400**	**3400**	**3400**	**3300**	**3400**
Silver	ND	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Sodium	1580	7	7	1	12200	1200	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**1200**	**12200**	**1500**	**1400**	**1400**	**1200**	**1200**
Thallium	ND	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Vanadium	0.3	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U
Zinc	0.5 J	7	1	1	10	10	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	5.86 U	**10**	5.86 U	5.86 U	5.86 U	5.86 U	5.86 U
Total Low Level Mercury																
Mercury	0.00000263	7	7	7	0.000478	0.000005	Total Mercury by EPA 1631	EPA 1631	mg/L	**0.000024**	**0.000041**	**0.000328**	**0.000467**	**0.000321**	**0.000005**	**0.000478**
Dissolved Inorganic Elements																
Aluminum	11.9 J	7	0	0			Dissolved Metals by ICP (6010C)	6010C	µg/L	5.48 U	5.48 U	5.48 U	5.48 U	5.48 U	5.48 U	5.48 U
Antimony	1.4 J	7	7	7	249	1.91	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	**17.6**	**95.7**	**195**	**210**	**249**	**1.91**	**58.5**
Arsenic	0	7	6	6	620	10	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	**10**	**620**	**75**	**71**	**87**	0.044 U	**28**
Barium	24	7	7	1	90	10	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	**20**	**90**	**20**	**20**	**20**	**20**	**10**
Beryllium	ND	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U
Cadmium	ND	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Calcium	19200	7	7	1	36400	10600	Dissolved Metals by ICP (6010C)	6010C	µg/L	**10600**	**36400**	**11400**	**11300**	**11200**	**10700**	**10700**
Chromium	0.23	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U
Cobalt	0.056	7	1	1	4.2	4.2	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.008 U	**4.2**	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Copper	0.27	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U
Iron	100	7	6	1	1100	20	Dissolved Metals by ICP (6010C)	6010C	µg/L	**20**	**1100**	**30**	**30**	**40**	0.56 U	**20**
Lead	ND	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U
Magnesium	10200	7	7	1	38500	6010	Dissolved Metals by ICP (6010C)	6010C	µg/L	**6010**	**38500**	**7080**	**7080**	**7000**	**6020**	**6200**
Manganese	15.9	7	6	1	307	3	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	**3 J**	**307**	**10 J**	**9**	**9**	0.047 U	**3**
Nickel	0.35	7	1	1	17.5	17.5	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.107 U	**17.5**	0.107 U	0.107 U	0.107 U	0.107 U	0.107 U
Potassium	220 J	7	1	1	1300	1300	Dissolved Metals by ICP (6010C)	6010C	µg/L	8.09 U	**1300**	8.09 U	8.09 U	8.09 U	8.09 U	8.09 U
Selenium	0.5 J	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.263 U	0.263 U	0.263 U	0.263 U	0.263 U	0.263 U	0.263 U
Silicon		7	7		4300	3200	Dissolved Metals by ICP (6010C)	6010C	µg/L	**3200**	**4300**	**3400**	**3400**	**3300**	**3300**	**3300**
Silver	ND	7	1	0	0.03	0.03	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.009 U	0.009 U	**0.03**	0.009 U	0.009 U	0.009 U	0.009 U
Sodium	1610	7	7	1	12300	1200	Dissolved Metals by ICP (6010C)	6010C	µg/L	**1200**	**12300**	**1500**	**1500**	**1400**	**1200**	**1200**
Thallium	ND	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U
Vanadium	0.13 J	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U
Zinc	ND	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.164 U	0.164 U	0.164 U	0.164 U	0.164 U	0.164 U	0.164 U
Dissolved Low Level Mercury																
Mercury	0.00000637	7	7	5	0.000188	0.000002	Dissolved Mercury by EPA 1631	EPA 1631	mg/L	**0.000011**	**0.000002**	**0.00002**	**0.000025**	**0.000014**	**0.000005**	**0.000188**
Arsenic Speciation																
Arsenate		7	7		83.9	0.665	EPA 1632	EPA 1632	µg/L	**10.4**	**83.9**	**72.2**	**77**	**82.5**	**0.665**	**27.7**
Arsenite		7	7		409	0.014	EPA 1632	EPA 1632	µg/L	**0.097 J**	**409 J**	**2.2 J**	**1.65 J**	**2.01 J**	**0.014 J**	**0.548 J**
Inorganic Arsenic		7	7		492	0.68	EPA 1632	EPA 1632	µg/L	**10.5**	**492**	**74.4**	**78.6**	**84.5**	**0.68**	**28.2**
Methylmercury																
Methylmercury	0.08 J	7	7	7	0.289	0.108	EPA 1630	EPA 1630	ng/L	**0.108**	**0.289**	**0.158**	**0.151**	**0.146**	**0.11**	**0.14**
General Chemistry																
Bicarbonate as HCO_3							Alkalinity	SM 2320B	mg/L	**56**	**298**	**61**	**65**	**61**	**56**	**56**
Carbonate as CO_3							Alkalinity	SM 2320B	mg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloride							Anions by ION Chromatography	EPA 300.0	mg/L	**0.5**	**0.5**	**0.5**	**0.4**	**0.5**	**0.3**	**0.5**
Fluoride							Anions by ION Chromatography	EPA 300.0	mg/L	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U

Table 3-4 Surface Water Baseline Sample Results, Spring 2012

Analyte	Background Screening Criteria	No. of Samples	No. of Detec-tions	No. of Detected Results Exceeding Background	Maxi mum Detec ted Value	Mini mum Detec ted Value	Station ID / Geographic Area / Sample ID / Method		Units	RD04 Red Devil Creek 0512RD04SW	RD05 Red Devil Creek 0512RD05SW	RD06 Red Devil Creek 0512RD06SW	RD08 Red Devil Creek 0512RD08SW	RD09 Red Devil Creek 0512RD09SW	RD10 Red Devil Creek 0512RD10SW	RD12 Red Devil Creek 0512RD12SW
Nitrate-Nitrite Nitrogen (as N)							Nitrogen, Nitrate-Nitrite (as N)	EPA 353.2	mg/L	**0.24**	0.01 U	**0.23**	**0.22**	**0.22**	**0.24**	**0.23**
Sulfate							Anions by ION Chromatography	EPA 300.0	mg/L	**5.2**	**33.8**	**6.7**	**6.3**	**6.7**	**5.2**	**5.7**
Total Alkalinity (as $CaCO_3$)							Alkalinity	SM 2320B	mg/L	**46**	**244**	**50**	**54**	**50**	**46**	**46**
Total Dissolved Solids (180)							Solids By SM 2540	SM 2540	mg/L	**70 J**	**260 J**	**70 J**	**30 J**	**60 J**	**60 J**	**50 J**
Total Organic Carbon							Total Organic Carbon	SM 5310B	mg/L	**2**	0.1 U	**2**	**2**	**2**	**2**	**2**
Total Suspended Solids							Solids By SM 2540	SM 2540	mg/L	2.6 UJ	8 UJ	2.6 UJ	**6 J**	16 UJ		2.6 UJ
Field Parameters																
Temperature								Field Test	°C	3.99	3.07	4.04	3.89	3.93	3.92	4.08
pH								Field Test	pH units	6.54	6.28	6.78	6.53	6.43	6.55	6.82
Conductance								Field Test	mS/cm	0.110	0.033	0.122	0.131	0.121	0.122	0.111
Turbidity								Field Test	NTU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ORP								Field Test	mV	155	38	122	204	132	167	68
Dissolved Oxygen								Field Test	mg/L	13.61	0.02	17.85	19.46	16.70	14.59	14.61

Key:

µg/L = micrograms per liter
$CaCO_3$ = calcium carbonate
ICP = inductively-coupled plasma
ICPMS = inductively-coupled plasma mass spectometry
ND = not detected
°C = degrees Celsius
ORP = oxidation-reduction potential
mS/c = miliSiemens per centimeter
J = analyte detected but relative percent difference was outside control limits; therefore concentration is estimated
mg/L = milligrams per liter
mV = millivolt
NTU = nephelometric turbidity unit
U = analyte was analyzed for but not detected. Value provided is reporting limit

Table 3-5 Groundwater Baseline Sample Results, Fall 2012

Analyte	Background Screening Criteria	No. of Samples	No. of Detections	No. of Detected Results Exceeding Background	Maximum Detected Value	Minimum Detected Value	Station ID / Geographic Area / Sample ID / Method		Units	MW04 Post 1955 MPA 0912MW04GW	MW06 Post 1955 MPA 0912MW06GW	MW09 Post 1955 MPA 0912MW09GW	MW10 Post 1955 MPA 0912MW10GW	MW14 Post 1955 MPA 0912MW14GW	MW15 Post 1955 MPA 0912MW15GW
Total Inorganic Elements															
Aluminum	405	17	12	3	1920	50	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**90**	5.44 U	**500**	**160**	**1920**	**50**
Antimony	0.505 J	17	17	17	9490	1.34	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**32.7**	**6.19**	**11.7**	**2.65**	**74.8**	**8430**
Arsenic	13.5	17	17	12	9710	3	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**10**	**34**	**13**	**110**	**9710**	**5370**
Barium	83.3	17	17	6	530	10	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**60**	**80**	**340**	**100**	**140**	**40**
Beryllium	0.018 J	17	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
Cadmium	0.017 J	17	1	1	0.6	0.6	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**0.6**	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U
Calcium	20600	17	17	14	98600	10300	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**64400**	**32500**	**53100**	**22400**	**22500**	**23100**
Chromium	4.95	17	11	6	47.7	0.8	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**4.2**	0.107 U	**47.7**	**4**	**11.1**	**3.3**
Cobalt	1.14	17	13	8	27.8	0.1	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**3.4**	**1.5**	**6.6**	**0.4**	**8.8**	**0.1**
Copper	0.48	17	13	13	10.6	1.2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**6.4**	0.06 U	**4.3**	**1.2**	**10.6**	**2**
Iron	8990	17	14	3	49200	30	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**190**	**2460**	**2070**	**1360**	**25400**	**40**
Lead	0.311	17	6	4	1.9	0.3	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.019 U	0.019 U	**0.7**	**0.4**	**1.9**	0.019 U
Magnesium	11300	17	17	16	98100	7640	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**98100**	**30400**	**34400**	**32100**	**18700**	**35900**
Manganese	1120	17	15	6	7650	2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**1750 J**	**603**	**4880 J**	**184 J**	**4390 J**	**3**
Mercury	0.0000584	7	7	7	0.00572	0.000139	Total Mercury by EPA 245.1 - Water	EPA 245.1	mg/L					**0.00572 J**	**0.0024 J**
Nickel	2.68	17	13	13	50	3	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**50**	**3**	**33**	**3**	**15**	**12**
Potassium	708	17	16	13	3700	500	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**1400**	**900**	**2600**	**1200**	**1100**	**1700**
Selenium	ND	17	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
Silicon		17	17		10200	4400	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**5600**	**9200**	**8800**	**4700**	**9900**	**7000**
Silver	0.016 J	17	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Sodium	2800	17	17	13	21400	1500	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**8800**	**4400**	**4700**	**3400**	**4100**	**4500**
Thallium	0.009 J	17	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Vanadium	0.55	17	2	2	9	2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.027 U	0.027 U	0.027 U	0.027 U	**9**	**2**
Zinc	1.3	17	3	3	20	20	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**20**	3.88 U	3.88 U	3.88 U	**20**	3.88 U
Total Low Level Mercury															
Mercury	0.0000584	10	8	4	0.000197	0.000008	Total Mercury by EPA 1631	EPA 1631	mg/L	**0.000197 J**	0.00000016 UJ	**0.000172 J**	0.00000016 UJ		
Dissolved Inorganic Elements															
Dissolved Mercury							Dissolved Mercury by EPA 245.1 - Water	EPA 245.1	mg/L					**0.000254 J**	**0.002 J**
Dissolved Low Level Mercury															
Mercury	0.00000114	11	6	6	0.00006	0.000003	Dissolved Mercury by EPA 1631	EPA 1631	mg/L	**0.00005 J**	0.00000017 UJ	**0.000011 J**	0.00000017 UJ		
General Chemistry															
Bicarbonate as HCO3							Alkalinity	SM 2320B	mg/L	**143 J**	**217 J**	**315 J**	**218 J**	**122 J**	**77 J**
Carbonate as CO3							Alkalinity	SM 2320B	mg/L	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
Chloride							Anions by ION Chromatography	EPA 300.0	mg/L	**0.5 J**	**0.8**	**0.5 J**	**1.2 J**	**0.7 J**	**3.5**
Fluoride							Anions by ION Chromatography	EPA 300.0	mg/L	0.006 UJ	0.006 U	0.006 UJ	0.006 UJ	**0.006 J**	0.006 U
Nitrate-Nitrite Nitrogen (as N)							Nitrogen, Nitrate-Nitrite (as N)	EPA 353.2	mg/L	0.01 UJ	0.01 U	**0.1 J**	0.01 UJ	0.01 UJ	**0.21**
Sulfate							Anions by ION Chromatography	EPA 300.0	mg/L	**424 J**	**25**	**20.5 J**	**9.3 J**	**41 J**	**128**
Total Alkalinity (as CaCO3)							Alkalinity	SM 2320B	mg/L	**117 J**	**178 J**	**258 J**	**178 J**	**100 J**	**63 J**
Total Dissolved Solids (180)							Solids By SM 2540	SM 2540	mg/L	**760 J**	**230 J**	**310 J**	**200 J**	**200 J**	**310 J**
Total Suspended Solids							Solids By SM 2540	SM 2540	mg/L	2.6 UJ	2.6 UJ	**22 J**	**8 J**	**135 J**	2.6 UJ
Field Parameters															
Temperature								Field Test	°C	**4.61**	**4.25**	**4.48**	**3.56**	**6.60**	**6.58**
pH								Field Test	N/A	**5.83**	**7.11**	**6.85**	**6.87**	**6.23**	**6.4**
Conductance								Field Test	mS/cm	**1.17**	**0.405**	**0.541**	**0.413**	**0.378**	**0.429**
Turbidity								Field Test	NTU	**0.0**	**0.8**	**40.1**	**0.0**	**0.0**	**0.0**
ORP								Field Test	mV	**109**	**-22**	**14**	**-40**	**-39**	**240**
Dissolved Oxygen								Field Test	mg/L	**0.00**	**1.31**	**2.67**	**0.00**	**0.00**	**6.59**

Table 3-5 Groundwater Baseline Sample Results, Fall 2012

Analyte	Background Screening Criteria	No. of Samples	No. of Detections	No. of Detected Results Exceeding Background	Maximum Detected Value	Minimum Detected Value	Station ID / Geographic Area / Sample ID / Method		Units	MW16 Post 1955 MPA 0912MW16GW
Total Inorganic Elements										
Aluminum	405	17	12	3	1920	50	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**100**
Antimony	0.505 J	17	17	17	9490	1.34	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**757**
Arsenic	13.5	17	17	12	9710	3	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**830**
Barium	83.3	17	17	6	530	10	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**50**
Beryllium	0.018 J	17	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.012 U
Cadmium	0.017 J	17	1	1	0.6	0.6	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.031 U
Calcium	20600	17	17	14	98600	10300	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**24400**
Chromium	4.95	17	11	6	47.7	0.8	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.107 U
Cobalt	1.14	17	13	8	27.8	0.1	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**7.9**
Copper	0.48	17	13	13	10.6	1.2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**1.3**
Iron	8990	17	14	3	49200	30	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**11200**
Lead	0.311	17	6	4	1.9	0.3	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.019 U
Magnesium	11300	17	17	16	98100	7640	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**42800**
Manganese	1120	17	15	6	7650	2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**5440**
Mercury	0.0000584	7	7	7	0.00572	0.000139	Total Mercury by EPA 245.1 - Water	EPA 245.1	mg/L	**0.000664 J**
Nickel	2.68	17	13	13	50	3	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**6**
Potassium	708	17	16	13	3700	500	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**2200**
Selenium	ND	17	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.27 U
Silicon		17	17		10200	4400	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**8000**
Silver	0.016 J	17	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.013 U
Sodium	2800	17	17	13	21400	1500	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**5000**
Thallium	0.009 J	17	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.013 U
Vanadium	0.55	17	2	2	9	2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.027 U
Zinc	1.3	17	3	3	20	20	Total(3020) Metals by ICP - 6010C	6010C	µg/L	3.88 U
Total Low Level Mercury										
Mercury	0.0000584	10	8	4	0.000197	0.000008	Total Mercury by EPA 1631	EPA 1631	mg/L	
Dissolved Inorganic Elements										
Dissolved Mercury							Dissolved Mercury by EPA 245.1 - Water	EPA 245.1	mg/L	**0.000285 J**
Dissolved Low Level Mercury										
Mercury	0.00000114	11	6	6	0.00006	0.000003	Dissolved Mercury by EPA 1631	EPA 1631	mg/L	
General Chemistry										
Bicarbonate as HCO3							Alkalinity	SM 2320B	mg/L	**138 J**
Carbonate as CO3							Alkalinity	SM 2320B	mg/L	1 UJ
Chloride							Anions by ION Chromatography	EPA 300.0	mg/L	**0.3**
Fluoride							Anions by ION Chromatography	EPA 300.0	mg/L	0.006 U
Nitrate-Nitrite Nitrogen (as N)							Nitrogen, Nitrate-Nitrite (as N)	EPA 353.2	mg/L	**0.05**
Sulfate							Anions by ION Chromatography	EPA 300.0	mg/L	**142**
Total Alkalinity (as CaCO3)							Alkalinity	SM 2320B	mg/L	**113 J**
Total Dissolved Solids (180)							Solids By SM 2540	SM 2540	mg/L	**350 J**
Total Suspended Solids							Solids By SM 2540	SM 2540	mg/L	**6 J**
Field Parameters										
Temperature								Field Test	°C	**6.96**
pH								Field Test	N/A	**6.62**
Conductance								Field Test	mS/cm	**0.54**
Turbidity								Field Test	NTU	**9**
ORP								Field Test	mV	**-18**
Dissolved Oxygen								Field Test	mg/L	**1.07**

Table 3-5 Groundwater Baseline Sample Results, Fall 2012

Analyte	Background Screening Criteria	No. of Samples	No. of Detections	No. of Detected Results Exceeding Background	Maximum Detected Value	Minimum Detected Value	Station ID / Geographic Area / Sample ID / Method		Units	MW17 Post 1955 MPA 0912MW17GW	MW20 Post 1955 MPA 0912MW20GW	MW21 Post 1955 MPA 0912MW21GW	MW24 Post 1955 MPA 0912MW24GW	MW25 Post 1955 MPA 0912MW25GW	MW27 Post 1955 MPA 0912MW27GW
Total Inorganic Elements															
Aluminum	405	17	12	3	1920	50	Total(3020) Metals by ICP - 6010C	6010C	µg/L	5.44 U	5.44 U	5.44 U	5.44 U	**50**	**150**
Antimony	0.505 J	17	17	17	9490	1.34	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**6.44**	**871**	**9490**	**108**	**69.6**	**12.9**
Arsenic	13.5	17	17	12	9710	3	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**3**	**221**	**2510**	**5**	**1160**	**31**
Barium	83.3	17	17	6	530	10	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**40**	**40**	**110**	**10**	**530**	**60**
Beryllium	0.018 J	17	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
Cadmium	0.017 J	17	1	1	0.6	0.6	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U
Calcium	20600	17	17	14	98600	10300	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**20700**	**19900**	**35100**	**24200**	**56600**	**98600**
Chromium	4.95	17	11	6	47.7	0.8	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.107 U	0.107 U	0.107 U	0.107 U	**6.3**	**8.9**
Cobalt	1.14	17	13	8	27.8	0.1	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.006 U	0.006 U	0.006 U	0.006 U	**27.8**	**1.9**
Copper	0.48	17	13	13	10.6	1.2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.06 U	0.06 U	**1.9**	0.06 U	**3.6**	**2.1**
Iron	8990	17	14	3	49200	30	Total(3020) Metals by ICP - 6010C	6010C	µg/L	5.06 U	**30**	5.06 U	5.06 U	**49200**	**310**
Lead	0.311	17	6	4	1.9	0.3	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**0.3**	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U
Magnesium	11300	17	17	16	98100	7640	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**13900**	**15700**	**30300**	**18200**	**32000**	**59000**
Manganese	1120	17	15	6	7650	2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.069 U	**5**	**2**	0.069 U	**7650**	**1280**
Mercury	0.0000584	7	7	7	0.00572	0.000139	Total Mercury by EPA 245.1 - Water	EPA 245.1	mg/L		**0.00108 J**	**0.000139 J**		**0.000951 J**	
Nickel	2.68	17	13	13	50	3	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.184 U	0.184 U	**3**	0.184 U	**24**	**48**
Potassium	708	17	16	13	3700	500	Total(3020) Metals by ICP - 6010C	6010C	µg/L	24.9 U	**600**	**2400**	**700**	**3700**	**2300**
Selenium	ND	17	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
Silicon		17	17		10200	4400	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**5000**	**5000**	**9700**	**6800**	**8700**	**7300**
Silver	0.016 J	17	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Sodium	2800	17	17	13	21400	1500	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**2600**	**2400**	**3400**	**7200**	**5200**	**21400**
Thallium	0.009 J	17	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Vanadium	0.55	17	2	2	9	2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U
Zinc	1.3	17	3	3	20	20	Total(3020) Metals by ICP - 6010C	6010C	µg/L	3.88 U	3.88 U	3.88 U	3.88 U	3.88 U	**20**
Total Low Level Mercury															
Mercury	0.0000584	10	8	4	0.000197	0.000008	Total Mercury by EPA 1631	EPA 1631	mg/L	**0.00001 J**			**0.000035 J**		**0.000112 J**
Dissolved Inorganic Elements															
Dissolved Mercury							Dissolved Mercury by EPA 245.1 - Water	EPA 245.1	mg/L		**0.00085 J**	**0.000131 J**		**0.000138 J**	
Dissolved Low Level Mercury															
Mercury	0.00000114	11	6	6	0.00006	0.000003	Dissolved Mercury by EPA 1631	EPA 1631	mg/L	0.00000017 UJ			0.00000017 UJ		**0.00006 J**
General Chemistry															
Bicarbonate as HCO3							Alkalinity	SM 2320B	mg/L	**135 J**	**113 J**	**214 J**	**126 J**	**264 J**	**266 J**
Carbonate as CO3							Alkalinity	SM 2320B	mg/L	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
Chloride							Anions by ION Chromatography	EPA 300.0	mg/L	**0.6**	**0.5**	**0.6**	**0.5**	**0.7**	**1 J**
Fluoride							Anions by ION Chromatography	EPA 300.0	mg/L	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 UJ
Nitrate-Nitrite Nitrogen (as N)							Nitrogen, Nitrate-Nitrite (as N)	EPA 353.2	mg/L	**0.05**	0.01 U	**0.06**	**0.32**	0.01 U	0.01 U
Sulfate							Anions by ION Chromatography	EPA 300.0	mg/L	**5.5**	**17.7**	**25.3**	**37.1**	**66.2**	**230 J**
Total Alkalinity (as CaCO3)							Alkalinity	SM 2320B	mg/L	**111 J**	**93 J**	**175 J**	**103 J**	**216 J**	**218 J**
Total Dissolved Solids (180)							Solids By SM 2540	SM 2540	mg/L	**130 J**	**140 J**	**270 J**	**190 J**	**380 J**	**640 J**
Total Suspended Solids							Solids By SM 2540	SM 2540	mg/L	2.6 UJ	2.6 UJ	2.6 UJ	2.6 UJ	**96 J**	2.6 UJ
Field Parameters															
Temperature								Field Test	°C	**5.34**	**3.91**	**5.83**	**5.37**	**5.66**	**7.10**
pH								Field Test	N/A	**7.28**	**7.03**	**6.86**	**6.80**	**6.64**	**6.40**
Conductance								Field Test	mS/cm	**0.213**	**0.235**	**0.400**	**0.287**	**0.762**	**1.03**
Turbidity								Field Test	NTU	**0.0**	**7.5**	**0.0**	**1.6**	**0.0**	**0.0**
ORP								Field Test	mV	**130**	**202**	**173**	**212**	**-58**	**87**
Dissolved Oxygen								Field Test	mg/L	**5.42**	**6.66**	**2.73**	**5.86**	**0.00**	**0.00**

Table 3-5 Groundwater Baseline Sample Results, Fall 2012

Analyte	Background Screening Criteria	No. of Samples	No. of Detections	No. of Detected Results Exceeding Background	Maximum Detected Value	Minimum Detected Value	Station ID / Geographic Area / Sample ID / Method		Units	MW28 Post 1955 MPA 0912MW28GW	MW29 Surface Mined Area 0912MW29GW	MW32 Red Devil Creek Delta 0912MW32GW	MW33 Red Devil Creek Delta 0912MW33GW
Total Inorganic Elements													
Aluminum	405	17	12	3	1920	50	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**440**	**140**	**400**	**150**
Antimony	0.505 J	17	17	17	9490	1.34	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**17.4**	**1.34**	**6.35**	**417**
Arsenic	13.5	17	17	12	9710	3	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**68**	**44**	**3**	**29**
Barium	83.3	17	17	6	530	10	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**70**	**230**	**30**	**40**
Beryllium	0.018 J	17	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.012 U	0.012 U	0.012 U	0.012 U
Cadmium	0.017 J	17	1	1	0.6	0.6	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.031 U	0.031 U	0.031 U	0.031 U
Calcium	20600	17	17	14	98600	10300	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**40900**	**50200**	**10300**	**17100**
Chromium	4.95	17	11	6	47.7	0.8	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**8**	**5.1**	**1.5**	**0.8**
Cobalt	1.14	17	13	8	27.8	0.1	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**3.9**	**0.8**	**0.6**	**0.2**
Copper	0.48	17	13	13	10.6	1.2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**2.6**	**1.2**	**2.9**	**1.3**
Iron	8990	17	14	3	49200	30	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**2250**	**2690**	**620**	**370**
Lead	0.311	17	6	4	1.9	0.3	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**0.8**	0.019 U	**0.3**	0.019 U
Magnesium	11300	17	17	16	98100	7640	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**29200**	**48200**	**7640**	**11600**
Manganese	1120	17	15	6	7650	2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**1070 J**	**398**	**27**	**16**
Mercury	0.0000584	7	7	7	0.00572	0.000139	Total Mercury by EPA 245.1 - Water	EPA 245.1	mg/L	**0.000183 J**			
Nickel	2.68	17	13	13	50	3	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**11**	**4**	**9**	0.184 U
Potassium	708	17	16	13	3700	500	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**1200**	**1100**	**500**	**800**
Selenium	ND	17	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.27 U	0.27 U	0.27 U	0.27 U
Silicon		17	17		10200	4400	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**5600**	**4400**	**9800**	**10200**
Silver	0.016 J	17	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.013 U	0.013 U	0.013 U	0.013 U
Sodium	2800	17	17	13	21400	1500	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**11100**	**2600**	**1500**	**5000**
Thallium	0.009 J	17	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.013 U	0.013 U	0.013 U	0.013 U
Vanadium	0.55	17	2	2	9	2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.027 U	0.027 U	0.027 U	0.027 U
Zinc	1.3	17	3	3	20	20	Total(3020) Metals by ICP - 6010C	6010C	µg/L	3.88 U	3.88 U	3.88 U	3.88 U
Total Low Level Mercury													
Mercury	0.0000584	10	8	4	0.000197	0.000008	Total Mercury by EPA 1631	EPA 1631	mg/L		**0.000008 J**	**0.00019 J**	**0.00001 J**
Dissolved Inorganic Elements													
Dissolved Mercury							Dissolved Mercury by EPA 245.1 - Water	EPA 245.1	mg/L				
Dissolved Low Level Mercury													
Mercury	0.00000114	11	6	6	0.00006	0.000003	Dissolved Mercury by EPA 1631	EPA 1631	mg/L	**0.000026 J**	**0.000007 J**	0.000028 JU	**0.000003 J**
General Chemistry													
Bicarbonate as HCO3							Alkalinity	SM 2320B	mg/L	**255 J**	**333 J**	**47 J**	**99 J**
Carbonate as CO3							Alkalinity	SM 2320B	mg/L	1 UJ	1 UJ	1 UJ	1 UJ
Chloride							Anions by ION Chromatography	EPA 300.0	mg/L	**0.6 J**	**0.7**	**0.5**	**0.8**
Fluoride							Anions by ION Chromatography	EPA 300.0	mg/L	**0.006 J**	**0.3**	0.006 U	0.006 U
Nitrate-Nitrite Nitrogen (as N)							Nitrogen, Nitrate-Nitrite (as N)	EPA 353.2	mg/L	0.01 UJ	0.01 U	**0.89**	**0.16**
Sulfate							Anions by ION Chromatography	EPA 300.0	mg/L	**40.5 J**	**28.1**	**15.8**	**14.9**
Total Alkalinity (as CaCO3)							Alkalinity	SM 2320B	mg/L	**209 J**	**273 J**	**39 J**	**81 J**
Total Dissolved Solids (180)							Solids By SM 2540	SM 2540	mg/L	**280 J**	**330 J**	**120 J**	**140 J**
Total Suspended Solids							Solids By SM 2540	SM 2540	mg/L	**38 J**	**13 J**	2.6 UJ	**8 J**
Field Parameters													
Temperature								Field Test	°C	**6.69**	**4.37**	**3.76**	**3.86**
pH								Field Test	N/A	**6.57**	**6.83**	**5.58**	**6.38**
Conductance								Field Test	mS/cm	**0.514**	**0.641**	**0.135**	**0.223**
Turbidity								Field Test	NTU	**0.0**	**0.0**	**0.0**	**0.0**
ORP								Field Test	mV	**13**	**24**	**215**	**183**
Dissolved Oxygen								Field Test	mg/L	**0.00**	**0.00**	**5.09**	**5.72**

Table 3-6 Surface Water Baseline Sample Results, Fall 2012

Analyte	Background Screening Criteria	No. of Samples	No. of Detections	No. of Detected Results Exceeding Background	Maximum Detected Value	Minimum Detected Value	Station ID / Geographic Area / Sample ID / Method		Units	RD04 Red Devil Creek 0912RD04SW	RD05 Red Devil Creek 0912RD05SW	RD06 Red Devil Creek 0912RD06SW	RD08 Red Devil Creek 0912RD08SW	RD09 Red Devil Creek 0912RD09SW	RD10 Red Devil Creek 0912RD10SW	RD12 Red Devil Creek 0912RD12SW
Total Inorganic Elements																
Aluminum	80	7	0	0			Total(3020) Metals by ICP - 6010C	6010C	µg/L	5.44 U	5.44 U	5.44 U	5.44 U	5.44 U	5.44 U	5.44 U
Antimony	1.52	7	7	7	243	1.6	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**27.3**	**38.2**	**227**	**243**	**195**	**1.6**	**80.3**
Arsenic	1.1	7	6	6	842	14	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**14**	**842**	**88**	**90**	**83**	0.06 U	**30**
Barium	26.4	7	7	4	110	20	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**20**	**110**	**30**	**30**	**30**	**20**	**20**
Beryllium	ND	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
Cadmium	ND	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U
Calcium	18400	7	7	1	41500	15600	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**15600**	**41500**	**16900**	**16800**	**16700**	**16000**	**15700**
Chromium	0.43	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.107 U	0.107 U	0.107 U	0.107 U	0.107 U	0.107 U	0.107 U
Cobalt	0.066	7	4	4	5.9	0.2	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.006 U	**5.9**	**0.2**	**0.2**	**0.2**	0.006 U	0.006 U
Copper	0.37	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
Iron	138	7	7	3	2320	90	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**110**	**2320**	**150**	**130**	**150**	**90**	**100**
Lead	0.021	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U
Magnesium	9680	7	7	4	42600	8490	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**8490**	**42600**	**10200**	**10000**	**10000**	**8580**	**8640**
Manganese	17.5	7	7	4	420	10	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	**11**	**420**	**24 J**	**22**	**22**	**10**	**11**
Nickel	0.44	7	1	1	22	22	Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.184 U	**22**	0.184 U	0.184 U	0.184 U	0.184 U	0.184 U
Potassium	218 J	7	1	1	1400	1400	Total(3020) Metals by ICP - 6010C	6010C	µg/L	24.9 U	**1400**	24.9 U	24.9 U	24.9 U	24.9 U	24.9 U
Selenium	0.5 J	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
Silicon		7	7		4600	3900	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**3900**	**4600**	**4100**	**4000**	**4000**	**3900**	**3900**
Silver	ND	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Sodium	1580	7	7	4	10900	1500	Total(3020) Metals by ICP - 6010C	6010C	µg/L	**1500**	**10900**	**1900**	**1900**	**1800**	**1500**	**1500**
Thallium	ND	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Vanadium	0.3	7	0	0			Total (3020) Metals by ICPMS - 6020A	6020A	µg/L	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U
Zinc	0.5 J	7	0	0			Total(3020) Metals by ICP - 6010C	6010C	µg/L	3.88 U	3.88 U	3.88 U	3.88 U	3.88 U	3.88 U	3.88 U
Total Low Level Mercury																
Mercury	0.00000263	7	7	7	0.00012	0.000004	Total Mercury by EPA 1631	EPA 1631	mg/L	**0.000012 J**	**0.000007 J**	**0.000046 J**	**0.00012 J**	**0.000097 J**	**0.000004 J**	**0.000053 J**
Dissolved Inorganic Elements																
Aluminum	11.9 J	7	0	0	0	0	Dissolved Metals by ICP (6010C)	6010C	µg/L	5.48 U	5.48 U	5.48 U	5.48 U	5.48 U	5.48 U	5.48 U
Antimony	1.4 J	7	7	7	226	1.6	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	**25.9**	**15.8**	**192**	**226**	**186**	**1.6**	**77.3**
Arsenic	0.9	7	6	6	619	14	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	**14**	**619**	**71**	**77**	**71**	0.044 U	**28**
Barium	24	7	7	1	100	20	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	**20**	**100**	**20**	**20**	**20**	**20**	**20**
Beryllium	ND	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U	0.028 U
Cadmium	ND	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Calcium	19200	7	7	1	37400	14300	Dissolved Metals by ICP (6010C)	6010C	µg/L	**14400**	**37400**	**15300**	**15400**	**15200**	**14500**	**14300**
Chromium	0.23	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U	0.096 U
Cobalt	0.056	7	4	4	4.7	0.1	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.008 U	**4.7**	**0.1**	**0.1**	**0.2**	0.008 U	0.008 U
Copper	0.27	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U
Iron	100	7	7	1	1570	40	Dissolved Metals by ICP (6010C)	6010C	µg/L	**60**	**1570**	**70**	**50**	**70**	**40**	**50**
Lead	ND	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U
Magnesium	10200	7	7	1	38700	7830	Dissolved Metals by ICP (6010C)	6010C	µg/L	**7890**	**38700**	**9250**	**9280**	**9210**	**7830**	**7960**
Manganese	15.9	7	7	4	386	6	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	**7**	**386 J**	**18 J**	**17**	**17**	**6**	**8**
Nickel	0.35	7	4	4	17.6	0.7	Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.107 U	**17.6**	**0.7**	**0.8**	**0.8**	0.107 U	0.107 U
Potassium	220 J	7	1	1	1300	1300	Dissolved Metals by ICP (6010C)	6010C	µg/L	8.09 U	**1300**	8.09 U	8.09 U	8.09 U	8.09 U	8.09 U
Selenium	0.5 J	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.263 U	0.263 U	0.263 U	0.263 U	0.263 U	0.263 U	0.263 U
Silicon		7	7		4200	3500	Dissolved Metals by ICP (6010C)	6010C	µg/L	**3500**	**4200**	**3600**	**3700**	**3600**	**3500**	**3500**
Silver	ND	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U
Sodium	1610	7	7	4	10300	1500	Dissolved Metals by ICP (6010C)	6010C	µg/L	**1600**	**10300**	**1900**	**1900**	**1800**	**1500**	**1500**
Thallium	ND	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U
Vanadium	0.13 J	7	0	0			Dissolved Metals by ICPMS (6020A)	6020A	µg/L	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U	0.026 U
Zinc	ND	7	0	0			Dissolved Metals by ICP (6010C)	6010C	µg/L	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U

Table 3-6 Surface Water Baseline Sample Results, Fall 2012

Analyte	Background Screening Criteria	No. of Samples	No. of Detections	No. of Detected Results Exceeding Background	Maximum Detected Value	Minimum Detected Value	Station ID / Geographic Area / Sample ID / Method		Units	RD04 Red Devil Creek 0912RD04SW	RD05 Red Devil Creek 0912RD05SW	RD06 Red Devil Creek 0912RD06SW	RD08 Red Devil Creek 0912RD08SW	RD09 Red Devil Creek 0912RD09SW	RD10 Red Devil Creek 0912RD10SW	RD12 Red Devil Creek 0912RD12SW
Dissolved Low Level Mercury																
Mercury	0.00000637	7	6	5	0.000013	0.00000017	Dissolved Mercury by EPA 1631	EPA 1631	mg/L	**0.000008 J**	**0.000000 J**	**0.000012 J**	**0.000013 J**	**0.00001 J**	0.000003 UJ	**0.000012 J**
Arsenic Speciation																
Arsenate		7	7		275	0.774	EPA 1632	EPA 1632	µg/L	**13.2**	**275**	**76.6**	**78.2**	**71.2**	**0.774**	**24.6**
Arsenite		7	7		492	0.094	EPA 1632	EPA 1632	µg/L	**0.256**	**492**	**8.97**	**4.87**	**9.65**	**0.094**	**0.4**
Inorganic Arsenic		7	7		767	0.868	EPA 1632	EPA 1632	µg/L	**13.4**	**767**	**85.6**	**83**	**80.9**	**0.868**	**25**
Methylmercury																
Methylmercury	0.08 J	7	7	7	0.392	0.101	EPA 1630	EPA 1630	ng/L	**0.236**	**0.392**	**0.132**	**0.137**	**0.118**	**0.101**	**0.118**
General Chemistry																
Bicarbonate as HCO_3							Alkalinity	SM 2320B	mg/L	**81**	**319**	**89**	**89**	**87**	**88**	**85**
Carbonate as CO_3							Alkalinity	SM 2320B	mg/L	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U
Chloride							Anions by ION Chromatography	EPA 300.0	mg/L	**0.5**	**0.7**	**0.4**	**0.5**	**0.5**	**0.4**	**0.5**
Fluoride							Anions by ION Chromatography	EPA 300.0	mg/L	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U
Nitrate-Nitrite Nitrogen (as N)							Nitrogen, Nitrate-Nitrite (as N)	EPA 353.2	mg/L	0.01 U	0.01 U	**0.43**	0.01 U	0.01 U	**0.05**	**0.2**
Sulfate							Anions by ION Chromatography	EPA 300.0	mg/L	**6.6**	**36.5**	**9.1**	**8.7**	**9.2**	**6.2**	**7.1**
Total Alkalinity (as $CaCO_3$)							Alkalinity	SM 2320B	mg/L	**66**	**261**	**73**	**73**	**71**	**72**	**70**
Total Dissolved Solids (180)							Solids By SM 2540	SM 2540	mg/L	**120**	**300**	**120**	**130**	**110**	**120**	**120**
Total Organic Carbon							Total Organic Carbon	SM 5310B	mg/L	**2**	0.1 U	**2**	**2**	**2**	**2**	**2**
Total Suspended Solids							Solids By SM 2540	SM 2540	mg/L	2.6 U	**7**	**2.6**	2.6 U	2.6 U	2.6 U	2.6 U
Field Parameters																
Temperature								Field Test	oC	4.29	7.42	2.64	2.40	3.13	3.95	4.41
pH								Field Test	pH units	7.92	7.65	6.75	6.01	6.92	6.35	8.0
Conductance								Field Test	mS/cm	0.168	0.329	0.206	0.214	0.204	0.172	0.148
Turbidity								Field Test	NTU	0.0	3.8	0.0	0.0	0.0	0.0	8.1
ORP								Field Test	mV	38	-67	184	238	154	208	51
Dissolved Oxygen								Field Test	mg/L	9.77	10.40	11.04	10.40	11.28	14.75	8.45

Key:

µg/L = micrograms per liter
CaCO3 = calcium carbonate
ICP = inductively-coupled plasma
ICPMS inductively-coupled plasma mass spectometry
ND = not detected
°C = degrees Celsius
ORP = oxidation-reduction potential
mS/c = miliSiemens per centimeter
J = analyte detected but relative percent difference was outside control limits; therefore concentration is estimated
mg/L = milligrams per liter
mV = millivolt
NTU = nephelometric turbidity unit
U = analyte was analyzed for but not detected. Value provided is reporting limit

Table 3-7 Red Devil Creek Surface Water Loading, May 2012 – Antimony, Arsenic, Mercury, and Methylmercury (kg/day)

Station ID	RD10	RD04	RD13	RD09	RD06	RD08
Sample ID	0512RD10SW	0512RD04SW	0512RD12SW	0512RD09SW	0512RD06SW	0512RD08SW
Total Antimony	0.053	0.80	2.1	8.3	9.8	9.8
Total Arsenic	NA	0.43	1.0	3.6	4.0	3.9
Total Mercury	1.5E-04	7.4E-04	1.2E-02	1.0E-02	1.2E-02	1.6E-02
Methylmercury	3.3E-06	3.3E-06	3.6E-06	4.8E-06	5.6E-06	5.2E-06

kg/day = kilograms per day

NA = Not calculated because sample results was nondetect.

Table 3-8 Red Devil Creek Surface Water Loading, September 2012 – Antimony, Arsenic, Mercury, and Methylmercury (kg/day)

Station ID	RD10	RD04	RD13	RD09	RD06	RD08
Sample ID	0912RD10SW	0912RD04SW	0912RD12SW	0912RD09SW	0912RD06SW	0912RD08SW
Total Antimony	0.018	0.23	0.7	1.6	2.1	1.8
Total Arsenic	NA	0.12	0.3	0.7	0.8	0.7
Total Mercury	4.5E-05	1.0E-04	4.9E-04	8.1E-04	4.3E-04	9.1E-04
Methylmercury	1.1E-06	2.0E-06	1.1E-06	9.8E-07	1.2E-06	1.0E-06

kg/day = kilograms per day

NA = Not calculated because sample results was nondetect.

MW12 263.1
MW01 239.9
MW14 224.6
MW15 226.5
MW17 220.4
MW16 221.9
MW18 222.0
MW19 228.4
MW03 215.3
MW20 210.3
MW04 220.4
MW28 217.7
MW27 216.6
MW26 213.1
MW25 210.0
MW24 208.9
MW06 201.2
MW21 202.2
MW22 199.5
MW23 189.5
MW29 229.6
MW30 224.8
MW33 174.9
MW32 179.8
MW13 258.2
MW11 248.7
MW10 250.5
MW09 250.6
MW07 261.2
RD04 12.6
RD10 12.1
RD13 10.5
RD05
RD09 13.3
RD06 14.4
RD08 14.2
Red Devil Creek

Groundwater Contour (10 ft. interval)
Groundwater Contour (5 ft. interval)
Topographic Contour (2 ft. interval)
Topographic Contour (10 ft. interval)
May 26, 2012 Groundwater Elevation
May 26, 2012 Estimated Surface Water Discharge (cu ft/second)
Settling Pond
Monofill
Historical Structure

RED DEVIL MINE

Red Devil, Alaska

Figure 3-1
Groundwater Potentiometric Surface and Surface Water Discharge Map
Spring 2012

0 50 100 200 300 Feet
0 12.5 25 50 75 Meters

Image Source: Aero-Metric, Inc. 2010a
Topographic elevation contours source: Aero-Metric, Inc. 2010b, based on Aero-Metric, Inc. aerial photograph dated 5/29/2001

Ecology & Environment, Inc. GIS Department Project:
\\prtbhp1\projects\Red_Devil_Mine\Maps\MXDs\2012_Baseline_Monitoring\Fig3-2_GW_potentiometric_SW_discharge_Fall2012.mxd Date: 1/28/2013

MW29 221.1
MW26 211.9
MW25 205.9
MW28 214.9
MW24 207.1
MW06 199.2
MW27 214.3
RD09 3.4
MW23 188.6
RD08 3.1
MW33 172.9
RD06 3.8
MW04 218.4
RD05
MW21 201.8
RD04 3.5
MW20 209.7
MW22 197.3
RD10 4.6
RD13 3.8
MW32 179.4
MW14 221.7
MW15 226.6
MW03 213.5
MW17 217.9
MW16 219.2
MW01 238.9
MW18 218.9
MW19 223.9
MW12 262.3
MW10 249.8
MW11 247.1
MW13 252.6
MW09 249.4
MW07 260.3
Red Devil Creek

- Groundwater Contour (10ft interval)
- Groundwater Contour (5ft interval)
- Topographic Contour (2 ft. interval)
- Topographic Contour (10 ft. interval)
- September 2012 Groundwater Elevation
- September 2012 Estimated Surface Water Discharge (cu ft/second)
- Settling Pond
- Monofill
- Historical Structure

RED DEVIL MINE

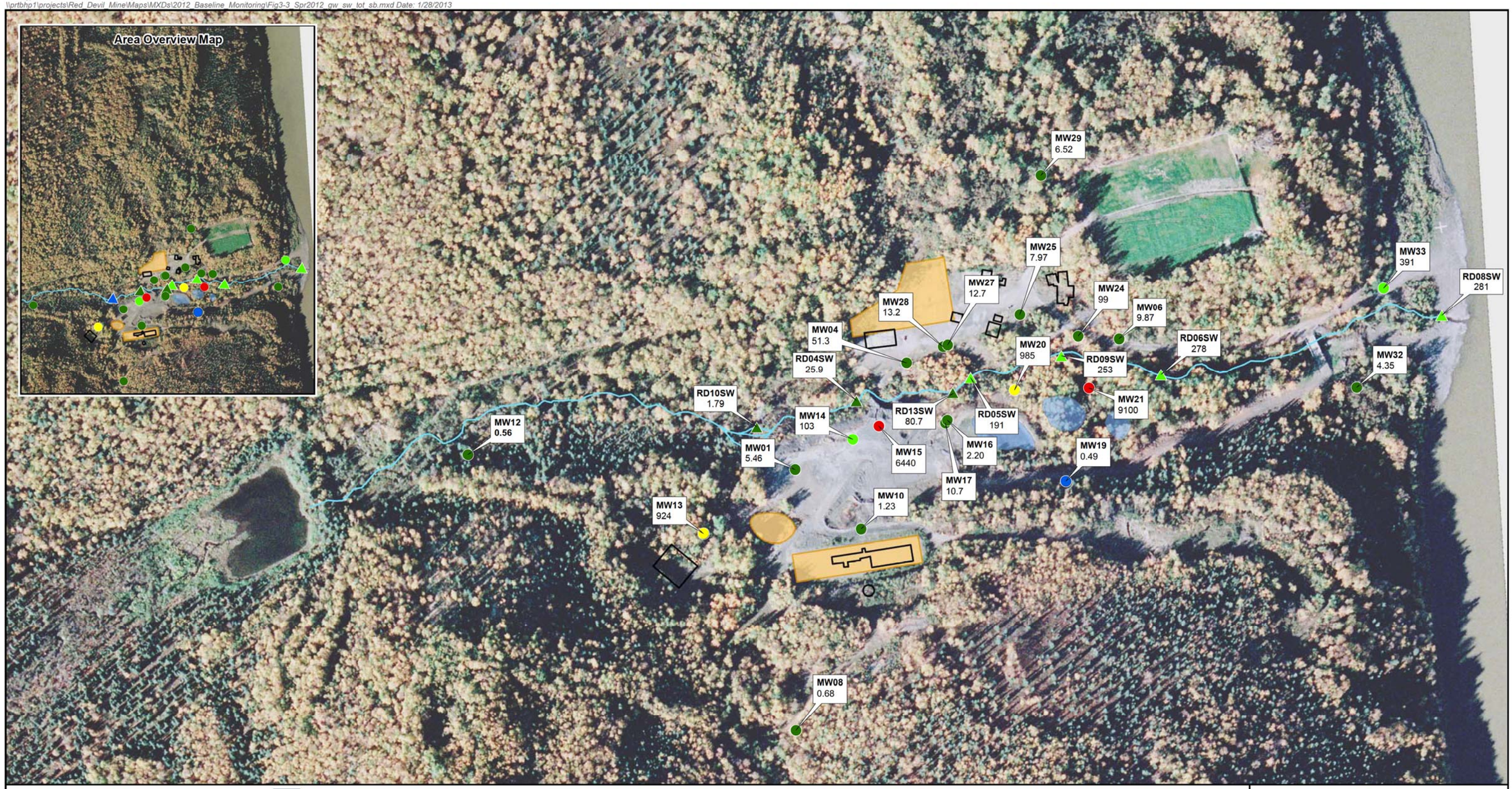
Red Devil, Alaska

Figure 3-2
Groundwater Potentiometric Surface and Surface Water Discharge Map
Fall 2012

0 50 100 200 300
Feet
0 12.5 25 50 75
Meters

Image Source: Aero-Metric, Inc. 2010a
Topographic elevation contours source: Aero-Metric, Inc. 2010b, based on Aero-Metric, Inc. aerial photograph dated 5/29/2001

Ecology & Environment, Inc. GIS Department Project:
\\prtbhp1\projects\Red_Devil_Mine\Maps\MXDs\2012_Baseline_Monitoring\Fig3-3_Spr2012_gw_sw_tot_sb.mxd Date: 1/28/2013



Groundwater Results
- < 0.505 µg/L
- 0.505 - 100 µg/L
- 100 - 500 µg/L
- 500 - 1,000 µg/L
- 1,000 - 5,000 µg/L
- 5,000 - 10,000 µg/L
- > 10,000 µg/L

Surface Water Results
- < 1.52 µg/L
- 1.52 - 100 µg/L
- 100 - 500 µg/L
- 500 - 1,000 µg/L
- 1,000 - 5,000 µg/L
- 5,000 - 10,000 µg/L
- > 10,000 µg/L

Settling Pond
Monofill
Historical Structure

RED DEVIL MINE

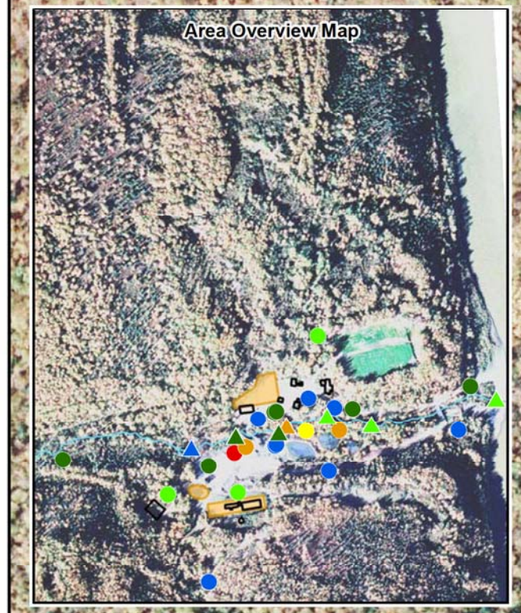
Red Devil, Alaska

Figure 3-3
Groundwater and Surface Water Sample Results, Spring 2012, Total Antimony

0 37.5 75 150 225 300 375 Feet
0 12.5 25 50 75 100 125 Meters

Image Source: Aero-Metric, Inc. 2010a

Ecology & Environment, Inc. GIS Department Project:
\\prtbhp1\projects\Red_Devil_Mine\Maps\MXDs\2012_Baseline_Monitoring\Fig3-4_Spr2012_gw_sw_tot_as.mxd Date: 1/28/2013



MW29 102
MW25 7
MW24 4
MW06 53
MW33 31
RD08SW 112
MW28 73
MW27 37
RD09SW 109
MW04 12
RD05SW 1400
RD06SW 113
RD04 14
MW32 2
RD10SW 0.06 U
RD13SW 40
MW17 3
MW20 662
MW21 2540
MW12 21
MW14 7030
MW15 4570
MW19 0.06 U
MW16 0.06 U
MW01 39
MW10 148
MW13 396
MW08 0.06 U

Groundwater Results
- < 13.5 µg/L
- 13.5 - 100 µg/L
- 100 - 500 µg/L
- 500 - 1,000 µg/L
- 1,000 - 5,000 µg/L
- 5,000 - 10,000 µg/L
- > 10,000 µg/L

Surface Water Results
- < 1.1 µg/L
- 1.1 - 1000 µg/L
- 100 - 500 µg/L
- 500 - 1,000 µg/L
- 1,000 - 5,000 µg/L
- 5,000 - 10,000 µg/L
- > 10,000 µg/L

- Settling Pond
- Monofill
- Historical Structure

RED DEVIL MINE

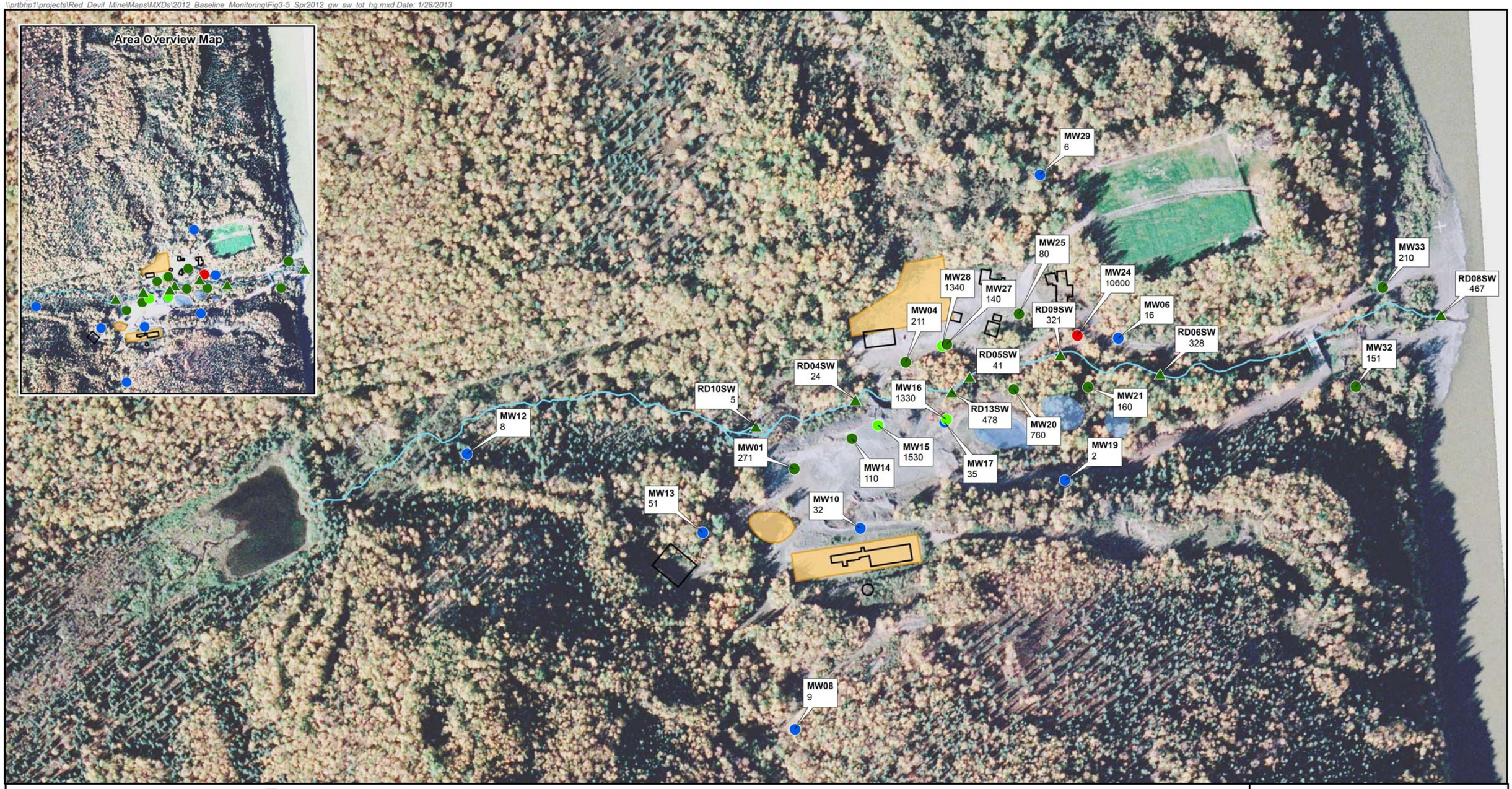
Red Devil, Alaska

Figure 3-4
Groundwater and Surface Water Sample Results, Spring 2012, Total Arsenic

0 50 100 200 300 400 Feet
0 12.5 25 50 75 100 125 Meters

Image Source: Aero-Metric, Inc. 2010a

Ecology & Environment, Inc. GIS Department Project:
\\prtbhp1\projects\Red_Devil_Mine\Maps\MXDs\2012_Baseline_Monitoring\Fig3-5_Spr2012_gw_sw_tot_hg.mxd Date: 1/28/2013



Groundwater Results
- < 58.4 ng/L
- 58.4 - 1,000 ng/L
- 1,000 - 2,000 ng/L
- 2,000 - 5,000 ng/L
- 5,000 - 10,000 ng/L
- 10,000 - 50,000 ng/L
- > 50,000 ng/L

Surface Water Results
- < 2.63 ng/L
- 2.63 - 1,000 ng/L
- 1,000 - 2,000 ng/L
- 2,000 - 5,000 ng/L
- 5,000 - 10,000 ng/L
- 10,000 - 50,000 ng/L
- > 50,000 ng/L

- Settling Pond
- Monofill
- Historical Structure

RED DEVIL MINE

Red Devil, Alaska

Figure 3-5
Groundwater and Surface Water Sample Results, Spring 2012, Total Mercury

0 50 100 200 300 400
Feet
0 12.5 25 50 75 100 125
Meters

Image Source: Aero-Metric, Inc. 2010a

Ecology & Environment, Inc. GIS Department Project:
\\prtbhp1\projects\Red_Devil_Mine\Maps\MXDs\2012_Baseline_Monitoring\Fig3-6_Spr2012_gw_sw_diss_sb.mxd Date: 1/25/2013

Groundwater Result
- < 0.522 µg/L
- 0.522 - 100 µg/L
- 100 - 500 µg/L
- 500 - 1,000 µg/L
- 1,000 - 5,000 µg/L
- 5,000 - 10,000 µg/L
- > 10,000 µg/L

Surface Water Result
- < 1.4 µg/L
- 1.4 - 100 µg/L
- 100 - 500 µg/L
- 500 - 1,000 µg/L
- 1,000 - 5,000 µg/L
- 5,000 - 10,000 µg/L
- > 10,000 µg/L

- Settling Pond
- Monofill
- Historical Structure

RED DEVIL MINE

Red Devil, Alaska

Figure 3-6
Groundwater and Surface Water Sample Results, Spring 2012, Dissolved Antimony

0 50 100 200 300 400
Feet
0 12.5 25 50 75 100 125
Meters

Image Source: Aero-Metric, Inc. 2010a

Ecology & Environment, Inc. GIS Department Project:
\\prtbhp1\projects\Red_Devil_Mine\Maps\MXDs\2012_Baseline_Monitoring\Fig3-7_Spr2012_gw_sw_diss_as.mxd Date: 1/28/2013

Groundwater Results
- < 13.9 µg/L
- 13.9 - 100 µg/L
- 100 - 500 µg/L
- 500 - 1,000 µg/L
- 1,000 - 5,000 µg/L
- 5,000 - 10,000 µg/L
- > 10,000 µg/L

Surface Water Results
- < 0.9 µg/L
- 0.9 - 100 µg/L
- 100 - 500 µg/L
- 500 - 1,000 µg/L
- 1,000 - 5,000 µg/L
- 5,000 - 10,000 µg/L
- > 10,000 µg/L

- Settling Pond
- Monofill
- Historical Structure

RED DEVIL MINE

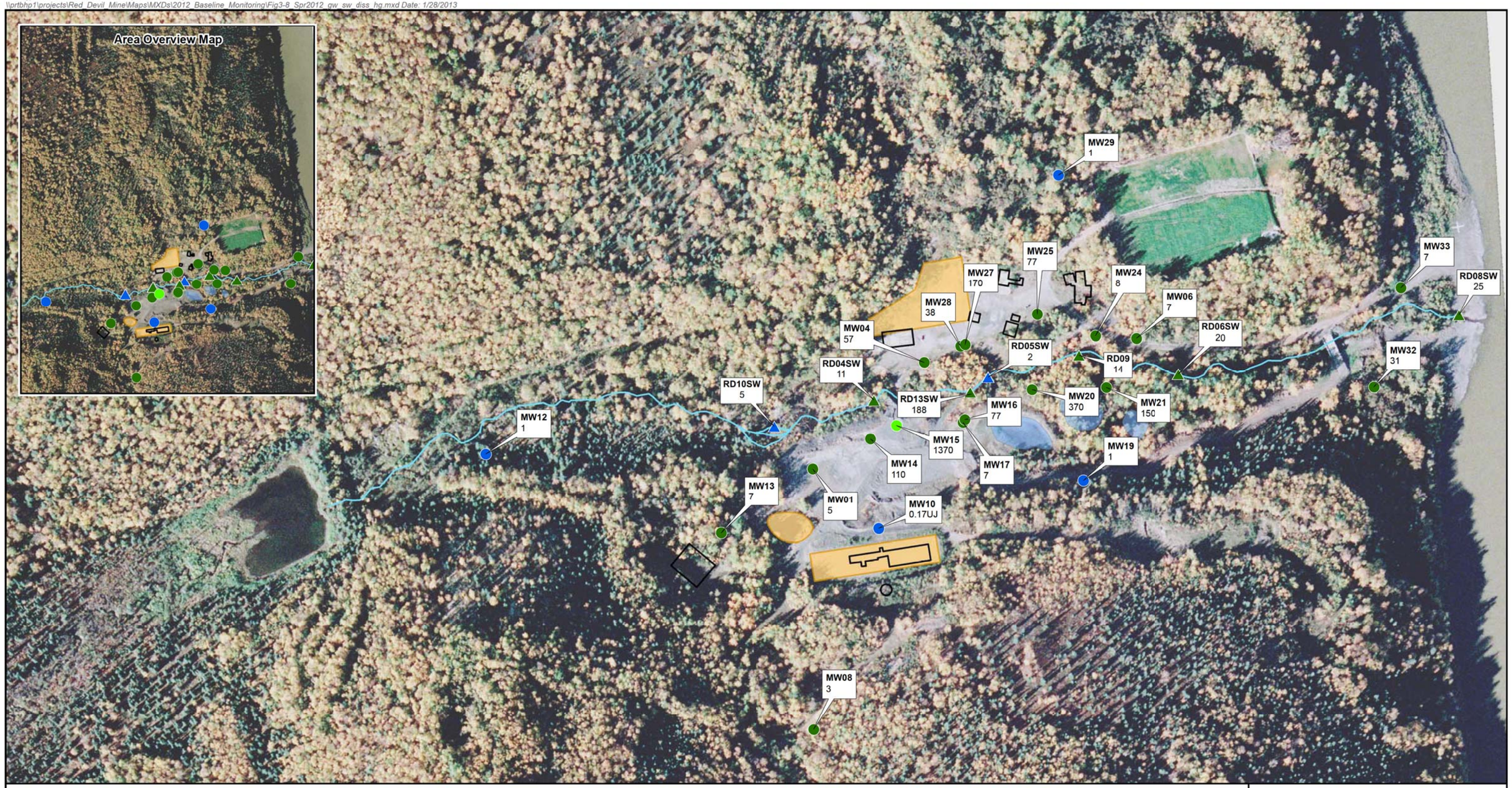
Red Devil, Alaska

Figure 3-7
Groundwater and Surface Water Sample Results, Spring 2012, Dissolved Arsenic

0 50 100 200 300 400 Feet
0 12.5 25 50 75 100 125 Meters

Image Source: Aero-Metric, Inc. 2010a

Ecology & Environment, Inc. GIS Department Project:
\\prtbhp1\projects\Red_Devil_Mine\Maps\MXDs\2012_Baseline_Monitoring\Fig3-8_Spr2012_gw_sw_diss_hg.mxd Date: 1/28/2013



Groundwater Results
- < 1.14 ng/L
- 1.14 - 1,000 ng/L
- 1,000 2,000 ng/L
- 2,000 - 5,000 ng/L
- 5,000 - 10,000 ng/L
- 10,000 - 50,000 ng/L
- > 50,000 ng/L

Surface Water Results
- < 6.37 ng/L
- 6.37 - 1,000 ng/L
- 1,000 - 2,000 ng/L
- 2,000 - 5,000 ng/L
- 5,000 - 10,000 ng/L
- 10,000 - 50,000 ng/L
- > 50,000 ng/L

- Settling Pond
- Monofill
- Historical Structure

RED DEVIL MINE

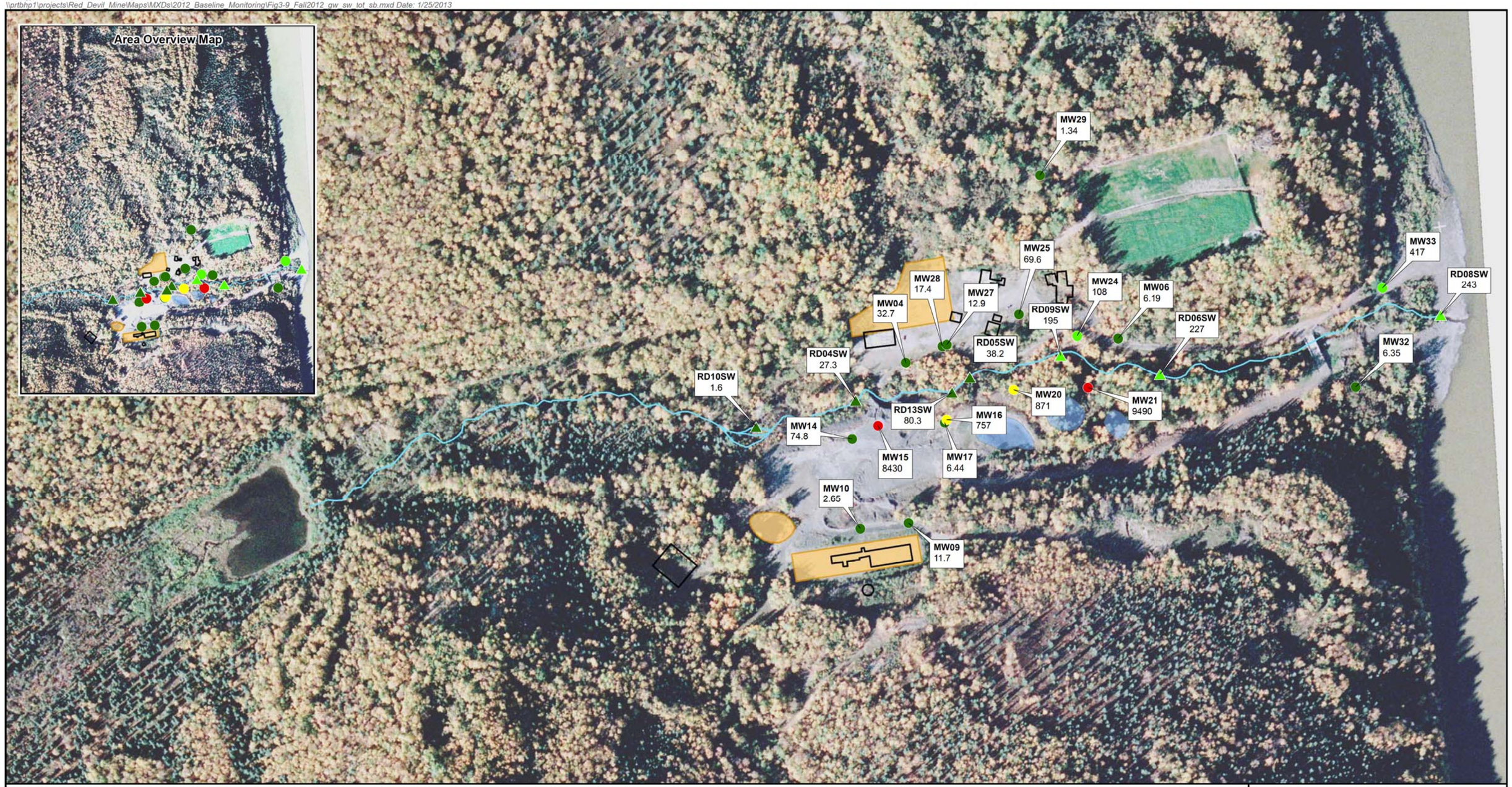
Red Devil, Alaska

Figure 3-8
Groundwater and Surface Water Sample Results, Spring 2012, Dissolved Mercury

0 50 100 200 300 400
Feet
0 12.5 25 50 75 100 125
Meters

Image Source: Aero-Metric, Inc. 2010a

Ecology & Environment, Inc. GIS Department Project:
\\prtbhp1\projects\Red_Devil_Mine\Maps\MXDs\2012_Baseline_Monitoring\Fig3-9_Fall2012_gw_sw_tot_sb.mxd Date: 1/25/2013



Groundwater Results
- < 0.505 µg/L
- 0.505 - 100 µg/L
- 100 - 500 µg/L
- 500 - 1,000 µg/L
- 1,000 - 5,000 µg/L
- 5,000 - 10,000 µg/L
- > 10,000 µg/L

Surface Water Results
- < 1.52 µg/L
- 1.52 - 100 µg/L
- 100 - 500 µg/L
- 500 - 1,000 µg/L
- 1,000 - 5,000 µg/L
- 5,000 - 10,000 µg/L
- > 10,000 µg/L

- Settling Pond
- Monofill
- Historical Structure

RED DEVIL MINE

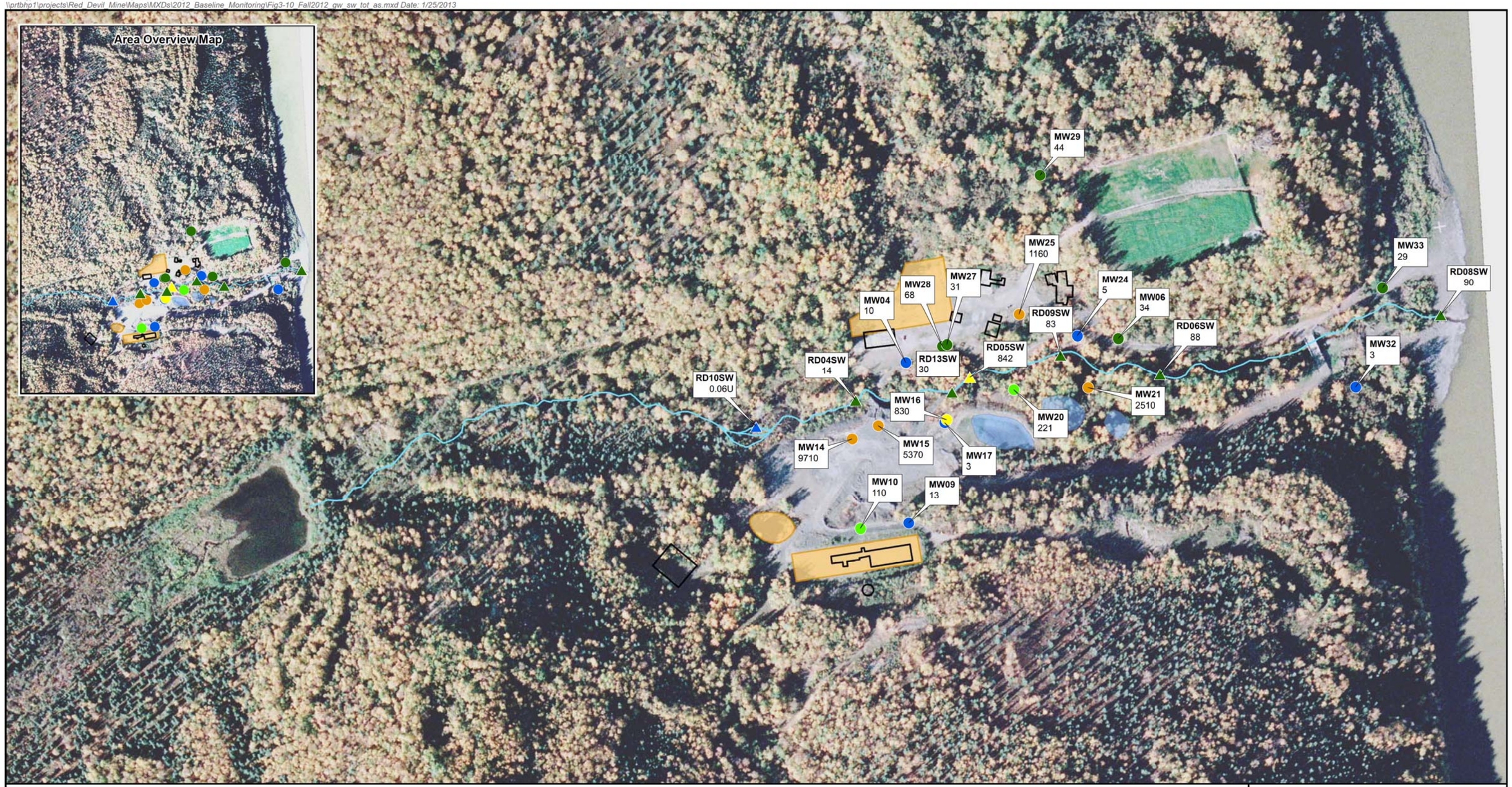
Red Devil, Alaska

Figure 3-9
Groundwater and Surface Water Sample Results, Fall 2012, Total Antimony

0 50 100 200 300 400 Feet
0 12.5 25 50 75 100 125 Meters

Image Source: Aero-Metric, Inc. 2010a

Ecology & Environment, Inc. GIS Department Project:
\\prtbhp1\projects\Red_Devil_Mine\Maps\MXDs\2012_Baseline_Monitoring\Fig3-10_Fall2012_gw_sw_tot_as.mxd Date: 1/25/2013



Groundwater Results
- < 13.5 µg/L
- 13.5 - 100 µg/L
- 100 - 500 µg/L
- 500 - 1,000 µg/L
- 1,000 - 5,000 µg/L
- 5,000 - 10,000 µg/L
- > 10,000 µg/L

Surface Water Results
- < 1.1 µg/L
- 1.1 - 100 µg/L
- 100 - 500 µg/L
- 500 - 1,000 µg/L
- 1,000 - 5,000 µg/L
- 5,000 - 10,000 µg/L
- > 10,000 µg/L

- Settling Pond
- Monofill
- Historical Structure

RED DEVIL MINE

Red Devil, Alaska

Figure 3-10
Groundwater and Surface Water Sample Results, Fall 2012, Total Arsenic

0 50 100 200 300 400
Feet
0 12.5 25 50 75 100 125
Meters

Image Source: Aero-Metric, Inc. 2010a

Ecology & Environment, Inc. GIS Department Project:
\\prtbhp1\projects\Red_Devil_Mine\Maps\MXDs\2012_Baseline_Monitoring\Fig3-11_Fall2012_gw_sw_tot_hg.mxd Date: 1/28/2013

Groundwater Results
- < 58.4 ng/L
- 58.4 - 1,000 ng/L
- 1,000 - 2,000 ng/L
- 2,000 - 5,000 ng/L
- 5,000 - 10,000 ng/L
- 10,000 - 50,000 ng/L
- > 50,000 ng/L

Surface Water Results
- < 2.63 ng/L
- 2.63 - 1,000 ng/L
- 1,000 - 2,000 ng/L
- 2,000 - 5,000 ng/L
- 5,000 - 10,000 ng/L
- 10,000 - 50,000 ng/L
- > 50,000 ng/L

- Settling Pond
- Monofill
- Historical Structure

RED DEVIL MINE

Red Devil, Alaska

Figure 3-11
Groundwater and Surface Water Sample Results, Fall 2012, Total Mercury

0 50 100 200 300 400 Feet
0 12.5 25 50 75 100 125 Meters

Image Source: Aero-Metric, Inc. 2010a

Ecology & Environment, Inc. GIS Department Project:
\\prtbhp1\projects\Red_Devil_Mine\Maps\MXDs\2012_Baseline_Monitoring\Fig3-12_Fall2012_gw_sw_diss_sb.mxd Date: 1/28/2013

Groundwater Results
- < 0.522 µg/L
- 0.522 - 100 µg/L
- 100 - 500 µg/L
- 500 - 1,000 µg/L
- 1,000 - 5,000 µg/L
- 5,000 - 10,000 µg/L
- > 10,000 µg/L

Surface Water Results
- < 1.4 µg/L
- 1.4 - 100 µg/L
- 100 - 500 µg/L
- 500 - 1,000 µg/L
- 1,000 - 5,000 µg/L
- 5,000 - 10,000 µg/L
- > 10,000 µg/L

- Settling Pond
- Monofill
- Historical Structure

RED DEVIL MINE

Red Devil, Alaska

Figure 3-12
Groundwater and Surface Water Sample Results, Fall 2012, Dissolved Antimony

0 50 100 200 300 400 Feet
0 12.5 25 50 75 100 125 Meters

Image Source: Aero-Metric, Inc. 2010a

Ecology & Environment, Inc. GIS Department Project:
\\prtbhp1\projects\Red_Devil_Mine\Maps\MXDs\2012_Baseline_Monitoring\Fig3-13_Fall2012_gw_sw_diss_as.mxd Date: 1/25/2013

Groundwater Results
- < 13.9 µg/L
- 13.9 - 100 µg/L
- 100 - 500 µg/L
- 500 - 1,000 µg/L
- 1,000 - 5,000 µg/L
- 5,000 - 10,000 µg/L
- > 10,000 µg/L

Surface Water Results
- < 0.9 µg/L
- 0.9 - 100 µg/L
- 100 - 500 µg/L
- 500 - 1,000 µg/L
- 1,000 - 10,000 µg/L
- 10,000 - 50,000 µg/L
- > 50,000 µg/L

- Settling Pond
- Monofill
- Historical Structure

RED DEVIL MINE

Red Devil, Alaska

Figure 3-13
Groundwater and Surface Water Sample Results, Fall 2012, Dissolved Arsenic

0 50 100 200 300 400
Feet
0 12.5 25 50 75 100 125
Meters

Image Source: Aero-Metric, Inc. 2010a

Ecology & Environment, Inc. GIS Department Project:
\\prtbhp1\projects\Red_Devil_Mine\Maps\MXDs\2012_Baseline_Monitoring\Fig3-14_Fall2012_gw_sw_diss_hg.mxd Date: 1/28/2013

RED DEVIL MINE

Red Devil, Alaska

Figure 3-14
Groundwater and Surface Water Sample Results, Fall 2012, Dissolved Mercury

Image Source: Aero-Metric, Inc. 2010a

Figure 3-15
Concentration Versus Distance, Red Devil Creek and Seep Surface Water
May 2012
Total Arsenic, Antimony, Mercury, Methylmercury, and Sulfate

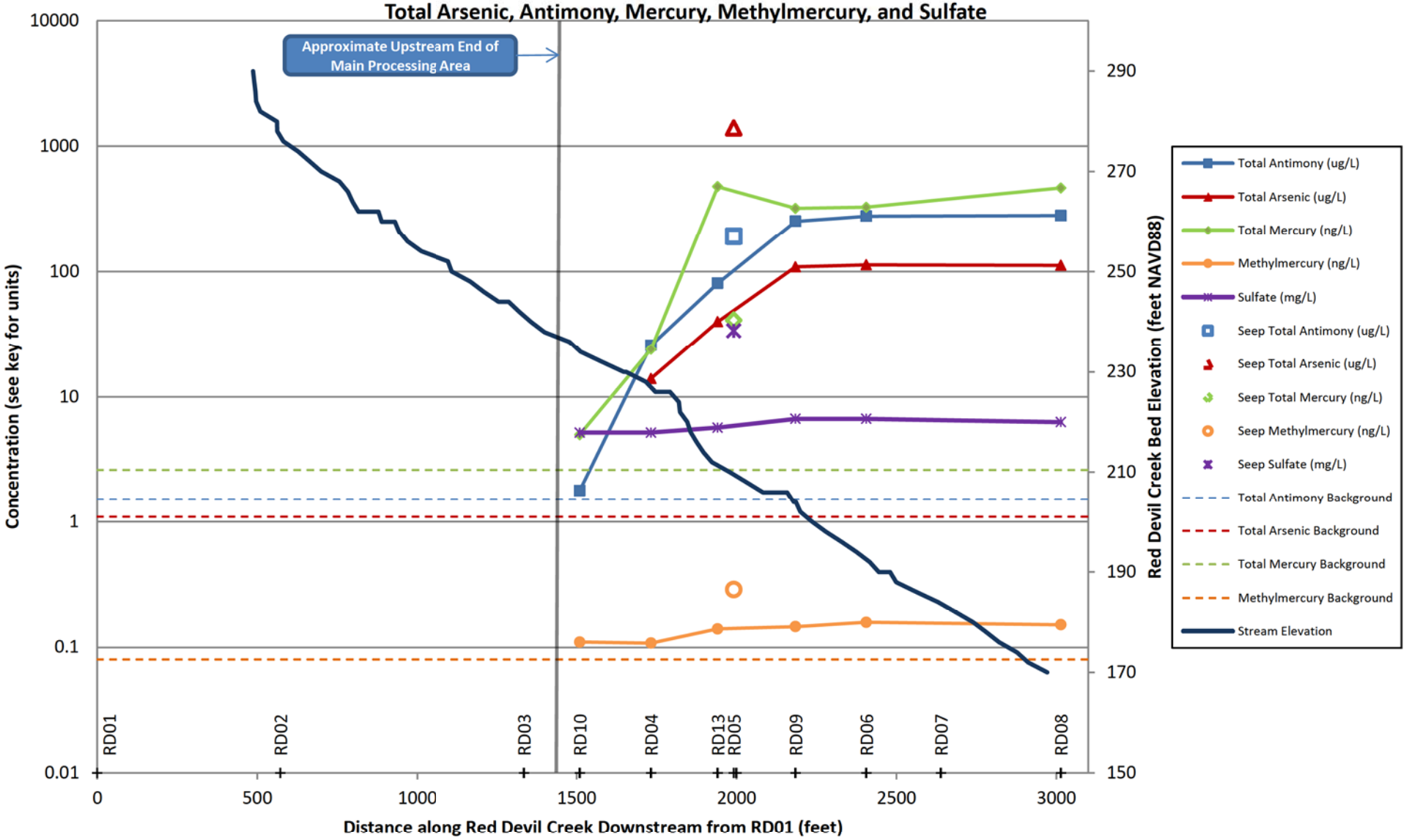


Figure 3-16
Concentration Versus Distance, Red Devil Creek and Seep Surface Water
May 2012
Dissolved Arsenic, Antimony, Mercury, Methylmercury, and Sulfate

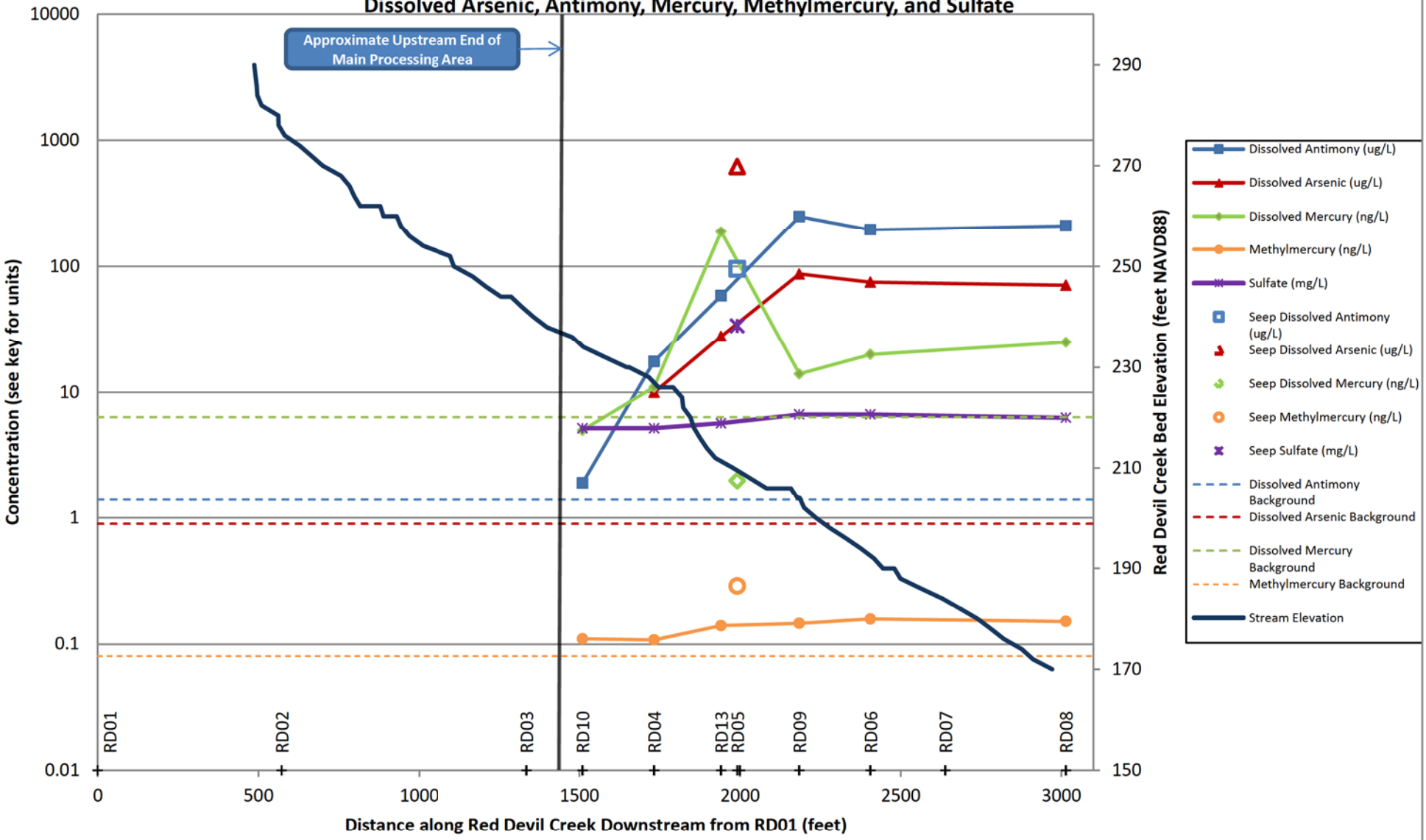


Figure 3-17
Concentration Versus Distance, Red Devil Creek and Seep Surface Water
September 2012
Total Arsenic, Antimony, Mercury, Methylmercury, and Sulfate

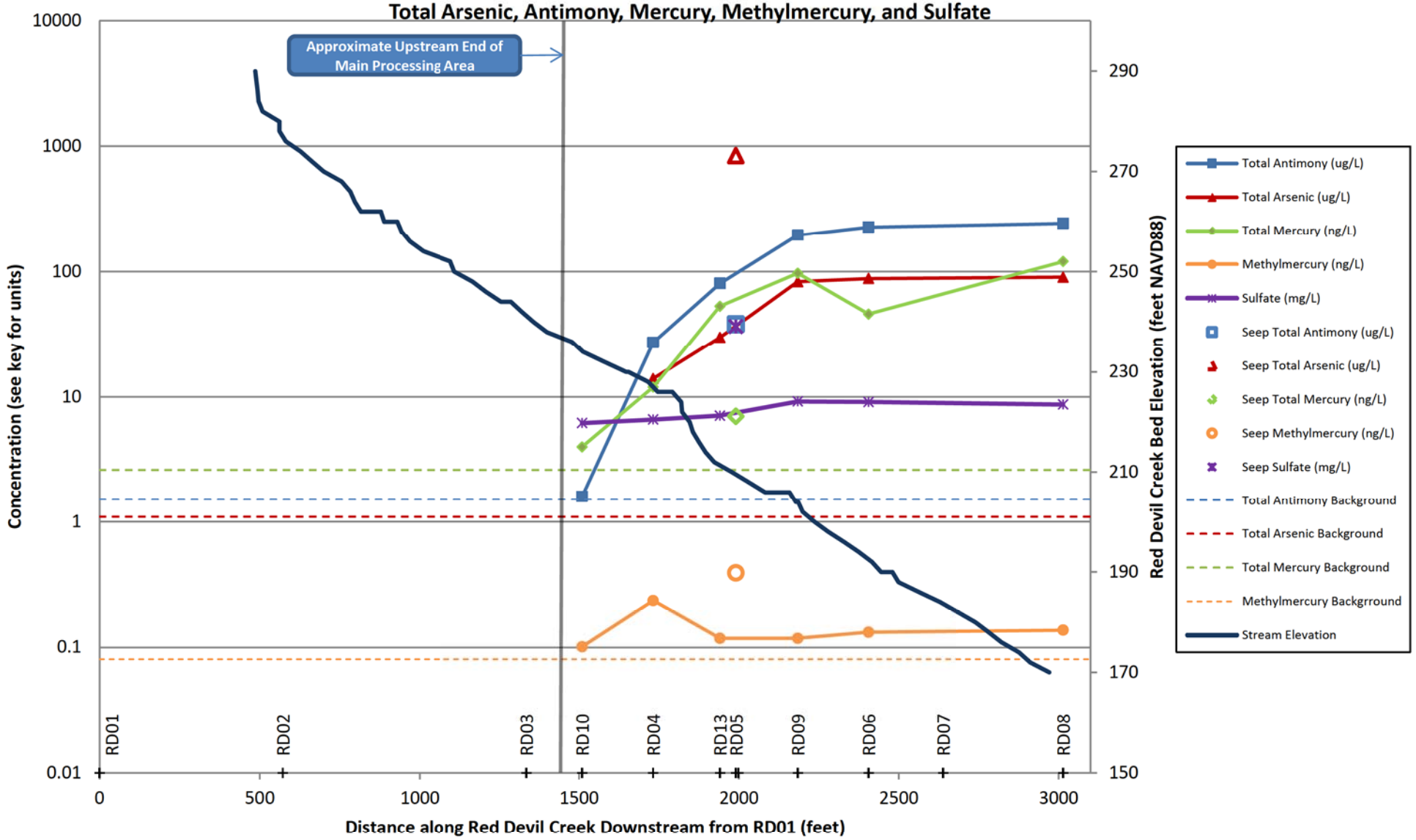
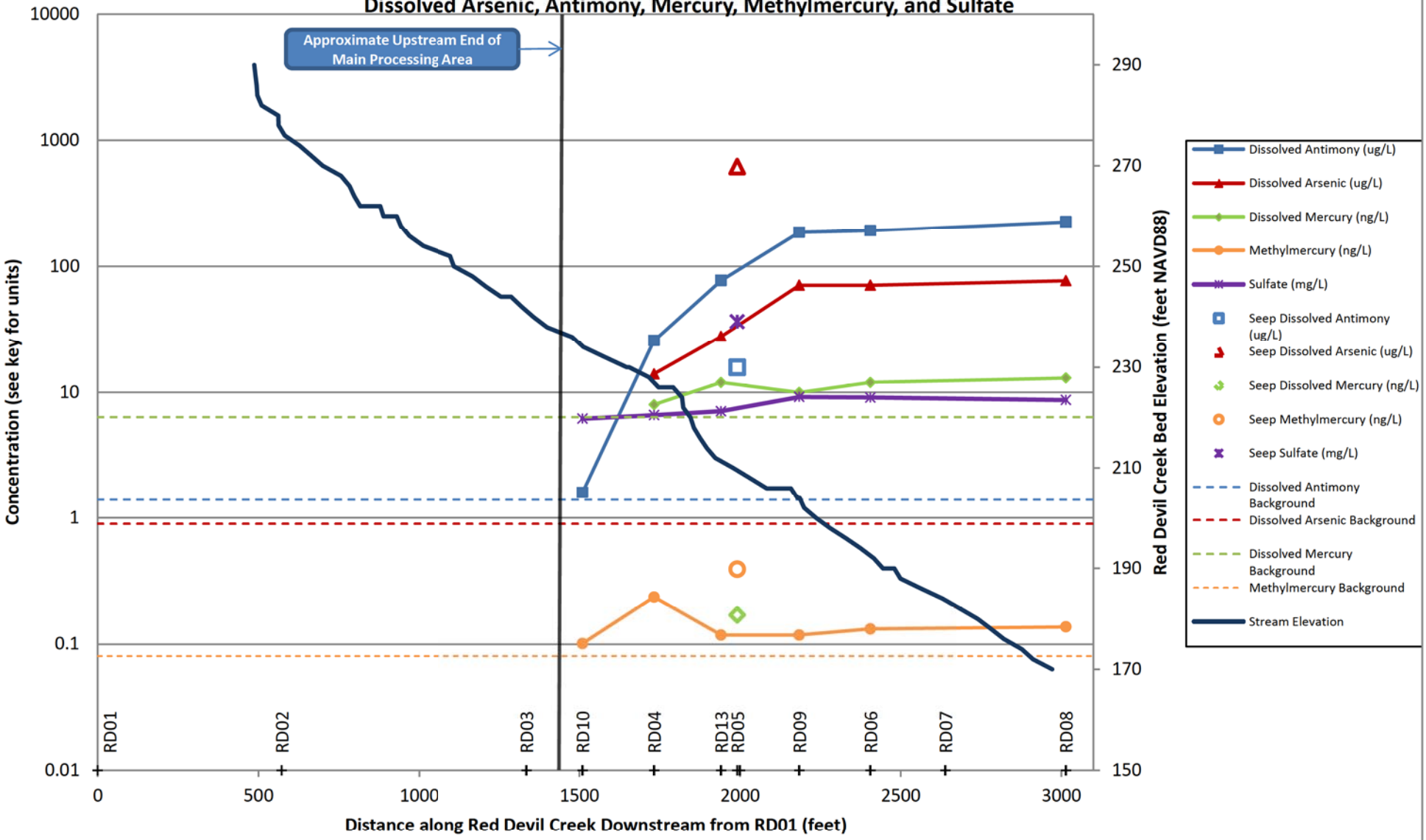


Figure 3-18
Concentration Versus Distance, Red Devil Creek and Seep Surface Water
September 2012
Dissolved Arsenic, Antimony, Mercury, Methylmercury, and Sulfate



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4 References

E & E (Ecology and Environment, Inc.). 2011. Work Plan, Remedial Investigation/Feasibility Study, Red Devil Mine, Alaska. Prepared for the U.S. Department of Interior, Bureau of Land Management, Anchorage Field Office, Anchorage, Alaska. June.

_____. 2012. Baseline Monitoring Work Plan, Red Devil Mine, Alaska. Prepared for the U.S. Department of Interior, Bureau of Land Management, Anchorage Field Office, Anchorage, Alaska. May.

_____. 2014. Final Remedial Investigation Report, Red Devil Mine, Alaska. Prepared for the U.S. Department of Interior, Bureau of Land Management, Anchorage Field Office, Anchorage, Alaska. September.

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A Laboratory Data Quality Assurance Review Memoranda

This appendix was provided by a third party lab, as a scanned document. It is not fully accessible. If you need assistance with this appendix, please contact the BLM Alaska Public Information Center 907-271-5960, BLM_AK_AKSO_Public_Room@blm.gov

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DATA REVIEW MEMORANDUM

DATE: November 14, 2012

TO: Bill Richards, Project Manager, E & E, Seattle, WA

FROM: Mindy Song, E & E, Long Beach, CA 11/16/12

SUBJ: Data Review: Red Devil Mine

REFERENCE:

Project ID	Lab Work Order	Lab
EE-1096-0070	S1209429	Inter-Mountain Labs

I. SAMPLE IDENTIFICATION

For the sampling activities at Red Devil Mine, Ecology and Environment, Inc. (E & E) collected the samples listed on Table 1. Project-specific matrix spike/matrix spike duplicates (MS/MSD) were designated in the field, laboratory also identified batch MS/MSD's as batch QC for additional analytical testing. All samples were sent to Inter-Mountain Labs in Sheridan, WY for analysis. All tables are included at the end of this memorandum.

Data were reviewed for field and laboratory precision, accuracy, and completeness in accordance with procedures and quality control (QC) limits, the current laboratory Quality Assurance Manual (QAM) and current standard operating procedures (SOPs). Laboratory data qualifiers for compound identification and quantitation were accepted. Any additional data review qualifiers added are noted below and listed on the tables at the end of this memorandum. Definitions of all data qualifiers are given in the report.

Table 1 Sample Listing

Work Order	Matrix	Sample ID	Lab ID	Sample Date	MS/MSD	ID Corrections
S1209429	Water	0912RD09SW	S1209429-001	09/11/2012	X	
S1209429	Water	0912RD21SW	S1209429-002	09/11/2012		

Work Orders, Tests and Number of Samples included in this DVM

Work Orders	Matrix	Test Method	Method Name	Number of Samples	Sample Type
S1209429	Water	SM 2540	TDS	2	
S1209429	Water	SM 2540	TSS	2	
S1209429	Water	SM 2320B	Alkalinity	2	
S1209429	Water	SM 5310B	TOC	2	
S1209429	Water	EPA 300.0/353.2	Anions	2	
S1209429	Water	EPA 6010C/6020A	Dissolved Metals	2	
S1209429	Water	EPA 6010C/6020A	Total Metals	2	

II. SAMPLE PROCEDURES

All samples were collected as specified in the work plan and documented on the chain-of-custody (COC) and in field notebooks. Samples were analyzed as specified on the COC. Samples were packaged, shipped and received as specified in the work plan. All samples must be received cold (4 ±2) °C and in good condition as documented on the Cooler Receipt Form.

REVIEW RESULTS:

All sample procedures were followed and the sample coolers were received at 7.6 °C. No problems with the condition of the sample upon receipt are documented. Since the samples were received at temperature outside of range (>6 °C), the detected results were qualified as estimated (J) and the non-detected results were qualified as estimated (UJ) for the analyses of Anions. Qualification for metals, TDS, TSS, Total Alkalinity, and TOC was not necessary.

III. LABORATORY DATA

1.0 HOLDING TIMES

Holding times are established and monitored to ensure analytical results accurately represent analyte concentrations in a sample at the time of collection. Exceeding the holding time for a sample generally results in a loss of the analyte due to a variety of mechanisms, such as deposition on the sample container walls or precipitation.

REVIEW RESULTS:

All samples were analyzed within the project and method specified holding times for all analytes except Total Dissolved solids and Total Suspended Solids. The detected TDS and TSS results were qualified as estimated (J) and the non-detected TDS and TSS results were qualified as estimated (UJ).

2.0 BLANKS

Laboratory and field blank samples are analyzed and evaluated to determine the existence and magnitude of possible contamination during the sampling and analysis process. As noted in Table 2, analyte concentrations in the blanks are generally below the practical quantitation limit (PQL). If the analyte is present in the sample at similar trace levels, then the analyte is likely a common background contaminant from some phase of the sampling, extraction, or analytical procedure and associated low level sample concentrations are not considered to be site related. If the analyte concentration is above the PQL, then there is a potential contamination problem and sample results may be biased high or the data unusable.

REVIEW RESULTS:

All blanks were performed at the required frequency. No analytes except trace amount (0.14 mg/L) of magnesium were detected in the method blank at reporting limit levels. Finding does not require qualification since sample concentration was greater than 5x the blank concentration.

3.0 SURROGATE SPIKE RECOVERY

Laboratory performance for individual samples analyzed for organic compounds is established by means of surrogate spiking activities. Samples are spiked with surrogate compounds prior to preparation and analysis. Unusually low or high surrogate recovery values may indicate some deficiency in the analytical system or that some matrix effects exist, resulting in low or high sample results for target compounds. Sample surrogate recoveries outside QC limits (if applicable) are presented in Table 3.

REVIEW RESULTS:

Not applicable for these analyses.

4.0 MATRIX SPIKE AND MATRIX SPIKE DUPLICATE ANALYSIS

The matrix spike and matrix spike duplicate (MS/MSD) analyses are intended to provide information about the affects that the sample matrix exerts on the digestion/extraction and measurement methodology. MS recovery values that do not meet laboratory QC criteria may indicate that sample analyte results are being attenuated in the analysis procedure. These results are presented in Table 4 (if applicable). The

potential sample bias may be estimated by noting the degree to which the MS concentration was elevated or lowered in the spike analysis. However, this bias should serve only as approximations; sample-specific problems may be the cause of the discrepancy, particularly in soil samples. Recoveries of a post-digestion spike or a laboratory control sample (LCS) are used to verify that the analytical methodology is acceptable and that MS recoveries are due to matrix effects. An MSD analysis is performed to evaluate the precision of the sample results. Precision is measured as the relative percent difference (RPD) between analytical results for duplicate samples. The laboratory's failure to produce similar results for MSD samples may indicate that the samples were non-homogeneous (particularly in soil samples), or that method defects may exist in the laboratory's techniques.

REVIEW RESULTS:

The MS/MSD sample analyses were performed on sample 0912RD09SW at the required frequency. MS/MSD recoveries were within the control limits generated by the laboratory.

5.0 LABORATORY CONTROL SAMPLE ANALYSIS

The LCS is analyzed to monitor the efficiency of the digestion/extraction procedure and analytical instrument operation. The ability of the laboratory to successfully analyze an LCS demonstrates that there are no analytical problems related to the digestion/sample preparation procedures and/or instrument operations. The LCS results outside QC limits are presented in Table 5 (if applicable). Sporadic and marginal QC failures for multiple component methods do not indicate an analytical concern. If recoveries are high and the compounds are not detected in the samples, then no data qualification is required. All recoveries should be above 10% or the non-detect results flagged "UR" as rejected.

REVIEW RESULTS:

All LCS analyses were within control limits and performed at the required frequency.

IV. COMPOUND IDENTIFICATION AND QUANTITATION

Compound identities are assigned by comparing sample compound retention times to retention times from known (standard) compounds and identification of an acceptable mass spectrum. Compounds detected below the PQL in samples should be considered estimated and are qualified "J." The samples with compounds above the linear range were all re-analyzed at a higher dilution factor.

REVIEW RESULTS:

All compound identification and quantitation criteria were achieved.

V. FIELD DUPLICATE SAMPLE RESULTS

Field duplicate samples were collected and analyzed as an indication of overall precision for both field and laboratory. Field duplicate results are summarized in Table 7 (if applicable). The results are expected to have more variability than laboratory duplicates, which measure only laboratory precision. It is expected also that soil field duplicates will exhibit greater variance than water field duplicates due to the difficulties associated with collecting identical field samples. The QC criteria used to assess field duplicate samples for this project was limits of 70% RPD for soils and 40% RPD for waters, or twice the general laboratory duplicate criteria. If both compounds were below the laboratory PQL or one of the compounds was present as a non-detect, then the compounds are generally not qualified due to field duplicate precision. There are no guidelines regarding data qualification based on poor field duplicate precision. Professional judgment was used to determine whether or not to qualify results.

REVIEW RESULTS:

No Field duplicates analyses were performed on this SDG. The RPD ratings are listed on Table 7 as "Good" if the RPD is less than field duplicate QC criteria of 40% and as "Poor" if the RPD exceeded the field duplicate QC criteria.

All the results show good precision in the sample pair as noted on table 7. Qualifiers were only added to the field duplicate sample pair results as noted.

6.0 OVERALL ASSESSMENT OF DATA

All data were reviewed and considered usable with qualification as noted in this report.

Table 2 - List of Positive Results for Blank Samples

Method	Sample ID	Sample Type	Analyte	Result	Qual	Anal Type	Units	PQL
EPA 6010C	MBLK		Magnesium	0.14			mg/L	

Table 2A - List of Samples Qualified for Method Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
None.						

Table 2B - List of Samples Qualified for Field Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
None.						

Table 3 - List of Samples with Surrogates outside Control Limits

Method	Sample ID	Sample Type	Analyte	Rec.	Low Limit	High Limit	Dil Fac	Sample Qual.
None.								

Table 4 - List MS/MSD Recoveries and RPDs outside Control Limits

Method	Sample ID	Sample Type	Analyte	Orig. Result	Spike Amount	Rec.	Dil Fac.	Low Limit	High Limit	Sample Qual	Reportable
None.											

Sample ID	Analyte	Method	RPD	RPD Limit	No. of Affected Samples	Samp Qual
None.						

Table 5 - List LCS Recoveries outside Control Limits

Method	Sample ID	Analyte	Rec.	Low Limit	High Limit	No. of Affected Samples	Samp Qual
None.							

Table 6 –Samples that were Re-analyzed

Sample ID	Lab ID	Method	Sample Type	Action
None.				

Table 7 – Summary of Field Duplicate Results:

Method	Analyte	Units			RPD	Rating	Sample Qualifier
None.							

Inter-Mountain Labs
Your Environmental Monitoring Partner
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209429001

Project: Red Devil Mine
Lab ID: S1209429-001
Client Sample ID: 0912RD09SW
COC: RDM-0912-003

Work Order: S1209429
Collection Date: 9/11/2012 1:12:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	110 J	10	H	mg/L	09/25/2012 1456 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1612 JCG	SM 2540
Alkalinity, Total (As CaCO3)	71	5		mg/L	09/25/2012 1923 KV	SM 2320B
Total Organic Carbon	2	1		mg/L	09/26/2012 1019 AMB	SM 5310B
Anions						
Alkalinity, Bicarbonate as HCO3	87 J	5		mg/L	09/25/2012 1923 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5		mg/L	09/25/2012 1923 KV	SM 2320B
Chloride	0.5 J	0.2		mg/L	09/25/2012 2237 AM	EPA 300.0
Fluoride	ND UJ	0.2		mg/L	09/25/2012 2237 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	ND UJ	0.05		mg/L	09/25/2012 1634 RH	EPA 353.2
Sulfate	9.2 HT J	0.2		mg/L	09/25/2012 2237 AM	EPA 300.0
Dissolved Metals						
Aluminum	ND	50		µg/L	09/26/2012 1252 DG	6010C
Antimony	186	0.2		µg/L	09/28/2012 1242 MS	6020A
Arsenic	71	2		µg/L	09/28/2012 1242 MS	6020A
Barium	20	10		µg/L	09/28/2012 1242 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1242 MS	6020A
Cadmium	ND	0.9		µg/L	09/28/2012 1242 MS	6020A
Calcium	15200	50		µg/L	09/26/2012 1252 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1242 MS	6020A
Cobalt	0.2	0.1		µg/L	09/28/2012 1242 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1242 MS	6020A
Iron	70	20		µg/L	09/26/2012 1252 DG	6010C
Lead	ND	0.14		µg/L	09/28/2012 1242 MS	6020A
Magnesium	9210	20		µg/L	09/26/2012 1252 DG	6010C
Manganese	17	2		µg/L	09/28/2012 1242 MS	6020A
Nickel	0.8	0.7		µg/L	09/28/2012 1242 MS	6020A
Potassium	ND	400		µg/L	09/26/2012 1252 DG	6010C
Selenium	ND	2		µg/L	09/28/2012 1242 MS	6020A
Silicon	3600	400		µg/L	09/26/2012 1252 DG	6010C
Silver	ND	0.2		µg/L	09/28/2012 1242 MS	6020A
Sodium	1800	200		µg/L	09/26/2012 1252 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1242 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1242 MS	6020A
Zinc	ND	10		µg/L	09/26/2012 1252 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209429001

Project: Red Devil Mine
Lab ID: S1209429-001
Client Sample ID: 0912RD09SW
COC: RDM-0912-003

Work Order: S1209429
Collection Date: 9/11/2012 1:12:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 1953 DG	6010C
Antimony	195	0.07		µg/L	09/28/2012 1301 MS	6020A
Arsenic	83	2		µg/L	09/28/2012 1301 MS	6020A
Barium	30	10		µg/L	09/28/2012 1301 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1301 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1301 MS	6020A
Calcium	16700	50		µg/L	10/01/2012 1953 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1301 MS	6020A
Cobalt	0.2	0.1		µg/L	09/28/2012 1301 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1301 MS	6020A
Iron	150	20		µg/L	10/01/2012 1953 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1301 MS	6020A
Magnesium	10000	20		µg/L	10/01/2012 1953 DG	6010C
Manganese	22	2		µg/L	09/28/2012 1301 MS	6020A
Nickel	ND	2		µg/L	09/28/2012 1301 MS	6020A
Potassium	ND	400		µg/L	10/01/2012 1953 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1301 MS	6020A
Silicon	4000	400		µg/L	10/01/2012 1953 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1301 MS	6020A
Sodium	1800	200		µg/L	10/01/2012 1953 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1301 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1301 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 1953 DG	6010C

11/15/12

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209429001

Project: Red Devil Mine
Lab ID: S1209429-002
Client Sample ID: 0912RD21SW
COC: RDM-0912-003

Work Order: S1209429
Collection Date: 9/11/2012 7:00:00 AM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	120 J	10	H	mg/L	09/25/2012 1458 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1613 JCG	SM 2540
Alkalinity, Total (As CaCO3)	72	5		mg/L	09/25/2012 1939 KV	SM 2320B
Total Organic Carbon	2	1		mg/L	09/26/2012 1104 AMB	SM 5310B
Anions						
Alkalinity, Bicarbonate as HCO3	88 J	5		mg/L	09/25/2012 1939 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5		mg/L	09/25/2012 1939 KV	SM 2320B
Chloride	0.5 J	0.2		mg/L	09/26/2012 003 AM	EPA 300.0
Fluoride	ND UJ	0.2		mg/L	09/26/2012 003 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	0.3 J	0.1		mg/L	10/01/2012 1612 AMB	EPA 353.2
Sulfate	8.8 J	0.2		mg/L	09/26/2012 003 AM	EPA 300.0
Dissolved Metals						
Aluminum	ND	50		µg/L	09/26/2012 1259 DG	6010C
Antimony	197	0.2		µg/L	09/28/2012 1325 MS	6020A
Arsenic	74	2		µg/L	09/28/2012 1325 MS	6020A
Barium	20	10		µg/L	09/28/2012 1325 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1325 MS	6020A
Cadmium	ND	0.9		µg/L	09/28/2012 1325 MS	6020A
Calcium	15200	50		µg/L	09/26/2012 1259 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1325 MS	6020A
Cobalt	0.2	0.1		µg/L	09/28/2012 1325 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1325 MS	6020A
Iron	70	20		µg/L	09/26/2012 1259 DG	6010C
Lead	ND	0.14		µg/L	09/28/2012 1325 MS	6020A
Magnesium	9200	20		µg/L	09/26/2012 1259 DG	6010C
Manganese	19	2		µg/L	09/28/2012 1325 MS	6020A
Nickel	0.8	0.7		µg/L	09/28/2012 1325 MS	6020A
Potassium	ND	400		µg/L	09/26/2012 1259 DG	6010C
Selenium	ND	2		µg/L	09/28/2012 1325 MS	6020A
Silicon	3600	400		µg/L	09/26/2012 1259 DG	6010C
Silver	ND	0.2		µg/L	09/28/2012 1325 MS	6020A
Sodium	1900	200		µg/L	09/26/2012 1259 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1325 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1325 MS	6020A
Zinc	ND	10		µg/L	09/26/2012 1259 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209429001

Project: Red Devil Mine
Lab ID: S1209429-002
Client Sample ID: 0912RD21SW
COC: RDM-0912-003

Work Order: S1209429
Collection Date: 9/11/2012 7:00:00 AM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2000 DG	6010C
Antimony	232	0.07		µg/L	09/28/2012 1330 MS	6020A
Arsenic	90	2		µg/L	09/28/2012 1330 MS	6020A
Barium	30	10		µg/L	09/28/2012 1330 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1330 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1330 MS	6020A
Calcium	16700	50		µg/L	10/01/2012 2000 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1330 MS	6020A
Cobalt	0.2	0.1		µg/L	09/28/2012 1330 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1330 MS	6020A
Iron	140	20		µg/L	10/01/2012 2000 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1330 MS	6020A
Magnesium	9960	20		µg/L	10/01/2012 2000 DG	6010C
Manganese	25	2		µg/L	09/28/2012 1330 MS	6020A
Nickel	ND	2		µg/L	09/28/2012 1330 MS	6020A
Potassium	ND	400		µg/L	10/01/2012 2000 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1330 MS	6020A
Silicon	4000	400		µg/L	10/01/2012 2000 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1330 MS	6020A
Sodium	1900	200		µg/L	10/01/2012 2000 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1330 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1330 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2000 DG	6010C

11/15/12

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209429
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209429001

Alkalinity

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87577	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLANK	09/25/12 12:57	Alkalinity, Total (As CaCO3)	ND	5					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87577	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
ATQC	09/25/12 12:51	Alkalinity, Total (As CaCO3)	585	5	601		97.4	90 - 110	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87577	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-001AD	09/25/12 19:31	Alkalinity, Bicarbonate as HCO3	87	5	87	0.250		20	
		Alkalinity, Carbonate as CO3	ND	5	ND			20	
		Alkalinity, Total (As CaCO3)	72	5	71	0.250		20	

Dissolved Metals by ICP (6010C)

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87609	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
MBLK DISS/CAT	09/26/12 12:38	Aluminum	ND	0.1					
		Calcium	ND	0.1					
		Iron	ND	0.05					
		Magnesium	ND	0.1					
		Potassium	ND	1					
		Silicon	ND	0.01					
		Sodium	ND	0.1					
		Zinc	ND	0.01					

11/15/12

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87609	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
DISS LCS Q	09/26/12 12:41	Aluminum	1.0	0.1	1		102	80 - 120	
		Iron	1.01	0.05	1		101	80 - 120	
		Silicon	1.00	0.01	1		99.6	80 - 120	
		Zinc	1.04	0.01	1		104	80 - 120	

Sample ID	RunNo: 87609	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
CAT LCS IML3	09/26/12 12:43	Calcium	40.1	0.1	40		100	80 - 120	
		Magnesium	39.6	0.1	40		99.0	80 - 120	
		Potassium	40	1	40		101	80 - 120	
		Sodium	39.5	0.1	40		98.8	80 - 120	

Qualifiers:

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- J Analyte detected below quantitation limits
- L Analyzed by a contract laboratory
- ND Not Detected at the Reporting Limit
- O Outside the Range of Dilutions
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209429
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209429001

Dissolved Metals by ICPMS (6020A)

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87727	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
MBLK	09/28/12 11:32	Antimony	ND	0.005					
		Arsenic	ND	0.005					
		Barium	ND	0.1					
		Beryllium	ND	0.002					
		Cadmium	ND	0.002					
		Chromium	ND	0.001					
		Cobalt	ND	0.01					
		Copper	ND	0.01					
		Lead	ND	0.02					
		Manganese	ND	0.01					
		Nickel	ND	0.01					
		Selenium	ND	0.005					
		Silver	ND	0.003					
		Thallium	ND	0.001					
		Vanadium	ND	0.02					

11/15/12

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87727	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	09/28/12 11:28	Antimony	0.101	0.005	0.1		101	80 - 120	
		Arsenic	0.099	0.005	0.1		98.6	80 - 120	
		Barium	0.1	0.1	0.1		102	80 - 120	
		Beryllium	0.099	0.002	0.1		98.6	80 - 120	
		Cadmium	0.098	0.002	0.1		97.6	80 - 120	
		Chromium	0.100	0.001	0.1		100	80 - 120	
		Cobalt	0.10	0.01	0.1		101	80 - 120	
		Copper	0.10	0.01	0.1		102	80 - 120	
		Lead	0.10	0.02	0.1		102	80 - 120	
		Manganese	0.10	0.01	0.1		101	80 - 120	
		Nickel	0.10	0.01	0.1		99.5	80 - 120	
		Selenium	0.099	0.005	0.1		98.8	80 - 120	
		Silver	0.097	0.003	0.1		97.4	80 - 120	
		Thallium	0.102	0.001	0.1		102	80 - 120	
		Vanadium	0.10	0.02	0.1		98.6	80 - 120	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209429
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209429001

Anions by ION Chromatography

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLK	09/25/12 11:41	Chloride	ND	1					
		Fluoride	ND	0.1					
		Sulfate	ND	1					

11/15/12

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
DIONEX	09/25/12 11:16	Chloride	31	1	30		102	90 - 110	
		Fluoride	20.7	0.1	20		104	90 - 110	
		Sulfate	144	1	150		95.8	90 - 110	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209429-001ASPK	09/25/12 23:01	Chloride	5	1	5	ND	95.0	80 - 120	
		Fluoride	2.2	0.1	2	ND	108	80 - 120	
		Sulfate	49	1	40	9	99.7	80 - 120	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209429-001ASPK	09/25/12 23:14	Chloride	5	1	5	0.426	95.5	20	
		Fluoride	2.2	0.1	2.2	0.498	107	20	
		Sulfate	50	1	49	1.10	101	20	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-001A	09/25/12 22:49	Chloride	0.5	0.2	0.5	4.92		20	
		Fluoride	ND	0.2	ND			20	
		Sulfate	9.2	0.2	9.2	0.0347		20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209429
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209429001

Nitrogen, Nitrate-Nitrite (as N)

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLANK	09/25/12 15:51	Nitrogen, Nitrate-Nitrite (as N)	ND	0.1					

11/15/12

Sample ID	RunNo: 87825	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLANK	10/01/12 15:28	Nitrogen, Nitrate-Nitrite (as N)	ND	0.1					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
QC	09/25/12 15:53	Nitrogen, Nitrate-Nitrite (as N)	18.5	0.1	19.3		95.7	90 - 110	

Sample ID	RunNo: 87825	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
QC	10/01/12 15:30	Nitrogen, Nitrate-Nitrite (as N)	19.4	0.1	19.3		101	90 - 110	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209429-001B	09/25/12 16:36	Nitrogen, Nitrate-Nitrite (as N)	4.78	0.05	5	ND	95.6	80 - 120	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209429-001B	09/25/12 16:37	Nitrogen, Nitrate-Nitrite (as N)	5.22	0.05	4.78	9.33	104	20	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-001B	09/25/12 16:35	Nitrogen, Nitrate-Nitrite (as N)	ND	0.05	ND			20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209429
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209429001

Solids By SM 2540

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87559	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLANK	09/25/12 16:02	Total Suspended Solids	ND	5					

Sample ID	RunNo: 87637	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
DI	09/25/12 14:32	Total Dissolved Solids (180)	ND	10					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87559	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
CONTROL	09/25/12 16:03	Total Suspended Solids	102	5	100		102	90 - 110	

Sample ID	RunNo: 87637	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
CONTROL	09/25/12 14:33	Total Dissolved Solids (180)	240	10	226		106	90 - 110	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87559	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-002A	09/25/12 16:14	Total Suspended Solids	ND	5	ND			20	H

Sample ID	RunNo: 87637	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-001A	09/25/12 14:57	Total Dissolved Solids (180)	120	10	110	7.27		20	H

Total Organic Carbon

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87635	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLANK	09/26/12 12:33	Total Organic Carbon	ND	0.5					

11/15/12

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87635	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	09/26/12 9:55	Total Organic Carbon	55.8	0.5	56.3		99.2	90 - 110	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87635	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209429-001ESPK	09/26/12 10:42	Total Organic Carbon	51.5	0.5	50	2.2	98.6	80 - 120	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87635	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209429-001ESPK	09/26/12 10:53	Total Organic Carbon	51.4	0.5	51.5	0.252	98.4	20	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87635	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-001E	09/26/12 10:30	Total Organic Carbon	2	1	2	5.51		20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209429
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209429001

Total(3020) Metals by ICP - 6010C

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
ICB	10/01/12 13:09	Aluminum	ND	0.005					
		Calcium	ND	0.2					
		Iron	ND	0.05					
		Magnesium	0.14	0.02					B
		Potassium	ND	0.1					
		Silicon	ND	0.1					
		Sodium	ND	0.1					
		Zinc	ND	0.005					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
ICV Q	10/01/12 13:11	Silicon	1.0	0.1	1		102	80 - 120	

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
ICV 3	10/01/12 13:13	Calcium	39.9	0.2	40		99.7	80 - 120	
		Magnesium	39.1	0.02	40		97.7	80 - 120	
		Potassium	40.4	0.1	40		101	80 - 120	
		Sodium	39.4	0.1	40		98.5	80 - 120	

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS-6432	10/01/12 19:51	Aluminum	0.525	0.005	0.5		105	80 - 120	
		Iron	0.57	0.05	0.5		113	80 - 120	
		Zinc	0.206	0.005	0.2		103	80 - 120	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209429-001DS	10/01/12 19:56	Aluminum	0.550	0.005	0.5	0.031	104	75 - 125	
		Iron	0.69	0.05	0.5	0.15	109	75 - 125	
		Zinc	0.206	0.005	0.2	ND	103	75 - 125	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209429-001DMSD	10/01/12 19:58	Aluminum	0.546	0.005	0.550	0.673	103	20	
		Iron	0.68	0.05	0.69	1.35	107	20	
		Zinc	0.205	0.005	0.206	0.388	103	20	

11/15/12

Qualifiers:

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- J Analyte detected below quantitation limits
- L Analyzed by a contract laboratory
- ND Not Detected at the Reporting Limit
- O Outside the Range of Dilutions
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209429
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209429001

Total(3020) Metals by ICP - 6010C

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-002DD	10/01/12 20:03	Aluminum	0.028	0.005	0.028	1.78		20	
		Calcium	16.7	0.2	16.7	0.0228		20	
		Iron	0.14	0.05	0.14	0.861		20	
		Magnesium	9.92	0.02	9.96	0.463		20	
		Potassium	0.3	0.1	0.4	0.172		20	
		Silicon	4.0	0.1	4.0	0.145		20	
		Sodium	1.9	0.1	1.9	0.423		20	
		Zinc	ND	0.005	ND			20	

Total (3020) Metals by ICPMS - 6020A

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87728	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
MB-6432	09/28/12 12:22	Antimony	ND	0.005					
		Arsenic	ND	0.005					
		Barium	ND	0.01					
		Beryllium	ND	0.002					
		Cadmium	ND	0.002					
		Chromium	ND	0.001					
		Cobalt	ND	0.01					
		Copper	ND	0.001					
		Lead	ND	0.001					
		Manganese	ND	0.01					
		Nickel	ND	0.01					
		Selenium	ND	0.005					
		Silver	ND	0.003					
		Thallium	ND	0.01					
		Vanadium	ND	0.02					

11/6/12

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

CHAIN OF CUSTODY RECORD

Red Devil Mine Project
Contact Name: Bill Richards
Contact Phone: 206-624-9537

No: RDM-0912-003

Cooler # 3
Lab: Inter-Mountain Laboratories, Inc.
Lab Phone: 800-828-1097

Ecology and Environment, Inc

S1209429-001

Lab #	Location		Analyses	Collected	Sample Time	Numb Cont	Container	Preservative	MS/MSD
-001	0912RD09SW		Total Inorganic Elements	9/11/2012	13:12	3	250 mL HDPE	HNO3 pH<2	Y
	0912RD09SW		Dissolved Inorganic Elements	9/11/2012	13:12	3	250 mL HDPE	HNO3 pH<2	Y
	0912RD09SW	F	Methyl Mercury	9/11/2012	13:12	3	500 mL FLPE	HCl	Y
	0912RD09SW	G	Arsenic Speciation	9/11/2012	13:12	3	250 mL HDPE	HCl	Y
	0912RD09SW		Anions, TSS, TDS, Carbonate, Bicarbonate	9/11/2012	13:12	3	500 mL HDPE	None	Y
	0912RD09SW		Nitrate/Nitrite	9/11/2012	13:12	3	125 mL HDPE	H2SO4 pH<2	Y
	0912RD09SW		Total Organic Carbon	9/11/2012	13:12	6	40 ml Amber Glass	HCl	Y
-002	0912RD21SW		Total Inorganic Elements	9/11/2012	07:00	1	250 mL HDPE	HNO3 pH<2	
	0912RD21SW		Dissolved Inorganic Elements	9/11/2012	07:00	1	250 mL HDPE	HNO3 pH<2	
	0912RD21SW	F	Methyl Mercury	9/11/2012	07:00	1	500 mL FLPE	HCl	
	0912RD21SW	G	Arsenic Speciation	9/11/2012	07:00	1	250 mL HDPE	HCl	
	0912RD21SW		Anions, TSS, TDS, Carbonate, Bicarbonate	9/11/2012	07:00	1	500 mL HDPE	None	
	0912RD21SW		Nitrate/Nitrite	9/11/2012	07:00	1	125 mL HDPE	H2SO4 pH<2	
	0912RD21SW		Total Organic Carbon	9/11/2012	07:00	2	40 ml Amber Glass	HCl	

Special Instructions: Lab filter Anions, Carbonate, and Bicarbonate

1.6°C

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Kathy Boyd	9.25.12	11:45						

DATA REVIEW MEMORANDUM

DATE: November 14, 2012

TO: Bill Richards, Project Manager, E & E, Seattle, WA

FROM: Mindy Song, E & E, Long Beach, CA 11/16/12

SUBJ: Data Review: Red Devil Mine

REFERENCE:

Project ID	Lab Work Order	Lab
EE-1096-0070	1239038	Brooks Rand Labs

I. SAMPLE IDENTIFICATION

For the sampling activities at Red Devil Mine, Ecology and Environment, Inc. (E & E) collected the samples listed on Table 1. Project-specific matrix spike/matrix spike duplicates (MS/MSD) were designated in the field, laboratory also identified batch MS/MSD's as batch QC for additional analytical testing. All samples were sent to Brooks Rand Labs in Seattle, WA for analysis. All tables are included at the end of this memorandum.

Data were reviewed for field and laboratory precision, accuracy, and completeness in accordance with procedures and quality control (QC) limits, the current laboratory Quality Assurance Manual (QAM) and current standard operating procedures (SOPs). Laboratory data qualifiers for compound identification and quantitation were accepted. Any additional data review qualifiers added are noted below and listed on the tables at the end of this memorandum. Definitions of all data qualifiers are given in the report.

Table 1 Sample Listing

Work Order	Matrix	Sample ID	Lab ID	Sample Date	MS/MSD	ID Corrections
1239038	Water	S1209429-001	1239038-01	09/11/2012	X	0912RD09SW
1239038	Water	S1209429-002	1239038-02	09/11/2012		0912RD21SW
1239038	Water	S1209431-001	1239038-03	09/11/2012		0912RD04SW
1239038	Water	S1209431-002	1239038-04	09/11/2012		0912RD08SW
1239038	Water	S1209431-003	1239038-05	09/12/2012		0912RD10SW
1239038	Water	S1209431-004	1239038-06	09/11/2012		0912RD12SW
1239038	Water	S1209432-006	1239038-07	09/11/2012		0912RD05SW
1239038	Water	S1209432-007	1239038-08	09/11/2012		0912RD06SW

Work Orders, Tests and Number of Samples included in this DVM

Work Orders	Matrix	Test Method	Method Name	Number of Samples	Sample Type
1239038	Water	EPA 1632	As (III)	8	
1239038	Water	EPA 1632	As(Inorg)	8	
1239038	Water	EPA 1630	MeHg	8	

II. SAMPLE PROCEDURES

All samples were collected as specified in the work plan and documented on the chain-of-custody (COC) and in field notebooks. Samples were analyzed as specified on the COC. Samples were packaged, shipped and received as specified in the work plan. All samples must be received cold (4 ±2) °C and in good condition as documented on the Cooler Receipt Form.

REVIEW RESULTS:

All sample procedures were followed and the sample coolers were received at 0.8 °C. No problems with the condition of the sample upon receipt are documented.

III. LABORATORY DATA

1.0 HOLDING TIMES

Holding times are established and monitored to ensure analytical results accurately represent analyte concentrations in a sample at the time of collection. Exceeding the holding time for a sample generally results in a loss of the analyte due to a variety of mechanisms, such as deposition on the sample container walls or precipitation.

REVIEW RESULTS:

All samples were analyzed within the project and method specified holding times for all analytes. No data were qualified.

2.0 BLANKS

Laboratory and field blank samples are analyzed and evaluated to determine the existence and magnitude of possible contamination during the sampling and analysis process. As noted in Table 2, analyte concentrations in the blanks are generally below the practical quantitation limit (PQL). If the analyte is present in the sample at similar trace levels, then the analyte is likely a common background contaminant from some phase of the sampling, extraction, or analytical procedure and associated low level sample concentrations are not considered to be site related. If the analyte concentration is above the PQL, then there is a potential contamination problem and sample results may be biased high or the data unusable.

REVIEW RESULTS:

All blanks were performed at the required frequency. No analytes were detected in the method blanks at reporting limit levels.

3.0 SURROGATE SPIKE RECOVERY

Laboratory performance for individual samples analyzed for organic compounds is established by means of surrogate spiking activities. Samples are spiked with surrogate compounds prior to preparation and analysis. Unusually low or high surrogate recovery values may indicate some deficiency in the analytical system or that some matrix effects exist, resulting in low or high sample results for target compounds. Sample surrogate recoveries outside QC limits (if applicable) are presented in Table 3.

REVIEW RESULTS:

Not applicable for these analyses.

4.0 MATRIX SPIKE AND MATRIX SPIKE DUPLICATE ANALYSIS

The matrix spike and matrix spike duplicate (MS/MSD) analyses are intended to provide information about the affects that the sample matrix exerts on the digestion/extraction and measurement methodology. MS recovery values that do not meet laboratory QC criteria may indicate that sample analyte results are being attenuated in the analysis procedure. These results are presented in Table 4 (if applicable). The

potential sample bias may be estimated by noting the degree to which the MS concentration was elevated or lowered in the spike analysis. However, this bias should serve only as approximations; sample-specific problems may be the cause of the discrepancy, particularly in soil samples. Recoveries of a post-digestion spike or a laboratory control sample (LCS) are used to verify that the analytical methodology is acceptable and that MS recoveries are due to matrix effects. An MSD analysis is performed to evaluate the precision of the sample results. Precision is measured as the relative percent difference (RPD) between analytical results for duplicate samples. The laboratory's failure to produce similar results for MSD samples may indicate that the samples were non-homogeneous (particularly in soil samples), or that method defects may exist in the laboratory's techniques.

REVIEW RESULTS:

The MS/MSD sample analyses were performed at the required frequency. MS/MSD recoveries were within the control limits generated by the laboratory.

5.0 LABORATORY CONTROL SAMPLE ANALYSIS

The LCS is analyzed to monitor the efficiency of the digestion/extraction procedure and analytical instrument operation. The ability of the laboratory to successfully analyze an LCS demonstrates that there are no analytical problems related to the digestion/sample preparation procedures and/or instrument operations. The LCS results outside QC limits are presented in Table 5 (if applicable). Sporadic and marginal QC failures for multiple component methods do not indicate an analytical concern. If recoveries are high and the compounds are not detected in the samples, then no data qualification is required. All recoveries should be above 10% or the non-detect results flagged "UR" as rejected.

REVIEW RESULTS:

All LCS analyses were within control limits and performed at the required frequency.

IV. COMPOUND IDENTIFICATION AND QUANTITATION

Compound identities are assigned by comparing sample compound retention times to retention times from known (standard) compounds and identification of an acceptable mass spectrum. Compounds detected below the PQL in samples should be considered estimated and are qualified "J." The samples with compounds above the linear range were all re-analyzed at a higher dilution factor.

REVIEW RESULTS:

All compound identification and quantitation criteria were achieved.

V. FIELD DUPLICATE SAMPLE RESULTS

Field duplicate samples were collected and analyzed as an indication of overall precision for both field and laboratory. Field duplicate results are summarized in Table 7 (if applicable). The results are expected to have more variability than laboratory duplicates, which measure only laboratory precision. It is expected also that soil field duplicates will exhibit greater variance than water field duplicates due to the difficulties associated with collecting identical field samples. The QC criteria used to assess field duplicate samples for this project was limits of 70% RPD for soils and 40% RPD for waters, or twice the general laboratory duplicate criteria. If both compounds were below the laboratory PQL or one of the compounds was present as a non-detect, then the compounds are generally not qualified due to field duplicate precision. There are no guidelines regarding data qualification based on poor field duplicate precision. Professional judgment was used to determine whether or not to qualify results.

REVIEW RESULTS:

Field duplicates analyses were performed on 0912RD21SW and 0912RD06SW. All RPDs were within the acceptance limit.

The RPD ratings are listed on Table 7 as "Good" if the RPD is less than field duplicate QC criteria of 40% and as "Poor" if the RPD exceeded the field duplicate QC criteria.

All the results show good precision in the sample pair as noted on table 7. Qualifiers were only added to the field duplicate sample pair results as noted.

6.0 OVERALL ASSESSMENT OF DATA

All data were reviewed and considered usable as noted in this report.

Table 2 - List of Positive Results for Blank Samples

Method	Sample ID	Samp Type	Analyte	Result	Qual	Anal Type	Units	PQL
None.								

Table 2A - List of Samples Qualified for Method Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
None.						

Table 2B - List of Samples Qualified for Field Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
None.						

Table 3 - List of Samples with Surrogates outside Control Limits

Method	Sample ID	Sample Type	Analyte	Rec.	Low Limit	High Limit	Dil Fac	Sample Qual.
None.								

Table 4 - List MS/MSD Recoveries and RPDs outside Control Limits

Method	Sample ID	Sample Type	Analyte	Orig. Result	Spike Amount	Rec.	Dil Fac.	Low Limit	High Limit	Sample Qual	Reportable
None.											

Sample ID	Analyte	Method	RPD	RPD Limit	No. of Affected Samples	Samp Qual
None.						

Table 5 - List LCS Recoveries outside Control Limits

Method	Sample ID	Analyte	Rec.	Low Limit	High Limit	No. of Affected Samples	Samp Qual
None.							

Table 6 –Samples that were Re-analyzed

Sample ID	Lab ID	Method	Sample Type	Action
None.				

Table 7 – Summary of Field Duplicate Results

Method	Analyte	Units	0912RD21SW	0912RD06SW	RPD	Rating	Sample Qualifier
EPA 1632	As(III)	ug/L	8.49	8.97	5	Good	
EPA 1632	As(Inorg)	ug/L	80.5	85.6	6	Good	
Calculation	As(V)	ug/L	72.0	76.6	6	Good	
EPA 1630	MeHg	ng/L	0.128	0.132	3	Good	

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
S1209429-001										
1239038-01	As(III)	Water	T	9.65		0.320	1.00	µg/L	B121819	1200751
1239038-01	As(Inorg)	Water	T	80.9		3.20	10.0	µg/L	B121818	1200769
1239038-01	As(V)	Water	T	71.2		3.20	10.0	µg/L	[CALC]	N/A
1239038-01	MeHg	Water	T	0.118		0.020	0.049	ng/L	B121851	1200784
S1209429-002										
1239038-02	As(III)	Water	T	8.49		0.160	0.500	µg/L	B121819	1200751
1239038-02	As(Inorg)	Water	T	80.5		1.60	5.00	µg/L	B121818	1200769
1239038-02	As(V)	Water	T	72.0		1.60	5.00	µg/L	[CALC]	N/A
1239038-02	MeHg	Water	T	0.128		0.020	0.051	ng/L	B121851	1200784
S1209431-001										
1239038-03	As(III)	Water	T	0.256		0.008	0.025	µg/L	B121819	1200751
1239038-03	As(Inorg)	Water	T	13.4		0.320	1.00	µg/L	B121818	1200769
1239038-03	As(V)	Water	T	13.2		0.320	1.00	µg/L	[CALC]	N/A
1239038-03	MeHg	Water	T	0.236		0.020	0.051	ng/L	B121851	1200784
S1209431-002										
1239038-04	As(III)	Water	T	4.87		0.160	0.500	µg/L	B121819	1200751
1239038-04	As(Inorg)	Water	T	83.0		1.60	5.00	µg/L	B121818	1200769
1239038-04	As(V)	Water	T	78.2		1.60	5.00	µg/L	[CALC]	N/A
1239038-04	MeHg	Water	T	0.137		0.020	0.050	ng/L	B121851	1200784
S1209431-003										
1239038-05	As(III)	Water	T	0.094		0.008	0.025	µg/L	B121819	1200751
1239038-05	As(Inorg)	Water	T	0.868		0.053	0.167	µg/L	B121818	1200769
1239038-05	As(V)	Water	T	0.774		0.053	0.167	µg/L	[CALC]	N/A
1239038-05	MeHg	Water	T	0.101		0.020	0.050	ng/L	B121851	1200784
S1209431-004										
1239038-06	As(III)	Water	T	0.400		0.008	0.025	µg/L	B121819	1200751
1239038-06	As(Inorg)	Water	T	25.0		0.320	1.00	µg/L	B121818	1200769
1239038-06	As(V)	Water	T	24.6		0.320	1.00	µg/L	[CALC]	N/A
1239038-06	MeHg	Water	T	0.118		0.019	0.049	ng/L	B121851	1200784

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Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
S1209432-006										
1239038-07	As(III)	Water	T	492		6.40	20.0	µg/L	B121819	1200751
1239038-07	As(Inorg)	Water	T	767		16.0	50.0	µg/L	B121818	1200769
1239038-07	As(V)	Water	T	275		16.0	50.0	µg/L	[CALC]	N/A
1239038-07	MeHg	Water	T	0.392		0.021	0.054	ng/L	B121851	1200784
S1209432-007										
1239038-08	As(III)	Water	T	8.97		0.320	1.00	µg/L	B121819	1200751
1239038-08	As(Inorg)	Water	T	85.6		3.20	10.0	µg/L	B121818	1200769
1239038-08	As(V)	Water	T	76.6		3.20	10.0	µg/L	[CALC]	N/A
1239038-08	MeHg	Water	T	0.132		0.021	0.052	ng/L	B121851	1200784

11/15/12

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Method Blanks & Reporting Limits

Batch: B121818
Matrix: Water
Method: EPA 1632
Analyte: As(Inorg)

Sample	Result	Units
B121818-BLK1	0.127	µg/L
B121818-BLK2	0.120	µg/L
B121818-BLK3	0.128	µg/L

Average: 0.125 **Standard Deviation:** 0.004 **MDL:** 0.160
Limit: 0.320 **Limit:** 0.107 **MRL:** 0.500

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Method Blanks & Reporting Limits

Batch: B121819
Matrix: Water
Method: EPA 1632
Analyte: As(III)

Sample	Result	Units
B121819-BLK1	0.034	µg/L
B121819-BLK2	0.00	µg/L
B121819-BLK3	0.00	µg/L

Average: 0.011 **Standard Deviation:** 0.020 **MDL:** 0.160
Limit: 0.320 **Limit:** 0.107 **MRL:** 0.500

11/15/12

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Method Blanks & Reporting Limits

Batch: B121851
Matrix: Water
Method: EPA 1630
Analyte: MeHg

Sample	Result	Units
B121851-BLK1	0.010	ng/L
B121851-BLK2	0.007	ng/L
B121851-BLK3	0.006	ng/L
B121851-BLK4	0.004	ng/L

Average: 0.007 **Standard Deviation:** 0.003 **MDL:** 0.021
Limit: 0.045 **Limit:** 0.015 **MRL:** 0.051

11/15/12

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CHAIN OF CUSTODY RECORD

BRL Report 1239038

Inter-Mountain Laboratories, Inc.
1673 Terra Ave., Sheridan, WY 82801
Phone 800-828-1097
FAX 307-672-6053

1239038

Relinquished by: _____ Date/Time: 9-25-12 @ 15:07

Received by Lab: _____ Date/Time: 9/26/12 0920

Sent to: Summit Env. Tech. Akron, OH 44310

Phone: 800-278-0140

P.O. 24042

Sample No.	Client ID	Sample Date	Sample Time	Number of Containers	Sample Matrix	Analyses/ Parameters	Remarks
S1209429-001	0912RD09SW	9/11/2012	13:12	6	water	Methyl Mercury/AS Speciation	**MATRIX Spike/MSD this sample**
S1209429-002	0912RD21SW	9/11/2012	7:00	6	water	Methyl Mercury/AS Speciation	
S1209431-001	0912RD04SW	9/11/2012	17:26	2	water	Methyl Mercury/AS Speciation	Call if you have any questions.
S1209431-002	0912RD08SW	9/11/2012	11:11	2	water	Methyl Mercury/AS Speciation	
S1209431-003	0912RD10SW	9/12/2012	11:52	2	water	Methyl Mercury/AS Speciation	**Please e-mail Results by:**
S1209431-004	0912RD12SW	9/11/2012	16:27	2	water	Methyl Mercury/AS Speciation	**Reqest Standard TAT (20Days)**
S1209432-006	0912RD05SW	9/11/2012	15:23	2	water	Methyl Mercury/AS Speciation	**Please include EDD and QC report**
S1209432-007	0912RD06SW	9/11/2012	11:57	2	water	Methyl Mercury/AS Speciation	Thank you
							e-mail: cmattson@imlinc.com +
							lketron@imlinc.com

DATA REVIEW MEMORANDUM

DATE: November 15, 2012

TO: Bill Richards, Project Manager, E & E, Seattle, WA

FROM: Mindy Song, E & E, Long Beach, CA 11/16/12

SUBJ: Data Review: Red Devil Mine

REFERENCE:

Project ID	Lab Work Order	Lab
EE-1096-0070	S1209430	Inter-Mountain Labs

I. SAMPLE IDENTIFICATION

For the sampling activities at Red Devil Mine, Ecology and Environment, Inc. (E & E) collected the samples listed on Table 1. Project-specific matrix spike/matrix spike duplicates (MS/MSD) were designated in the field, laboratory also identified batch MS/MSD's as batch QC for additional analytical testing. All samples were sent to Inter-Mountain Labs in Sheridan, WY for analysis. All tables are included at the end of this memorandum.

Data were reviewed for field and laboratory precision, accuracy, and completeness in accordance with procedures and quality control (QC) limits, the current laboratory Quality Assurance Manual (QAM) and current standard operating procedures (SOPs). Laboratory data qualifiers for compound identification and quantitation were accepted. Any additional data review qualifiers added are noted below and listed on the tables at the end of this memorandum. Definitions of all data qualifiers are given in the report.

Table 1 Sample Listing

Work Order	Matrix	Sample ID	Lab ID	Sample Date	MS/MSD	ID Corrections
S1209430	Water	0912MW06GW	S1209430-001	09/09/2012		
S1209430	Water	0912MW15GW	S1209430-002	09/08/2012		
S1209430	Water	0912MW16GW	S1209430-003	09/08/2012		
S1209430	Water	0912MW17GW	S1209430-004	09/08/2012		
S1209430	Water	0912MW20GW	S1209430-005	09/09/2012		
S1209430	Water	0912MW21GW	S1209430-006	09/08/2012		
S1209430	Water	0912MW24GW	S1209430-007	09/09/2012		
S1209430	Water	0912MW25GW	S1209430-008	09/09/2012		
S1209430	Water	0912MW27GW	S1209430-009	09/09/2012	X	
S1209430	Water	0912MW29GW	S1209430-010	09/09/2012		
S1209430	Water	0912MW32GW	S1209430-011	09/08/2012		
S1209430	Water	0912MW33GW	S1209430-012	09/08/2012	X	
S1209430	Water	0912MW53GW	S1209430-013	09/09/2012		
S1209430	Water	0912MW54GW	S1209430-014	09/09/2012		
S1209430	Water	0912EB01D1	S1209430-015	09/09/2012		

Work Orders, Tests and Number of Samples included in this DVM

Work Orders	Matrix	Test Method	Method Name	Number of Samples	Sample Type
S1209430	Water	SM 2540	TDS	15	
S1209430	Water	SM 2540	TSS	15	
S1209430	Water	SM 2320B	Alkalinity	15	
S1209430	Water	EPA 300.0/353.2	Anions	15	
S1209430	Water	EPA 6010C/6020A	Total Metals	15	

II. SAMPLE PROCEDURES

All samples were collected as specified in the work plan and documented on the chain-of-custody (COC) and in field notebooks. Samples were analyzed as specified on the COC. Samples were packaged, shipped and received as specified in the work plan. All samples must be received cold (4 ±2) °C and in good condition as documented on the Cooler Receipt Form.

REVIEW RESULTS:

All sample procedures were followed and the sample coolers were received at 4.9 °C. No problems with the condition of the sample upon receipt are documented.

III. LABORATORY DATA

1.0 HOLDING TIMES

Holding times are established and monitored to ensure analytical results accurately represent analyte concentrations in a sample at the time of collection. Exceeding the holding time for a sample generally results in a loss of the analyte due to a variety of mechanisms, such as deposition on the sample container walls or precipitation.

REVIEW RESULTS:

All samples were analyzed within the project and method specified holding times for all analytes except Alkalinity, Total Dissolved solids, and Total Suspended Solids. The detected Alkalinity, TDS and TSS results were qualified as estimated (J) and the non-detected Alkalinity, TDS and TSS results were qualified as estimated (UJ). Also, for sample 0912MW27GW, re-analysis of Chloride, Sulfate, and Fluoride due to matrix interference was done outside of holding time and reported results were qualified as estimated (J).

2.0 BLANKS

Laboratory and field blank samples are analyzed and evaluated to determine the existence and magnitude of possible contamination during the sampling and analysis process. As noted in Table 2, analyte concentrations in the blanks are generally below the practical quantitation limit (PQL). If the analyte is present in the sample at similar trace levels, then the analyte is likely a common background contaminant from some phase of the sampling, extraction, or analytical procedure and associated low level sample concentrations are not considered to be site related. If the analyte concentration is above the PQL, then there is a potential contamination problem and sample results may be biased high or the data unusable.

REVIEW RESULTS:

All blanks were performed at the required frequency. No analytes except trace amount (0.14 mg/L) of magnesium were detected in the method blank at reporting limit levels. Finding does not require qualification since sample concentration was greater than 5x the blank concentration. Also, trace amount of Antimony (0.12 ug/L) and Magnesium (70 ug/L) were detected in the equipment blank (0912EB01DI). Finding does not require qualification since sample concentration was greater than 5x the blank concentration,

3.0 SURROGATE SPIKE RECOVERY

Laboratory performance for individual samples analyzed for organic compounds is established by means of surrogate spiking activities. Samples are spiked with surrogate compounds prior to preparation and analysis. Unusually low or high surrogate recovery values may indicate some deficiency in the analytical system or that some matrix effects exist, resulting in low or high sample results for target compounds. Sample surrogate recoveries outside QC limits (if applicable) are presented in Table 3.

REVIEW RESULTS:

Not applicable for these analyses.

4.0 MATRIX SPIKE AND MATRIX SPIKE DUPLICATE ANALYSIS

The matrix spike and matrix spike duplicate (MS/MSD) analyses are intended to provide information about the affects that the sample matrix exerts on the

digestion/extraction and measurement methodology. MS recovery values that do not meet laboratory QC criteria may indicate that sample analyte results are being attenuated in the analysis procedure. These results are presented in Table 4 (if applicable). The potential sample bias may be estimated by noting the degree to which the MS concentration was elevated or lowered in the spike analysis. However, this bias should serve only as approximations; sample-specific problems may be the cause of the discrepancy, particularly in soil samples. Recoveries of a post-digestion spike or a laboratory control sample (LCS) are used to verify that the analytical methodology is acceptable and that MS recoveries are due to matrix effects. An MSD analysis is performed to evaluate the precision of the sample results. Precision is measured as the relative percent difference (RPD) between analytical results for duplicate samples. The laboratory's failure to produce similar results for MSD samples may indicate that the samples were non-homogeneous (particularly in soil samples), or that method defects may exist in the laboratory's techniques.

REVIEW RESULTS:

The MS/MSD sample analyses were performed on samples 0912MW27GW and 0912MW33GW at the required frequency. MS/MSD recoveries were within the control limits generated by the laboratory.

5.0 LABORATORY CONTROL SAMPLE ANALYSIS

The LCS is analyzed to monitor the efficiency of the digestion/extraction procedure and analytical instrument operation. The ability of the laboratory to successfully analyze an LCS demonstrates that there are no analytical problems related to the digestion/sample preparation procedures and/or instrument operations. The LCS results outside QC limits are presented in Table 5 (if applicable). Sporadic and marginal QC failures for multiple component methods do not indicate an analytical concern. If recoveries are high and the compounds are not detected in the samples, then no data qualification is required. All recoveries should be above 10% or the non-detect results flagged "UR" as rejected.

REVIEW RESULTS:

All LCS analyses were within control limits and performed at the required frequency.

IV. COMPOUND IDENTIFICATION AND QUANTITATION

Compound identities are assigned by comparing sample compound retention times to retention times from known (standard) compounds and identification of an acceptable mass spectrum. Compounds detected below the PQL in samples should be considered estimated and are qualified "J." The samples with compounds above the linear range were all re-analyzed at a higher dilution factor.

REVIEW RESULTS:

All compound identification and quantitation criteria were achieved.

V. FIELD DUPLICATE SAMPLE RESULTS

Field duplicate samples were collected and analyzed as an indication of overall precision for both field and laboratory. Field duplicate results are summarized in Table 7 (if applicable). The results are expected to have more variability than laboratory duplicates, which measure only laboratory precision. It is expected also that soil field duplicates will exhibit greater variance than water field duplicates due to the difficulties associated with collecting identical field samples. The QC criteria used to assess field duplicate samples for this project was limits of 70% RPD for soils and 40% RPD for waters, or twice the general laboratory duplicate criteria. If both compounds were below the laboratory PQL or one of the compounds was present as a non-detect, then the compounds are generally not qualified due to field duplicate precision. There are no guidelines regarding data qualification based on poor field duplicate precision. Professional judgment was used to determine whether or not to qualify results.

REVIEW RESULTS:

Two Field duplicates analyses were performed on this SDG. The RPD ratings are listed on Table 7 as "Good" if the RPD is less than field duplicate QC criteria of 40% and as "Poor" if the RPD exceeded the field duplicate QC criteria. The detected Nitrogen, Nitrate-Nitrite result in 0912MW53GW was qualified as estimated (J) and the non-detected Nitrogen, Nitrate-Nitrite result in 0912MW20GW was qualified as estimated (UJ). Also, the detected Al, Fe, Cr, and Cu results in samples 0912MW27GW and 0912MW54GW were qualified as estimated (J) and the non-detected Al result in sample 0912ME54GW was qualified as estimated (UJ).

All the results show good precision in the sample pair as noted on table 7. Qualifiers were only added to the field duplicate sample pair results as noted.

6.0 OVERALL ASSESSMENT OF DATA

All data were reviewed and considered usable with qualification as noted in this report.

Table 2 - List of Positive Results for Blank Samples

Method	Sample ID	Samp Type	Analyte	Result	Qual	Anal Type	Units	PQL
EPA 6020A	0912EB01DI		Antimony	0.12			ug/L	
EPA 6010C	0912EB01DI		Magnesium	70			ug/L	
EPA 6010C	MBLK		Magnesium	0.14			mg/L	

Table 2A - List of Samples Qualified for Method Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
None.						

Table 2B - List of Samples Qualified for Field Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
None.						

Table 3 - List of Samples with Surrogates outside Control Limits

Method	Sample ID	Sample Type	Analyte	Rec.	Low Limit	High Limit	Dil Fac	Sample Qual.
None.								

Table 4 - List MS/MSD Recoveries and RPDs outside Control Limits

Method	Sample ID	Sample Type	Analyte	Orig. Result	Spike Amount	Rec.	Dil Fac.	Low Limit	High Limit	Sample Qual	Reportable
None.											

Sample ID	Analyte	Method	RPD	RPD Limit	No. of Affected Samples	Samp Qual
None.						

Table 5 - List LCS Recoveries outside Control Limits

Method	Sample ID	Analyte	Rec.	Low Limit	High Limit	No. of Affected Samples	Samp Qual
None.							

Table 6 –Samples that were Re-analyzed

Sample ID	Lab ID	Method	Sample Type	Action
None.				

Table 7 – Summary of Field Duplicate Results:

Method	Analyte	Units	0912MW20GW	0912MW53GW	RPD	Rating	Sample Qualifier
SM 2320B	Total Alkalinity	mg/L	93	89	4	Good	
EPA 300.0	Chloride	mg/L	0.5	0.5	0	Good	
EPA 300.0	Fluoride	mg/L	<0.2	<0.2	0	Good	
EPA 300.0	Sulfate	mg/L	17.7	17.6	1	Good	
SM 2540	TDS	mg/L	140	150	7	Good	
SM 2540	TSS	mg/L	<5	<5	0	Good	
EPA 353.2	Nitrogen, Nitrate-Nitrite	mg/L	<0.05	0.10	NC	Poor	J
EPA 6010C	Aluminum	ug/L	<50	<50	0	Good	
EPA 6010C	Calcium	ug/L	19900	19600	2	Good	
EPA 6010C	Iron	ug/L	30	20	40	Good	
EPA 6010C	Magnesium	ug/L	15700	15200	3	Good	
EPA 6010C	Potassium	ug/L	600	600	0	Good	
EPA 6010C	Silicone	ug/L	5000	4900	2	Good	
EPA 6010C	Sodium	ug/L	2400	2400	0	Good	
EPA 6010C	Zinc	ug/L	<10	<10	0	Good	
EPA 6020A	Antimony	ug/L	871	866	1	Good	
EPA 6020A	Arsenic	ug/L	221	233	5	Good	
EPA 6020A	Barium	ug/L	40	40	0	Good	
EPA 6020A	Beryllium	ug/L	<0.2	<0.2	0	Good	
EPA 6020A	Cadmium	ug/L	<0.5	<0.5	0	Good	
EPA 6020A	Chromium	ug/L	<0.5	<0.5	0	Good	
EPA 6020A	Cobalt	ug/L	<0.1	<0.1	0	Good	

NC: Not calculated

Method	Analyte	Units	0912MW20GW	0912MW53GW	RPD	Rating	Sample Qualifier
EPA 6020A	Copper	ug/L	<0.9	<0.9	0	Good	
EPA 6020A	Lead	ug/L	<0.3	<0.3	0	Good	
EPA 6020A	Manganese	ug/L	5	5	0	Good	
EPA 6020A	Nickel	ug/L	<2	<2	0	Good	
EPA 6020A	Selenium	ug/L	<3	<3	0	Good	
EPA 6020A	Silver	ug/L	<0.3	<0.3	0	Good	
EPA 6020A	Thallium	ug/L	<0.3	<0.3	0	Good	
EPA 6020A	Vanadium	ug/L	<2	<2	0	Good	

Method	Analyte	Units	0912MW27GW	0912MW54GW	RPD	Rating	Sample Qualifier
SM 2320B	Total Alkalinity	mg/L	218	221	1	Good	
EPA 300.0	Chloride	mg/L	1.0	1.1	1	Good	
EPA 300.0	Fluoride	mg/L	<0.2	<0.2	0	Good	
EPA 300.0	Sulfate	mg/L	230	233	1	Good	
SM 2540	TDS	mg/L	640	620	3	Good	
SM 2540	TSS	mg/L	<5	<5	0	Good	
EPA 353.2	Nitrogen, Nitrate-Nitrite	mg/L	<0.05	<0.05	0	Good	
EPA 6010C	Aluminum	ug/L	150	<50	NC	Poor	J
EPA 6010C	Calcium	ug/L	98600	94700	4	Good	
EPA 6010C	Iron	ug/L	310	50	144	Poor	J
EPA 6010C	Magnesium	ug/L	59000	54700	8	Good	
EPA 6010C	Potassium	ug/L	2300	1900	19	Good	
EPA 6010C	Silicone	ug/L	7300	6700	9	Good	
EPA 6010C	Sodium	ug/L	21400	20800	3	Good	
EPA 6010C	Zinc	ug/L	20	20	0	Good	
EPA 6020A	Antimony	ug/L	12.9	9.23	33	Good	
EPA 6020A	Arsenic	ug/L	31	29	7	Good	
EPA 6020A	Barium	ug/L	60	50	18	Good	
EPA 6020A	Beryllium	ug/L	<0.2	<0.2	0	Good	
EPA 6020A	Cadmium	ug/L	<0.5	<0.5	0	Good	
EPA 6020A	Chromium	ug/L	8.9	4.3	70	Poor	
EPA 6020A	Cobalt	ug/L	1.9	1.3	38	Good	

NC: Not calculated

Method	Analyte	Units	0912MW20GW	0912MW53GW	RPD	Rating	Sample Qualifier
EPA 6020A	Copper	ug/L	2.1	1.1	63	Poor	J
EPA 6020A	Lead	ug/L	<0.3	<0.3	0	Good	
EPA 6020A	Manganese	ug/L	1280	1070	18	Good	
EPA 6020A	Nickel	ug/L	48	50	4	Good	
EPA 6020A	Selenium	ug/L	<3	<3	0	Good	
EPA 6020A	Silver	ug/L	<0.3	<0.3	0	Good	
EPA 6020A	Thallium	ug/L	<0.3	<0.3	0	Good	
EPA 6020A	Vanadium	ug/L	<2	<2	0	Good	

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/8/2012
Report ID: S1209430001

Project: Red Devil Mine
Lab ID: S1209430-001
Client Sample ID: 0912MW06GW
COC: RDM-0912-011

Work Order: S1209430
Collection Date: 9/9/2012 12:40:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	230 J	10	H	mg/L	09/25/2012 1459 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1615 JCG	SM 2540
Alkalinity, Total (As CaCO3)	178 J	5	H	mg/L	09/25/2012 1946 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	217 J	5	H	mg/L	09/25/2012 1946 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 1946 KV	SM 2320B
Chloride	0.8	0.2		mg/L	09/25/2012 1752 AM	EPA 300.0
Fluoride	ND	0.2		mg/L	09/25/2012 1752 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	ND	0.05		mg/L	09/28/2012 1600 RH	EPA 353.2
Sulfate	25.0	0.2		mg/L	09/25/2012 1752 AM	EPA 300.0
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2005 DG	6010C
Antimony	6.19	0.07		µg/L	09/28/2012 1525 MS	6020A
Arsenic	34	2		µg/L	09/28/2012 1525 MS	6020A
Barium	80	10		µg/L	09/28/2012 1525 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1525 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1525 MS	6020A
Calcium	32500	50		µg/L	10/01/2012 2005 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1525 MS	6020A
Cobalt	1.5	0.1		µg/L	09/28/2012 1525 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1525 MS	6020A
Iron	2460	20		µg/L	10/01/2012 2005 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1525 MS	6020A
Magnesium	30400	20		µg/L	10/01/2012 2005 DG	6010C
Manganese	603	2		µg/L	09/28/2012 1525 MS	6020A
Nickel	3	2		µg/L	09/28/2012 1525 MS	6020A
Potassium	900	400		µg/L	10/01/2012 2005 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1525 MS	6020A
Silicon	9200	400		µg/L	10/01/2012 2005 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1525 MS	6020A
Sodium	4400	200		µg/L	10/01/2012 2005 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1525 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1525 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2005 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/8/2012
Report ID: S1209430001

Project: Red Devil Mine
Lab ID: S1209430-002
Client Sample ID: 0912MW15GW
COC: RDM-0912-011

Work Order: S1209430
Collection Date: 9/8/2012 2:00:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	310 J	10	H	mg/L	09/25/2012 1500 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1616 JCG	SM 2540
Alkalinity, Total (As CaCO3)	63 J	5	H	mg/L	09/25/2012 1953 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	77 J	5	H	mg/L	09/25/2012 1953 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 1953 KV	SM 2320B
Chloride	3.5	0.2		mg/L	09/25/2012 1805 AM	EPA 300.0
Fluoride	ND	0.2		mg/L	09/25/2012 1805 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	0.21	0.05		mg/L	09/25/2012 1559 RH	EPA 353.2
Sulfate	128	0.2		mg/L	09/25/2012 1805 AM	EPA 300.0
Total Metals						
Aluminum	50	50		µg/L	10/01/2012 2008 DG	6010C
Antimony	8430	0.07		µg/L	09/28/2012 1802 MS	6020A
Arsenic	5370	2		µg/L	09/28/2012 1802 MS	6020A
Barium	40	10		µg/L	09/28/2012 1530 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1530 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1530 MS	6020A
Calcium	23100	50		µg/L	10/01/2012 2008 DG	6010C
Chromium	3.3	0.5		µg/L	09/28/2012 1530 MS	6020A
Cobalt	0.1	0.1		µg/L	09/28/2012 1530 MS	6020A
Copper	2.0	0.9		µg/L	09/28/2012 1530 MS	6020A
Iron	40	20		µg/L	10/01/2012 2008 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1530 MS	6020A
Magnesium	35900	20		µg/L	10/01/2012 2008 DG	6010C
Manganese	3	2		µg/L	09/28/2012 1530 MS	6020A
Nickel	12	2		µg/L	09/28/2012 1530 MS	6020A
Potassium	1700	400		µg/L	10/01/2012 2008 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1530 MS	6020A
Silicon	7000	400		µg/L	10/01/2012 2008 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1530 MS	6020A
Sodium	4500	200		µg/L	10/01/2012 2008 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1530 MS	6020A
Vanadium	2	2		µg/L	09/28/2012 1530 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2008 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/8/2012
Report ID: S1209430001

Project: Red Devil Mine
Lab ID: S1209430-003
Client Sample ID: 0912MW16GW
COC: RDM-0912-011

Work Order: S1209430
Collection Date: 9/8/2012 3:35:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	350 J	10	H	mg/L	09/25/2012 1501 JCG	SM 2540
Total Suspended Solids	6 J	5	H	mg/L	09/25/2012 1617 JCG	SM 2540
Alkalinity, Total (As CaCO3)	113 J	5	H	mg/L	09/25/2012 1959 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	138 J	5	H	mg/L	09/25/2012 1959 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 1959 KV	SM 2320B
Chloride	0.3	0.2		mg/L	09/25/2012 1817 AM	EPA 300.0
Fluoride	ND	0.2		mg/L	09/25/2012 1817 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	0.05	0.05		mg/L	09/25/2012 1600 RH	EPA 353.2
Sulfate	142	0.2		mg/L	09/25/2012 1817 AM	EPA 300.0
Total Metals						
Aluminum	100	50		µg/L	10/01/2012 2010 DG	6010C
Antimony	757	0.07		µg/L	09/28/2012 1535 MS	6020A
Arsenic	830	2		µg/L	09/28/2012 1535 MS	6020A
Barium	50	10		µg/L	09/28/2012 1535 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1535 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1535 MS	6020A
Calcium	24400	50		µg/L	10/01/2012 2010 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1535 MS	6020A
Cobalt	7.9	0.1		µg/L	09/28/2012 1535 MS	6020A
Copper	1.3	0.9		µg/L	09/28/2012 1535 MS	6020A
Iron	11200	20		µg/L	10/01/2012 2010 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1535 MS	6020A
Magnesium	42800	20		µg/L	10/01/2012 2010 DG	6010C
Manganese	5440	2		µg/L	09/28/2012 1817 MS	6020A
Nickel	6	2		µg/L	09/28/2012 1535 MS	6020A
Potassium	2200	400		µg/L	10/01/2012 2010 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1535 MS	6020A
Silicon	8000	400		µg/L	10/01/2012 2010 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1535 MS	6020A
Sodium	5000	200		µg/L	10/01/2012 2010 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1535 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1535 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2010 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/8/2012
Report ID: S1209430001

Project: Red Devil Mine
Lab ID: S1209430-004
Client Sample ID: 0912MW17GW
COC: RDM-0912-011

Work Order: S1209430
Collection Date: 9/8/2012 4:59:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	130 J	10	H	mg/L	09/25/2012 1502 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1618 JCG	SM 2540
Alkalinity, Total (As CaCO3)	111 J	5	H	mg/L	09/25/2012 2006 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	135 J	5	H	mg/L	09/25/2012 2006 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 2006 KV	SM 2320B
Chloride	0.6	0.2		mg/L	09/25/2012 1829 AM	EPA 300.0
Fluoride	ND	0.2		mg/L	09/25/2012 1829 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	0.05	0.05		mg/L	09/28/2012 1556 RH	EPA 353.2
Sulfate	5.5	0.2		mg/L	09/25/2012 1829 AM	EPA 300.0
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2020 DG	6010C
Antimony	6.44	0.07		µg/L	09/28/2012 1540 MS	6020A
Arsenic	3	2		µg/L	09/28/2012 1540 MS	6020A
Barium	40	10		µg/L	09/28/2012 1540 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1540 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1540 MS	6020A
Calcium	20700	50		µg/L	10/01/2012 2020 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1540 MS	6020A
Cobalt	ND	0.1		µg/L	09/28/2012 1540 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1540 MS	6020A
Iron	ND	20		µg/L	10/01/2012 2020 DG	6010C
Lead	0.3	0.3		µg/L	09/28/2012 1540 MS	6020A
Magnesium	13900	20		µg/L	10/01/2012 2020 DG	6010C
Manganese	ND	2		µg/L	09/28/2012 1540 MS	6020A
Nickel	ND	2		µg/L	09/28/2012 1540 MS	6020A
Potassium	ND	400		µg/L	10/01/2012 2020 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1540 MS	6020A
Silicon	5000	400		µg/L	10/01/2012 2020 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1540 MS	6020A
Sodium	2600	200		µg/L	10/01/2012 2020 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1540 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1540 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2020 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/8/2012
Report ID: S1209430001

Project: Red Devil Mine
Lab ID: S1209430-005
Client Sample ID: 0912MW20GW
COC: RDM-0912-011

Work Order: S1209430
Collection Date: 9/9/2012 10:40:00 AM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	140 J	10	H	mg/L	09/25/2012 1503 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1619 JCG	SM 2540
Alkalinity, Total (As CaCO3)	93 J	5	H	mg/L	09/25/2012 2013 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	113 J	5	H	mg/L	09/25/2012 2013 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 2013 KV	SM 2320B
Chloride	0.5	0.2		mg/L	09/25/2012 1842 AM	EPA 300.0
Fluoride	ND	0.2		mg/L	09/25/2012 1842 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	ND	0.05		mg/L	09/25/2012 1606 RH	EPA 353.2
Sulfate	17.7	0.2		mg/L	09/25/2012 1842 AM	EPA 300.0
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2022 DG	6010C
Antimony	871	0.07		µg/L	09/28/2012 1545 MS	6020A
Arsenic	221	2		µg/L	09/28/2012 1545 MS	6020A
Barium	40	10		µg/L	09/28/2012 1545 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1545 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1545 MS	6020A
Calcium	19900	50		µg/L	10/01/2012 2022 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1545 MS	6020A
Cobalt	ND	0.1		µg/L	09/28/2012 1545 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1545 MS	6020A
Iron	30	20		µg/L	10/01/2012 2022 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1545 MS	6020A
Magnesium	15700	20		µg/L	10/01/2012 2022 DG	6010C
Manganese	5	2		µg/L	09/28/2012 1545 MS	6020A
Nickel	ND	2		µg/L	09/28/2012 1545 MS	6020A
Potassium	600	400		µg/L	10/01/2012 2022 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1545 MS	6020A
Silicon	5000	400		µg/L	10/01/2012 2022 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1545 MS	6020A
Sodium	2400	200		µg/L	10/01/2012 2022 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1545 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1545 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2022 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/8/2012
Report ID: S1209430001

Project: Red Devil Mine
Lab ID: S1209430-006
Client Sample ID: 0912MW21GW
COC: RDM-0912-011

Work Order: S1209430
Collection Date: 9/8/2012 6:00:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	270 J	10	H	mg/L	09/25/2012 1504 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1620 JCG	SM 2540
Alkalinity, Total (As CaCO3)	175 J	5	H	mg/L	09/25/2012 2020 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	214 J	5	H	mg/L	09/25/2012 2020 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 2020 KV	SM 2320B
Chloride	0.6	0.2		mg/L	09/25/2012 1854 AM	EPA 300.0
Fluoride	ND	0.2		mg/L	09/25/2012 1854 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	0.06	0.05		mg/L	09/28/2012 1557 RH	EPA 353.2
Sulfate	25.3	0.2		mg/L	09/25/2012 1854 AM	EPA 300.0
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2024 DG	6010C
Antimony	9490	0.07		µg/L	09/28/2012 1822 MS	6020A
Arsenic	2510	2		µg/L	09/28/2012 1550 MS	6020A
Barium	110	10		µg/L	09/28/2012 1550 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1550 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1550 MS	6020A
Calcium	35100	50		µg/L	10/01/2012 2024 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1550 MS	6020A
Cobalt	ND	0.1		µg/L	09/28/2012 1550 MS	6020A
Copper	1.9	0.9		µg/L	09/28/2012 1550 MS	6020A
Iron	ND	20		µg/L	10/01/2012 2024 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1550 MS	6020A
Magnesium	30300	20		µg/L	10/01/2012 2024 DG	6010C
Manganese	2	2		µg/L	09/28/2012 1550 MS	6020A
Nickel	3	2		µg/L	09/28/2012 1550 MS	6020A
Potassium	2400	400		µg/L	10/01/2012 2024 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1550 MS	6020A
Silicon	9700	400		µg/L	10/01/2012 2024 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1550 MS	6020A
Sodium	3400	200		µg/L	10/01/2012 2024 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1550 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1550 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2024 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/8/2012
Report ID: S1209430001

Project: Red Devil Mine
Lab ID: S1209430-007
Client Sample ID: 0912MW24GW
COC: RDM-0912-011

Work Order: S1209430
Collection Date: 9/9/2012 2:50:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	190 J	10	H	mg/L	09/25/2012 1505 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1621 JCG	SM 2540
Alkalinity, Total (As CaCO3)	103 J	5	H	mg/L	09/25/2012 2027 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	126 J	5	H	mg/L	09/25/2012 2027 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 2027 KV	SM 2320B
Chloride	0.5	0.2		mg/L	09/25/2012 1906 AM	EPA 300.0
Fluoride	ND	0.2		mg/L	09/25/2012 1906 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	0.32	0.05		mg/L	09/25/2012 1607 RH	EPA 353.2
Sulfate	37.1	0.2		mg/L	09/25/2012 1906 AM	EPA 300.0
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2027 DG	6010C
Antimony	108	0.07		µg/L	09/28/2012 1554 MS	6020A
Arsenic	5	2		µg/L	09/28/2012 1554 MS	6020A
Barium	10	10		µg/L	09/28/2012 1554 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1554 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1554 MS	6020A
Calcium	24200	50		µg/L	10/01/2012 2027 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1554 MS	6020A
Cobalt	ND	0.1		µg/L	09/28/2012 1554 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1554 MS	6020A
Iron	ND	20		µg/L	10/01/2012 2027 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1554 MS	6020A
Magnesium	18200	20		µg/L	10/01/2012 2027 DG	6010C
Manganese	ND	2		µg/L	09/28/2012 1554 MS	6020A
Nickel	ND	2		µg/L	09/28/2012 1554 MS	6020A
Potassium	700	400		µg/L	10/01/2012 2027 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1554 MS	6020A
Silicon	6800	400		µg/L	10/01/2012 2027 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1554 MS	6020A
Sodium	7200	200		µg/L	10/01/2012 2027 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1554 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1554 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2027 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/8/2012
Report ID: S1209430001

Project: Red Devil Mine
Lab ID: S1209430-008
Client Sample ID: 0912MW25GW
COC: RDM-0912-011

Work Order: S1209430
Collection Date: 9/9/2012 11:10:00 AM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	380 J	10	H	mg/L	09/25/2012 1506 JCG	SM 2540
Total Suspended Solids	96 J	5	H	mg/L	09/25/2012 1622 JCG	SM 2540
Alkalinity, Total (As CaCO3)	216 J	5	H	mg/L	09/25/2012 2033 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	264 J	5	H	mg/L	09/25/2012 2033 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 2033 KV	SM 2320B
Chloride	0.7	0.2		mg/L	09/25/2012 1919 AM	EPA 300.0
Fluoride	ND	0.2		mg/L	09/25/2012 1919 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	ND	0.05		mg/L	09/25/2012 1608 RH	EPA 353.2
Sulfate	66.2	0.2		mg/L	09/25/2012 1919 AM	EPA 300.0
Total Metals						
Aluminum	50	50		µg/L	10/01/2012 2029 DG	6010C
Antimony	69.6	0.07		µg/L	09/28/2012 1559 MS	6020A
Arsenic	1160	2		µg/L	09/28/2012 1559 MS	6020A
Barium	530	10		µg/L	09/28/2012 1559 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1559 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1559 MS	6020A
Calcium	56600	50		µg/L	10/01/2012 2029 DG	6010C
Chromium	6.3	0.5		µg/L	09/28/2012 1559 MS	6020A
Cobalt	27.8	0.1		µg/L	09/28/2012 1559 MS	6020A
Copper	3.6	0.9		µg/L	09/28/2012 1559 MS	6020A
Iron	49200	20		µg/L	10/01/2012 2029 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1559 MS	6020A
Magnesium	32000	20		µg/L	10/01/2012 2029 DG	6010C
Manganese	7650	2		µg/L	09/28/2012 1827 MS	6020A
Nickel	24	2		µg/L	09/28/2012 1559 MS	6020A
Potassium	3700	400		µg/L	10/01/2012 2029 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1559 MS	6020A
Silicon	8700	400		µg/L	10/01/2012 2029 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1559 MS	6020A
Sodium	5200	200		µg/L	10/01/2012 2029 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1559 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1559 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2029 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

- * Value exceeds Maximum Contaminant Level
- C Calculated Value
- H Holding times for preparation or analysis exceeded
- L Analyzed by a contract laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL
- O Outside the Range of Dilutions

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/8/2012
Report ID: S1209430001

Project: Red Devil Mine
Lab ID: S1209430-009
Client Sample ID: 0912MW27GW
COC: RDM-0912-011

Work Order: S1209430
Collection Date: 9/9/2012 1:34:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	640 J	10	H	mg/L	09/25/2012 1507 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1623 JCG	SM 2540
Alkalinity, Total (As CaCO3)	218 J	5	H	mg/L	09/25/2012 2040 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	266 J	5	H	mg/L	09/25/2012 2040 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 2040 KV	SM 2320B
Chloride	1.0 J	0.2	H	mg/L	10/12/2012 1146 AM	EPA 300.0
Fluoride	ND UJ	0.2	H	mg/L	10/12/2012 1146 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	ND	0.05		mg/L	09/25/2012 1616 RH	EPA 353.2
Sulfate	230 J	0.2	H	mg/L	10/12/2012 1146 AM	EPA 300.0
Total Metals						
Aluminum	150	50		µg/L	10/01/2012 2032 DG	6010C
Antimony	12.9	0.07		µg/L	09/28/2012 1604 MS	6020A
Arsenic	31	2		µg/L	09/28/2012 1604 MS	6020A
Barium	60	10		µg/L	09/28/2012 1604 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1604 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1604 MS	6020A
Calcium	98600	50		µg/L	10/01/2012 2032 DG	6010C
Chromium	8.9	0.5		µg/L	09/28/2012 1604 MS	6020A
Cobalt	1.9	0.1		µg/L	09/28/2012 1604 MS	6020A
Copper	2.1	0.9		µg/L	09/28/2012 1604 MS	6020A
Iron	310	20		µg/L	10/01/2012 2032 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1604 MS	6020A
Magnesium	59000	20		µg/L	10/01/2012 2032 DG	6010C
Manganese	1280	2		µg/L	09/28/2012 1604 MS	6020A
Nickel	48	2		µg/L	09/28/2012 1604 MS	6020A
Potassium	2300	400		µg/L	10/01/2012 2032 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1604 MS	6020A
Silicon	7300	400		µg/L	10/01/2012 2032 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1604 MS	6020A
Sodium	21400	200		µg/L	10/01/2012 2032 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1604 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1604 MS	6020A
Zinc	20	10		µg/L	10/01/2012 2032 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/8/2012
Report ID: S1209430001

Project: Red Devil Mine
Lab ID: S1209430-010
Client Sample ID: 0912MW29GW
COC: RDM-0912-011

Work Order: S1209430
Collection Date: 9/9/2012 4:58:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	330 J	10	H	mg/L	09/25/2012 1509 JCG	SM 2540
Total Suspended Solids	13 J	5	H	mg/L	09/25/2012 1624 JCG	SM 2540
Alkalinity, Total (As CaCO3)	273 J	5	H	mg/L	09/25/2012 2053 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	333 J	5	H	mg/L	09/25/2012 2053 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 2053 KV	SM 2320B
Chloride	0.7	0.2		mg/L	09/25/2012 2045 AM	EPA 300.0
Fluoride	0.3	0.2		mg/L	09/25/2012 2045 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	ND	0.05		mg/L	09/25/2012 1626 RH	EPA 353.2
Sulfate	28.1	0.2		mg/L	09/25/2012 2045 AM	EPA 300.0
Total Metals						
Aluminum	140	50		µg/L	10/01/2012 2039 DG	6010C
Antimony	1.34	0.07		µg/L	09/28/2012 1629 MS	6020A
Arsenic	44	2		µg/L	09/28/2012 1629 MS	6020A
Barium	230	10		µg/L	09/28/2012 1629 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1629 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1629 MS	6020A
Calcium	50200	50		µg/L	10/01/2012 2039 DG	6010C
Chromium	5.1	0.5		µg/L	09/28/2012 1629 MS	6020A
Cobalt	0.8	0.1		µg/L	09/28/2012 1629 MS	6020A
Copper	1.2	0.9		µg/L	09/28/2012 1629 MS	6020A
Iron	2690	20		µg/L	10/01/2012 2039 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1629 MS	6020A
Magnesium	48200	20		µg/L	10/01/2012 2039 DG	6010C
Manganese	398	2		µg/L	09/28/2012 1629 MS	6020A
Nickel	4	2		µg/L	09/28/2012 1629 MS	6020A
Potassium	1100	400		µg/L	10/01/2012 2039 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1629 MS	6020A
Silicon	4400	400		µg/L	10/01/2012 2039 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1629 MS	6020A
Sodium	2600	200		µg/L	10/01/2012 2039 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1629 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1629 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2039 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/8/2012
Report ID: S1209430001

Project: Red Devil Mine
Lab ID: S1209430-011
Client Sample ID: 0912MW32GW
COC: RDM-0912-011

Work Order: S1209430
Collection Date: 9/8/2012 4:18:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	120 J	10	H	mg/L	09/25/2012 1510 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1626 JCG	SM 2540
Alkalinity, Total (As CaCO3)	39 J	5	H	mg/L	09/25/2012 2100 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	47 J	5	H	mg/L	09/25/2012 2100 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 2100 KV	SM 2320B
Chloride	0.5	0.2		mg/L	09/25/2012 2058 AM	EPA 300.0
Fluoride	ND	0.2		mg/L	09/25/2012 2058 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	0.89	0.05		mg/L	09/28/2012 1558 RH	EPA 353.2
Sulfate	15.8	0.2		mg/L	09/25/2012 2058 AM	EPA 300.0
Total Metals						
Aluminum	400	50		µg/L	10/01/2012 2051 DG	6010C
Antimony	6.35	0.07		µg/L	09/28/2012 1639 MS	6020A
Arsenic	3	2		µg/L	09/28/2012 1639 MS	6020A
Barium	30	10		µg/L	09/28/2012 1639 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1639 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1639 MS	6020A
Calcium	10300	50		µg/L	10/01/2012 2051 DG	6010C
Chromium	1.5	0.5		µg/L	09/28/2012 1639 MS	6020A
Cobalt	0.6	0.1		µg/L	09/28/2012 1639 MS	6020A
Copper	2.9	0.9		µg/L	09/28/2012 1639 MS	6020A
Iron	620	20		µg/L	10/01/2012 2051 DG	6010C
Lead	0.3	0.3		µg/L	09/28/2012 1639 MS	6020A
Magnesium	7640	20		µg/L	10/01/2012 2051 DG	6010C
Manganese	27	2		µg/L	09/28/2012 1639 MS	6020A
Nickel	9	2		µg/L	09/28/2012 1639 MS	6020A
Potassium	500	400		µg/L	10/01/2012 2051 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1639 MS	6020A
Silicon	9800	400		µg/L	10/01/2012 2051 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1639 MS	6020A
Sodium	1500	200		µg/L	10/01/2012 2051 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1639 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1639 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2051 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/8/2012
Report ID: S1209430001

Project: Red Devil Mine
Lab ID: S1209430-012
Client Sample ID: 0912MW33GW
COC: RDM-0912-011

Work Order: S1209430
Collection Date: 9/8/2012 12:52:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	140 J	10	H	mg/L	09/25/2012 1511 JCG	SM 2540
Total Suspended Solids	8 J	5	H	mg/L	09/25/2012 1627 JCG	SM 2540
Alkalinity, Total (As CaCO3)	81 J	5	H	mg/L	09/25/2012 2107 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	99 J	5	H	mg/L	09/25/2012 2107 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 2107 KV	SM 2320B
Chloride	0.8	0.2		mg/L	09/25/2012 2110 AM	EPA 300.0
Fluoride	ND	0.2		mg/L	09/25/2012 2110 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	0.16	0.05		mg/L	09/25/2012 1601 RH	EPA 353.2
Sulfate	14.9	0.2		mg/L	09/25/2012 2110 AM	EPA 300.0
Total Metals						
Aluminum	150	50		µg/L	10/01/2012 2053 DG	6010C
Antimony	417	0.07		µg/L	09/28/2012 1644 MS	6020A
Arsenic	29	2		µg/L	09/28/2012 1644 MS	6020A
Barium	40	10		µg/L	09/28/2012 1644 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1644 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1644 MS	6020A
Calcium	17100	50		µg/L	10/01/2012 2053 DG	6010C
Chromium	0.8	0.5		µg/L	09/28/2012 1644 MS	6020A
Cobalt	0.2	0.1		µg/L	09/28/2012 1644 MS	6020A
Copper	1.3	0.9		µg/L	09/28/2012 1644 MS	6020A
Iron	370	20		µg/L	10/01/2012 2053 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1644 MS	6020A
Magnesium	11600	20		µg/L	10/01/2012 2053 DG	6010C
Manganese	16	2		µg/L	09/28/2012 1644 MS	6020A
Nickel	ND	2		µg/L	09/28/2012 1644 MS	6020A
Potassium	800	400		µg/L	10/01/2012 2053 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1644 MS	6020A
Silicon	10200	400		µg/L	10/01/2012 2053 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1644 MS	6020A
Sodium	5000	200		µg/L	10/01/2012 2053 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1644 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1644 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2053 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

- * Value exceeds Maximum Contaminant Level
- C Calculated Value
- H Holding times for preparation or analysis exceeded
- L Analyzed by a contract laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL
- O Outside the Range of Dilutions

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/8/2012
Report ID: S1209430001

Work Order: S1209430
Project: Red Devil Mine
Collection Date: 9/9/2012 7:00:00 AM
Lab ID: S1209430-013
Date Received: 9/25/2012 11:45:00 AM
Client Sample ID: 0912MW53GW
Sampler:
COC: RDM-0912-011
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	150 J	10	H	mg/L	09/25/2012 1513 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1628 JCG	SM 2540
Alkalinity, Total (As CaCO3)	99 J	5	H	mg/L	09/25/2012 2121 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	121 J	5	H	mg/L	09/25/2012 2121 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 2121 KV	SM 2320B
Chloride	0.5	0.2		mg/L	09/25/2012 2159 AM	EPA 300.0
Fluoride	ND	0.2		mg/L	09/25/2012 2159 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	0.10	0.05		mg/L	09/28/2012 1601 RH	EPA 353.2
Sulfate	17.6	0.2		mg/L	09/25/2012 2159 AM	EPA 300.0
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2100 DG	6010C
Antimony	866	0.07		µg/L	09/28/2012 1658 MS	6020A
Arsenic	233	2		µg/L	09/28/2012 1658 MS	6020A
Barium	40	10		µg/L	09/28/2012 1658 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1658 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1658 MS	6020A
Calcium	19600	50		µg/L	10/01/2012 2100 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1658 MS	6020A
Cobalt	ND	0.1		µg/L	09/28/2012 1658 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1658 MS	6020A
Iron	20	20		µg/L	10/01/2012 2100 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1658 MS	6020A
Magnesium	15200	20		µg/L	10/01/2012 2100 DG	6010C
Manganese	5	2		µg/L	09/28/2012 1658 MS	6020A
Nickel	ND	2		µg/L	09/28/2012 1658 MS	6020A
Potassium	600	400		µg/L	10/01/2012 2100 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1658 MS	6020A
Silicon	4900	400		µg/L	10/01/2012 2100 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1658 MS	6020A
Sodium	2400	200		µg/L	10/01/2012 2100 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1658 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1658 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2100 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/8/2012
Report ID: S1209430001

Work Order: S1209430
Project: Red Devil Mine
Collection Date: 9/9/2012 7:00:00 AM
Lab ID: S1209430-014
Date Received: 9/25/2012 11:45:00 AM
Client Sample ID: 0912MW54GW
Sampler:
COC: RDM-0912-011
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	620 J	10	H	mg/L	09/25/2012 1514 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1629 JCG	SM 2540
Alkalinity, Total (As CaCO3)	221 J	5	H	mg/L	09/25/2012 2127 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	270 J	5	H	mg/L	09/25/2012 2127 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 2127 KV	SM 2320B
Chloride	1.1	0.2		mg/L	09/25/2012 2212 AM	EPA 300.0
Fluoride	ND	0.2		mg/L	09/25/2012 2212 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	ND	0.05		mg/L	09/28/2012 1602 RH	EPA 353.2
Sulfate	233	0.2		mg/L	09/25/2012 2212 AM	EPA 300.0
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2103 DG	6010C
Antimony	9.23	0.07		µg/L	09/28/2012 1703 MS	6020A
Arsenic	29	2		µg/L	09/28/2012 1703 MS	6020A
Barium	50	10		µg/L	09/28/2012 1703 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1703 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1703 MS	6020A
Calcium	94700	50		µg/L	10/01/2012 2103 DG	6010C
Chromium	4.3	0.5		µg/L	09/28/2012 1703 MS	6020A
Cobalt	1.3	0.1		µg/L	09/28/2012 1703 MS	6020A
Copper	1.1	0.9		µg/L	09/28/2012 1703 MS	6020A
Iron	50	20		µg/L	10/01/2012 2103 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1703 MS	6020A
Magnesium	54700	20		µg/L	10/01/2012 2103 DG	6010C
Manganese	1070	2		µg/L	09/28/2012 1703 MS	6020A
Nickel	50	2		µg/L	09/28/2012 1703 MS	6020A
Potassium	1900	400		µg/L	10/01/2012 2103 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1703 MS	6020A
Silicon	6700	400		µg/L	10/01/2012 2103 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1703 MS	6020A
Sodium	20800	200		µg/L	10/01/2012 2103 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1703 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1703 MS	6020A
Zinc	20	10		µg/L	10/01/2012 2103 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/8/2012
Report ID: S1209430001

Project: Red Devil Mine
Lab ID: S1209430-015
Client Sample ID: 0912EB01DI
COC: RDM-0912-011

Work Order: S1209430
Collection Date: 9/9/2012 1:50:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	ND	UJ 10	H	mg/L	09/25/2012 1515 JCG	SM 2540
Total Suspended Solids	ND	5	H	mg/L	09/25/2012 1630 JCG	SM 2540
Alkalinity, Total (As CaCO3)	ND	5	H	mg/L	09/25/2012 2133 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	ND	5	H	mg/L	09/25/2012 2133 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND	5	H	mg/L	09/25/2012 2133 KV	SM 2320B
Chloride	ND	0.2		mg/L	09/25/2012 2224 AM	EPA 300.0
Fluoride	ND	0.2		mg/L	09/25/2012 2224 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	ND	0.05		mg/L	09/28/2012 1603 RH	EPA 353.2
Sulfate	ND	0.2		mg/L	09/25/2012 2224 AM	EPA 300.0
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2105 DG	6010C
Antimony	0.12	0.07		µg/L	09/28/2012 1718 MS	6020A
Arsenic	ND	2		µg/L	09/28/2012 1718 MS	6020A
Barium	ND	10		µg/L	09/28/2012 1718 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1718 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1718 MS	6020A
Calcium	ND	50		µg/L	10/01/2012 2105 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1718 MS	6020A
Cobalt	ND	0.1		µg/L	09/28/2012 1718 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1718 MS	6020A
Iron	ND	20		µg/L	10/01/2012 2105 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1718 MS	6020A
Magnesium	70	20		µg/L	10/01/2012 2105 DG	6010C
Manganese	ND	2		µg/L	09/28/2012 1718 MS	6020A
Nickel	ND	2		µg/L	09/28/2012 1718 MS	6020A
Potassium	ND	400		µg/L	10/01/2012 2105 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1718 MS	6020A
Silicon	ND	400		µg/L	10/01/2012 2105 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1718 MS	6020A
Sodium	ND	200		µg/L	10/01/2012 2105 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1718 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1718 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2105 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/15/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209430
Project: Red Devil Mine

Date: 10/8/2012
Report ID: S1209430001

Alkalinity

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87577	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLANK	09/25/12 12:57	Alkalinity, Total (As CaCO3)	ND	5					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87577	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
ATQC	09/25/12 12:51	Alkalinity, Total (As CaCO3)	585	5	601		97.4	90 - 110	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87577	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209430-009AD	09/25/12 20:46	Alkalinity, Bicarbonate as HCO3	268	5	266	0.835		20	H
		Alkalinity, Carbonate as CO3	ND	5	ND			20	H
		Alkalinity, Total (As CaCO3)	220	5	218	0.835		20	H

Sample ID	RunNo: 87577	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209430-012AD	09/25/12 21:14	Alkalinity, Bicarbonate as HCO3	98	5	99	1.02		20	H
		Alkalinity, Carbonate as CO3	ND	5	ND			20	H
		Alkalinity, Total (As CaCO3)	80	5	81	1.02		20	H

11/5/12

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209430
Project: Red Devil Mine

Date: 10/8/2012
Report ID: S1209430001

Anions by ION Chromatography

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLK	09/25/12 11:41	Chloride	ND	1					
		Fluoride	ND	0.1					
		Sulfate	ND	1					

Sample ID	RunNo: 88248	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLK	10/12/12 11:35	Chloride	ND	1					
		Fluoride	ND	0.1					
		Sulfate	ND	1					

11/15/12

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
DIONEX	09/25/12 11:16	Chloride	31	1	30		102	90 - 110	
		Fluoride	20.7	0.1	20		104	90 - 110	
		Sulfate	144	1	150		95.8	90 - 110	

Sample ID	RunNo: 88248	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
DIONEX	10/12/12 11:12	Chloride	30	1	30		99.4	90 - 110	
		Fluoride	20.8	0.1	20		104	90 - 110	
		Sulfate	144	1	150		95.9	90 - 110	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209430-012ASPK	09/25/12 21:35	Chloride	6	1	5	ND	97.9	80 - 120	
		Fluoride	2.2	0.1	2	ND	109	80 - 120	
		Sulfate	58	1	40	15	107	80 - 120	

Sample ID	RunNo: 88248	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209430-009ASPK	10/12/12 12:09	Chloride	29	1	30	1	94.6	80 - 120	H
		Fluoride	11.5	0.1	12	ND	95.4	80 - 120	H
		Sulfate	491	1	240	230	109	80 - 120	H

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209430-012ASPK	09/25/12 21:47	Chloride	6	1	6	0.0263	97.8	20	
		Fluoride	2.2	0.1	2.2	0.140	109	20	
		Sulfate	58	1	58	0.0493	107	20	

Sample ID	RunNo: 88248	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209430-009ASPK	10/12/12 12:20	Chloride	29	1	29	0.555	94.1	20	H
		Fluoride	11.4	0.1	11.5	1.27	94.1	20	H
		Sulfate	490	1	491	0.155	109	20	H

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits
E	Value above quantitation range
J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209430
Project: Red Devil Mine

Date: 10/8/2012
Report ID: S1209430001

Anions by ION Chromatography

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209430-012A	09/25/12 21:22	Chloride	0.8	0.2	0.8	2.53		20	
		Fluoride	ND	0.2	ND			20	
		Sulfate	14.8	0.2	14.9	0.345		20	

Sample ID	RunNo: 88248	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209430-009A	10/12/12 11:57	Chloride	1.0	0.2	1.0	0.364		20	H
		Fluoride	ND	0.2	ND			20	H
		Sulfate	226	0.2	230	1.62		20	H

Nitrogen, Nitrate-Nitrite (as N)

11/15/12

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLANK	09/25/12 15:51	Nitrogen, Nitrate-Nitrite (as N)	ND	0.1					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
QC	09/25/12 15:53	Nitrogen, Nitrate-Nitrite (as N)	18.5	0.1	19.3		95.7	90 - 110	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209430-012B	09/25/12 16:04	Nitrogen, Nitrate-Nitrite (as N)	5.69	0.05	5	0.16	110	80 - 120	

Sample ID	RunNo: 87583	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209430-009B	09/25/12 16:19	Nitrogen, Nitrate-Nitrite (as N)	5.03	0.05	5	ND	101	80 - 120	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209430-012B	09/25/12 16:05	Nitrogen, Nitrate-Nitrite (as N)	5.02	0.05	5.69	11.6	97.2	20	

Sample ID	RunNo: 87583	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209430-009B	09/25/12 16:20	Nitrogen, Nitrate-Nitrite (as N)	4.94	0.05	5.03	1.65	98.9	20	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209430-012B	09/25/12 16:02	Nitrogen, Nitrate-Nitrite (as N)	0.14	0.05	0.16	17.2		20	

Qualifiers:

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- J Analyte detected below quantitation limits
- L Analyzed by a contract laboratory
- ND Not Detected at the Reporting Limit
- O Outside the Range of Dilutions
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209430
Project: Red Devil Mine

Date: 10/8/2012
Report ID: S1209430001

Nitrogen, Nitrate-Nitrite (as N)

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209430-009B	09/25/12 16:18	Nitrogen, Nitrate-Nitrite (as N)	ND	0.05	ND			20	

Solids By SM 2540

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87559	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLANK	09/25/12 16:02	Total Suspended Solids	ND	5					

Sample ID	RunNo: 87637	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
DI	09/25/12 14:32	Total Dissolved Solids (180)	ND	10					

11/15/12

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87559	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
CONTROL	09/25/12 16:03	Total Suspended Solids	102	5	100		102	90 - 110	

Sample ID	RunNo: 87637	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
CONTROL	09/25/12 14:33	Total Dissolved Solids (180)	240	10	226		106	90 - 110	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87559	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209430-010A	09/25/12 16:25	Total Suspended Solids	14	5	13	7.69		20	H

Sample ID	RunNo: 87637	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209430-009A	09/25/12 15:08	Total Dissolved Solids (180)	640	10	640	0		20	H

Sample ID	RunNo: 87637	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209430-012A	09/25/12 15:12	Total Dissolved Solids (180)	140	10	140	0		20	H

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209430
Project: Red Devil Mine

Date: 10/8/2012
Report ID: S1209430001

Total(3020) Metals by ICP - 6010C

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
ICB	10/01/12 13:09	Aluminum	ND	0.005					
		Calcium	ND	0.2					
		Iron	ND	0.05					
		Magnesium	0.14	0.02					B
		Potassium	ND	0.1					
		Silicon	ND	0.1					
		Sodium	ND	0.1					
		Zinc	ND	0.005					

10/15/12

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
ICV Q	10/01/12 13:11	Silicon	1.0	0.1	1		102	80 - 120	

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
ICV 3	10/01/12 13:13	Calcium	39.9	0.2	40		99.7	80 - 120	
		Magnesium	39.1	0.02	40		97.7	80 - 120	
		Potassium	40.4	0.1	40		101	80 - 120	
		Sodium	39.4	0.1	40		98.5	80 - 120	

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS-6432	10/01/12 19:51	Aluminum	0.525	0.005	0.5		105	80 - 120	
		Iron	0.57	0.05	0.5		113	80 - 120	
		Zinc	0.206	0.005	0.2		103	80 - 120	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209430-009CS	10/01/12 20:34	Aluminum	0.640	0.005	0.5	0.145	99.0	75 - 125	
		Iron	0.83	0.05	0.5	0.31	104	75 - 125	
		Zinc	0.229	0.005	0.2	0.024	103	75 - 125	

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209430-012CS	10/01/12 20:55	Aluminum	0.604	0.005	0.5	0.153	90.2	75 - 125	
		Iron	0.89	0.05	0.5	0.37	105	75 - 125	
		Zinc	0.207	0.005	0.2	ND	101	75 - 125	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209430-009CMSD	10/01/12 20:36	Aluminum	0.638	0.005	0.640	0.406	98.5	20	
		Iron	0.82	0.05	0.83	0.363	104	20	
		Zinc	0.229	0.005	0.229	0.0873	103	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209430
Project: Red Devil Mine

Date: 10/8/2012
Report ID: S1209430001

Total (3020) Metals by ICPMS - 6020A

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87728	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
MB-6432	09/28/12 12:22	Antimony	ND	0.005					
		Arsenic	ND	0.005					
		Barium	ND	0.01					
		Beryllium	ND	0.002					
		Cadmium	ND	0.002					
		Chromium	ND	0.001					
		Cobalt	ND	0.01					
		Copper	ND	0.001					
		Lead	ND	0.001					
		Manganese	ND	0.01					
		Nickel	ND	0.01					
		Selenium	ND	0.005					
		Silver	ND	0.003					
		Thallium	ND	0.01					
		Vanadium	ND	0.02					

11/15/12

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87728	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS-6432	09/28/12 12:32	Antimony	0.198	0.005	0.2		99.2	80 - 120	
		Arsenic	0.206	0.005	0.2		103	80 - 120	
		Barium	0.21	0.01	0.2		103	80 - 120	
		Beryllium	0.224	0.002	0.2		112	80 - 120	
		Cadmium	0.196	0.002	0.2		98.2	80 - 120	
		Chromium	0.201	0.001	0.2		101	80 - 120	
		Cobalt	0.21	0.01	0.2		103	80 - 120	
		Copper	0.211	0.001	0.2		105	80 - 120	
		Lead	0.211	0.001	0.2		106	80 - 120	
		Manganese	0.21	0.01	0.2		105	80 - 120	
		Nickel	0.50	0.01	0.5		99.6	80 - 120	
		Selenium	0.394	0.005	0.4		98.4	80 - 120	
		Silver	0.106	0.003	0.1		106	80 - 120	
		Thallium	0.21	0.01	0.2		104	80 - 120	
		Vanadium	0.20	0.02	0.2		100	80 - 120	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

CHAIN OF CUSTODY RECORD

Red Devil Mine Project
Contact Name: Bill Richards
Contact Phone: 206-624-9537

No: RDM-0912-011

Cooler #: 11
Lab: Inter-Mountain Laboratories, Inc
Lab Phone: 800-828-1097

Ecology and Environment, Inc

S1209430

Lab #	Location	Analyses	Collected	Sample Time	Numb Cont	Container	Preservative	MS/MSD
~~[illegible]~~	~~[illegible]~~	~~Total Inorganic Elements~~	~~9/9/2012~~	~~14:23~~	~~1~~	~~Bag~~	~~None~~	~~AH~~
~~[illegible]~~	~~16SM24RE~~	~~Total Inorganic Elements~~	~~9/9/2012~~	~~13:46~~	~~1~~	~~Bag~~	~~None~~	~~AH~~
~~[illegible]~~	~~12WR03RE~~	~~Total Inorganic Elements~~	~~9/9/2012~~	~~13:43~~	~~1~~	~~Bag~~	~~None~~	~~AH~~
~~[illegible]~~	~~12WR07RE~~	~~Total Inorganic Elements~~	~~9/9/2012~~	~~15:05~~	~~1~~	~~Bag~~	~~None~~	~~AH~~
001	0912MW06GW	Total Inorganic Elements	9/9/2012	12:40	1	250 mL HDPE	HNO3 pH<2	
	0912MW06GW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/9/2012	12:40	1	500 mL HDPE	None	
	0912MW06GW	Nitrate/Nitrite	9/9/2012	12:40	1	125 mL HDPE	H2SO4 pH<2	
002	0912MW15GW	Total Inorganic Elements	9/8/2012	14:00	1	250 mL HDPE	HNO3 pH<2	
	0912MW15GW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/8/2012	14:00	1	500 mL HDPE	None	
	0912MW15GW	Nitrate/Nitrite	9/8/2012	14:00	1	125 mL HDPE	H2SO4 pH<2	
003	0912MW16GW	Total Inorganic Elements	9/8/2012	15:35	1	250 mL HDPE	HNO3 pH<2	
	0912MW16GW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/8/2012	15:35	1	500 mL HDPE	None	
	0912MW16GW	Nitrate/Nitrite	9/8/2012	15:35	1	125 mL HDPE	H2SO4 pH<2	
004	0912MW17GW	Total Inorganic Elements	9/8/2012	16:59	1	250 mL HDPE	HNO3 pH<2	
	0912MW17GW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/8/2012	16:59	1	500 mL HDPE	None	
	0912MW17GW	Nitrate/Nitrite	9/8/2012	16:59	1	125 mL HDPE	H2SO4 pH<2	
005	0912MW20GW	Total Inorganic Elements	9/9/2012	10:40	1	250 mL HDPE	HNO3 pH<2	

Special Instructions: Lab Filter Anions, Carbonate, bicarbonate

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
									[signature]	9/25/12	11:45

4.9°C

CHAIN OF CUSTODY RECORD

No: RDM-0912-011

Red Devil Mine Project
Contact Name: Bill Richards
Contact Phone: 206-624-9537

Cooler #. 11
Lab: Inter-Mountain Laboratories, Inc.
Lab Phone: 800-828-1097

Ecology and Environment, Inc

51209436

Lab #	Location	Analyses	Collected	Sample Time	Numb Cont	Container	Preservative	MS/MSD
005	0912MW20GW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/9/2012	10:40	1	500 mL HDPE	None	
	0912MW20GW	Nitrate/Nitrite	9/9/2012	10:40	1	125 mL HDPE	H2SO4 pH<2	
	0912MW21GW	Total Inorganic Elements	9/8/2012	18:00	1	250 mL HDPE	HNO3 pH<2	
006	0912MW21GW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/8/2012	18:00	1	500 mL HDPE	None	
	0912MW21GW	Nitrate/Nitrite	9/8/2012	18:00	1	125 mL HDPE	H2SO4 pH<2	
	0912MW24GW	Total Inorganic Elements	9/9/2012	14:50	1	250 mL HDPE	HNO3 pH<2	
007	0912MW24GW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/9/2012	14:50	1	500 mL HDPE	None	
	0912MW24GW	Nitrate/Nitrite	9/9/2012	14:50	1	125 mL HDPE	H2SO4 pH<2	
	0912MW25GW	Total Inorganic Elements	9/9/2012	11:10	1	250 mL HDPE	HNO3 pH<2	
008	0912MW25GW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/9/2012	11:10	1	500 mL HDPE	None	
	0912MW25GW	Nitrate/Nitrite	9/9/2012	11:10	1	125 mL HDPE	H2SO4 pH<2	
	0912MW27GW	Total Inorganic Elements	9/9/2012	13:34	3	250 mL HDPE	HNO3 pH<2	Y
009	0912MW27GW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/9/2012	13:34	3	500 mL HDPE	None	Y
	0912MW27GW	Nitrate/Nitrite	9/9/2012	13:34	1	125 mL HDPE	H2SO4 pH<2	
010	0912MW29GW	Total Inorganic Elements	9/8/2012	16:58	1	250 mL HDPE	HNO3 pH<2	

Special Instructions: Lab Filter Anions, carbonate, bicarbonate

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
									[signature]	9/10/12	1145 4.9°C

CHAIN OF CUSTODY RECORD

No: RDM-0912-011

Red Devil Mine Project
Contact Name: Bill Richards
Contact Phone: 206-624-9537

Cooler #: 11
Lab: Inter-Mountain Laboratories, Inc.
Lab Phone: 800-828-1097

Ecology and Environment, Inc

S1209430

Lab #	Location	Analyses	Collected	Sample Time	Numb Cont	Container	Preservative	MS/MSD
010	0912MW29GW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/9/2012	16:58	1	500 mL HDPE	None	
	0912MW29GW	Nitrate/Nitrite	9/9/2012	16:58	1	125 mL HDPE	H2SO4 pH<2	
	0912MW32GW	Total Inorganic Elements	9/8/2012	16:18	1	250 mL HDPE	HNO3 pH<2	
011	0912MW32GW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/8/2012	16:18	1	500 mL HDPE	None	
	0912MW32GW	Nitrate/Nitrite	9/8/2012	16:18	1	125 mL HDPE	H2SO4 pH<2	
	0912MW33GW	Total Inorganic Elements	9/8/2012	12:52	3	250 mL HDPE	HNO3 pH<2	Y
012	0912MW33GW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/8/2012	12:52	3	500 mL HDPE	None	Y
	0912MW33GW	Nitrate/Nitrite	9/8/2012	12:52	3	125 mL HDPE	H2SO4 pH<2	Y
	0912MW53GW	Total Inorganic Elements	9/9/2012	07:00	1	250 mL HDPE	HNO3 pH<2	
013	0912MW53GW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/9/2012	07:00	1	500 mL HDPE	None	
	0912MW53GW	Nitrate/Nitrite	9/9/2012	07:00	1	125 mL HDPE	H2SO4 pH<2	
	0912MW54GW	Total Inorganic Elements	9/9/2012	07:00	1	250 mL HDPE	HNO3 pH<2	
014	0912MW54GW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/9/2012	07:00	1	500 mL HDPE	None	
	0912MW54GW	Nitrate/Nitrite	9/9/2012	07:00	1	125 mL HDPE	H2SO4 pH<2	
	0912EB01DI	Total Inorganic Elements	9/9/2012	13:50	1	250 mL HDPE	HNO3 pH<2	
015								

Special Instructions: Lab Filter Anions, Carbonate, Bicarbonate

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
									[signature]	9/10/12	1145 4.9°C

CHAIN OF CUSTODY RECORD

Red Devil Mine Project

Contact Name: Bill Richards

Contact Phone: 208-624-9537

No: RDM-0912-011

Cooler #: 11

Ecology and Environment, Inc

Lab: Inter-Mountain Laboratories, Inc

Lab Phone: 800-828-1097

S1209430

Lab #	Location	Analyses	Collected	Sample Time	Numb Cont	Container	Preservative	MS/MSD
	0912EB01DI	Anions, TSS, TDS, Carbonate, Bicarbonate	9/9/2012	13:50	1	500 mL HDPE	None	
DLQ	0912EB01DI	Nitrate/Nitrite	9/9/2012	13:50	1	125 mL HDPE	H2SO4 pH<2	

Special Instructions: Lab Filter Anions, carbonate, bicarbonate

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
									[signature]	9/13/12	1145 4.9°C

DATA REVIEW MEMORANDUM

DATE: November 15, 2012

TO: Bill Richards, Project Manager, E & E, Seattle, WA

FROM: Mindy Song, E & E, Long Beach, CA 11/16/12

SUBJ: Data Review: Red Devil Mine

REFERENCE:

Project ID	Lab Work Order	Lab
EE-1096-0070	S1209431	Inter-Mountain Labs

I. SAMPLE IDENTIFICATION

For the sampling activities at Red Devil Mine, Ecology and Environment, Inc. (E & E) collected the samples listed on Table 1. Project-specific matrix spike/matrix spike duplicates (MS/MSD) were designated in the field, laboratory also identified batch MS/MSD's as batch QC for additional analytical testing. All samples were sent to Inter-Mountain Labs in Sheridan, WY for analysis. All tables are included at the end of this memorandum.

Data were reviewed for field and laboratory precision, accuracy, and completeness in accordance with procedures and quality control (QC) limits, the current laboratory Quality Assurance Manual (QAM) and current standard operating procedures (SOPs). Laboratory data qualifiers for compound identification and quantitation were accepted. Any additional data review qualifiers added are noted below and listed on the tables at the end of this memorandum. Definitions of all data qualifiers are given in the report.

Table 1 Sample Listing

Work Order	Matrix	Sample ID	Lab ID	Sample Date	MS/MSD	ID Corrections
S1209431	Water	0912RD04SW	S1209431-001	09/11/2012		
S1209431	Water	0912RD08SW	S1209431-002	09/11/2012		
S1209431	Water	0912RD10SW	S1209431-003	09/12/2012		
S1209431	Water	0912RD12SW	S1209431-004	09/11/2012		

Work Orders, Tests and Number of Samples included in this DVM

Work Orders	Matrix	Test Method	Method Name	Number of Samples	Sample Type
S1209431	Water	SM 2540	TDS	2	
S1209431	Water	SM 2540	TSS	2	
S1209431	Water	SM 2320B	Alkalinity	2	
S1209431	Water	SM 5310B	TOC	2	
S1209431	Water	EPA 300.0/353.2	Anions	2	
S1209431	Water	EPA 6010C/6020A	Dissolved Metals	2	
S1209431	Water	EPA 6010C/6020A	Total Metals	2	

II. SAMPLE PROCEDURES

All samples were collected as specified in the work plan and documented on the chain-of-custody (COC) and in field notebooks. Samples were analyzed as specified on the COC. Samples were packaged, shipped and received as specified in the work plan. All samples must be received cold (4 ±2) °C and in good condition as documented on the Cooler Receipt Form.

REVIEW RESULTS:

All sample procedures were followed and the sample coolers were received at 7.8 °C. No problems with the condition of the sample upon receipt are documented. Since the samples were received at temperature outside of range (>6 °C), the detected results were qualified as estimated (J) and the non-detected results were qualified as estimated (UJ) for the analyses of Anions. Qualification for metals, TDS, TSS, Total Alkalinity, and TOC was not necessary.

III. LABORATORY DATA

1.0 HOLDING TIMES

Holding times are established and monitored to ensure analytical results accurately represent analyte concentrations in a sample at the time of collection. Exceeding the holding time for a sample generally results in a loss of the analyte due to a variety of mechanisms, such as deposition on the sample container walls or precipitation.

REVIEW RESULTS:

All samples were analyzed within the project and method specified holding times for all analytes except Total Dissolved solids and Total Suspended Solids. The detected TDS results were qualified as estimated (J) and the non-detected TSS results were qualified as estimated (UJ).

2.0 BLANKS

Laboratory and field blank samples are analyzed and evaluated to determine the existence and magnitude of possible contamination during the sampling and analysis process. As noted in Table 2, analyte concentrations in the blanks are generally below the practical quantitation limit (PQL). If the analyte is present in the sample at similar trace levels, then the analyte is likely a common background contaminant from some phase of the sampling, extraction, or analytical procedure and associated low level sample concentrations are not considered to be site related. If the analyte concentration is above the PQL, then there is a potential contamination problem and sample results may be biased high or the data unusable.

REVIEW RESULTS:

All blanks were performed at the required frequency. No analytes except trace amount (0.14 mg/L) of magnesium were detected in the method blank at reporting limit levels. Finding does not require qualification since sample concentration was greater than 5x the blank concentration.

3.0 SURROGATE SPIKE RECOVERY

Laboratory performance for individual samples analyzed for organic compounds is established by means of surrogate spiking activities. Samples are spiked with surrogate compounds prior to preparation and analysis. Unusually low or high surrogate recovery values may indicate some deficiency in the analytical system or that some matrix effects exist, resulting in low or high sample results for target compounds. Sample surrogate recoveries outside QC limits (if applicable) are presented in Table 3.

REVIEW RESULTS:

Not applicable for these analyses.

4.0 MATRIX SPIKE AND MATRIX SPIKE DUPLICATE ANALYSIS

The matrix spike and matrix spike duplicate (MS/MSD) analyses are intended to provide information about the affects that the sample matrix exerts on the digestion/extraction and measurement methodology. MS recovery values that do not meet laboratory QC criteria may indicate that sample analyte results are being attenuated in the analysis procedure. These results are presented in Table 4 (if applicable). The

potential sample bias may be estimated by noting the degree to which the MS concentration was elevated or lowered in the spike analysis. However, this bias should serve only as approximations; sample-specific problems may be the cause of the discrepancy, particularly in soil samples. Recoveries of a post-digestion spike or a laboratory control sample (LCS) are used to verify that the analytical methodology is acceptable and that MS recoveries are due to matrix effects. An MSD analysis is performed to evaluate the precision of the sample results. Precision is measured as the relative percent difference (RPD) between analytical results for duplicate samples. The laboratory's failure to produce similar results for MSD samples may indicate that the samples were non-homogeneous (particularly in soil samples), or that method defects may exist in the laboratory's techniques.

REVIEW RESULTS:

The MS/MSD sample analyses were performed on sample 0912RD09SW at the required frequency. MS/MSD recoveries were within the control limits generated by the laboratory.

5.0 LABORATORY CONTROL SAMPLE ANALYSIS

The LCS is analyzed to monitor the efficiency of the digestion/extraction procedure and analytical instrument operation. The ability of the laboratory to successfully analyze an LCS demonstrates that there are no analytical problems related to the digestion/sample preparation procedures and/or instrument operations. The LCS results outside QC limits are presented in Table 5 (if applicable). Sporadic and marginal QC failures for multiple component methods do not indicate an analytical concern. If recoveries are high and the compounds are not detected in the samples, then no data qualification is required. All recoveries should be above 10% or the non-detect results flagged "UR" as rejected.

REVIEW RESULTS:

All LCS analyses were within control limits and performed at the required frequency.

IV. COMPOUND IDENTIFICATION AND QUANTITATION

Compound identities are assigned by comparing sample compound retention times to retention times from known (standard) compounds and identification of an acceptable mass spectrum. Compounds detected below the PQL in samples should be considered estimated and are qualified "J." The samples with compounds above the linear range were all re-analyzed at a higher dilution factor.

REVIEW RESULTS:

All compound identification and quantitation criteria were achieved.

V. FIELD DUPLICATE SAMPLE RESULTS

Field duplicate samples were collected and analyzed as an indication of overall precision for both field and laboratory. Field duplicate results are summarized in Table 7 (if applicable). The results are expected to have more variability than laboratory duplicates, which measure only laboratory precision. It is expected also that soil field duplicates will exhibit greater variance than water field duplicates due to the difficulties associated with collecting identical field samples. The QC criteria used to assess field duplicate samples for this project was limits of 70% RPD for soils and 40% RPD for waters, or twice the general laboratory duplicate criteria. If both compounds were below the laboratory PQL or one of the compounds was present as a non-detect, then the compounds are generally not qualified due to field duplicate precision. There are no guidelines regarding data qualification based on poor field duplicate precision. Professional judgment was used to determine whether or not to qualify results.

REVIEW RESULTS:

No Field duplicates analyses were performed on this SDG. The RPD ratings are listed on Table 7 as "Good" if the RPD is less than field duplicate QC criteria of 40% and as "Poor" if the RPD exceeded the field duplicate QC criteria.

All the results show good precision in the sample pair as noted on table 7. Qualifiers were only added to the field duplicate sample pair results as noted.

6.0 OVERALL ASSESSMENT OF DATA

All data were reviewed and considered usable with qualification as noted in this report.

Table 2 - List of Positive Results for Blank Samples

Method	Sample ID	Samp Type	Analyte	Result	Qual	Anal Type	Units	PQL
None.								

Table 2A - List of Samples Qualified for Method Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
None.						

Table 2B - List of Samples Qualified for Field Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
None.						

Table 3 - List of Samples with Surrogates outside Control Limits

Method	Sample ID	Sample Type	Analyte	Rec.	Low Limit	High Limit	Dil Fac	Sample Qual.
None.								

Table 2 - List of Positive Results for Blank Samples

Method	Sample ID	Samp Type	Analyte	Result	Qual	Anal Type	Units	PQL
EPA 6010C	MBLK		Magnesium	0.14			mg/L	

Table 2A - List of Samples Qualified for Method Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
None.						

Table 2B - List of Samples Qualified for Field Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
None.						

Table 3 - List of Samples with Surrogates outside Control Limits

Method	Sample ID	Sample Type	Analyte	Rec.	Low Limit	High Limit	Dil Fac	Sample Qual.
None.								

Table 7 – Summary of Field Duplicate Results:

Method	Analyte	Units			RPD	Rating	Sample Qualifier
None.							

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

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Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209431001

Project: Red Devil Mine
Lab ID: S1209431-001
Client Sample ID: 0912RD04SW
COC: RDM-0912-004

Work Order: S1209431
Collection Date: 9/11/2012 5:26:00 PM
Date Received: 9/25/2012 11:47:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	120 J	10	H	mg/L	09/25/2012 1516 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1631 JCG	SM 2540
Alkalinity, Total (As CaCO3)	66	5		mg/L	09/25/2012 2141 KV	SM 2320B
Total Organic Carbon	2	1		mg/L	09/26/2012 1117 AMB	SM 5310B
Anions						
Alkalinity, Bicarbonate as HCO3	81 J	5		mg/L	09/25/2012 2141 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5		mg/L	09/25/2012 2141 KV	SM 2320B
Chloride	0.5 J	0.2		mg/L	09/26/2012 015 AM	EPA 300.0
Fluoride	ND UJ	0.2		mg/L	09/26/2012 015 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	ND UJ	0.05		mg/L	09/25/2012 1639 RH	EPA 353.2
Sulfate	6.6 J	0.2		mg/L	09/26/2012 015 AM	EPA 300.0
Dissolved Metals						
Aluminum	ND	50		µg/L	09/26/2012 1304 DG	6010C
Antimony	25.9	0.2		µg/L	09/28/2012 1340 MS	6020A
Arsenic	14	2		µg/L	09/28/2012 1340 MS	6020A
Barium	20	10		µg/L	09/28/2012 1340 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1340 MS	6020A
Cadmium	ND	0.9		µg/L	09/28/2012 1340 MS	6020A
Calcium	14400	50		µg/L	09/26/2012 1304 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1340 MS	6020A
Cobalt	ND	0.1		µg/L	09/28/2012 1340 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1340 MS	6020A
Iron	60	20		µg/L	09/26/2012 1304 DG	6010C
Lead	ND	0.14		µg/L	09/28/2012 1340 MS	6020A
Magnesium	7890	20		µg/L	09/26/2012 1304 DG	6010C
Manganese	7	2		µg/L	09/28/2012 1340 MS	6020A
Nickel	ND	0.7		µg/L	09/28/2012 1340 MS	6020A
Potassium	ND	400		µg/L	09/26/2012 1304 DG	6010C
Selenium	ND	2		µg/L	09/28/2012 1340 MS	6020A
Silicon	3500	400		µg/L	09/26/2012 1304 DG	6010C
Silver	ND	0.2		µg/L	09/28/2012 1340 MS	6020A
Sodium	1600	200		µg/L	09/26/2012 1304 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1340 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1340 MS	6020A
Zinc	ND	10		µg/L	09/26/2012 1304 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____ 11/16/12
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209431001

Project: Red Devil Mine
Lab ID: S1209431-001
Client Sample ID: 0912RD04SW
COC: RDM-0912-004

Work Order: S1209431
Collection Date: 9/11/2012 5:26:00 PM
Date Received: 9/25/2012 11:47:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2107 DG	6010C
Antimony	27.3	0.07		µg/L	09/28/2012 1345 MS	6020A
Arsenic	14	2		µg/L	09/28/2012 1345 MS	6020A
Barium	20	10		µg/L	09/28/2012 1345 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1345 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1345 MS	6020A
Calcium	15600	50		µg/L	10/01/2012 2107 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1345 MS	6020A
Cobalt	ND	0.1		µg/L	09/28/2012 1345 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1345 MS	6020A
Iron	110	20		µg/L	10/01/2012 2107 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1345 MS	6020A
Magnesium	8490	20		µg/L	10/01/2012 2107 DG	6010C
Manganese	11	2		µg/L	09/28/2012 1345 MS	6020A
Nickel	ND	2		µg/L	09/28/2012 1345 MS	6020A
Potassium	ND	400		µg/L	10/01/2012 2107 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1345 MS	6020A
Silicon	3900	400		µg/L	10/01/2012 2107 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1345 MS	6020A
Sodium	1500	200		µg/L	10/01/2012 2107 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1345 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1345 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2107 DG	6010C

11/16/12

These results apply only to the samples tested.

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S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209431001

Project: Red Devil Mine
Lab ID: S1209431-002
Client Sample ID: 0912RD08SW
COC: RDM-0912-004

Work Order: S1209431
Collection Date: 9/11/2012 11:11:00 AM
Date Received: 9/25/2012 11:47:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	130 J	10	H	mg/L	09/25/2012 1517 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1632 JCG	SM 2540
Alkalinity, Total (As CaCO3)	73	5		mg/L	09/25/2012 2149 KV	SM 2320B
Total Organic Carbon	2	1		mg/L	09/26/2012 1130 AMB	SM 5310B
Anions						
Alkalinity, Bicarbonate as HCO3	89 J	5		mg/L	09/25/2012 2149 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5		mg/L	09/25/2012 2149 KV	SM 2320B
Chloride	0.5 J	0.2		mg/L	09/26/2012 028 AM	EPA 300.0
Fluoride	ND UJ	0.2		mg/L	09/26/2012 028 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	ND UJ	0.05		mg/L	09/25/2012 1640 RH	EPA 353.2
Sulfate	8.7 J	0.2		mg/L	09/26/2012 028 AM	EPA 300.0
Dissolved Metals						
Aluminum	ND	50		µg/L	09/26/2012 1306 DG	6010C
Antimony	226	0.2		µg/L	09/28/2012 1350 MS	6020A
Arsenic	77	2		µg/L	09/28/2012 1350 MS	6020A
Barium	20	10		µg/L	09/28/2012 1350 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1350 MS	6020A
Cadmium	ND	0.9		µg/L	09/28/2012 1350 MS	6020A
Calcium	15400	50		µg/L	09/26/2012 1306 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1350 MS	6020A
Cobalt	0.1	0.1		µg/L	09/28/2012 1350 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1350 MS	6020A
Iron	50	20		µg/L	09/26/2012 1306 DG	6010C
Lead	ND	0.14		µg/L	09/28/2012 1350 MS	6020A
Magnesium	9280	20		µg/L	09/26/2012 1306 DG	6010C
Manganese	17	2		µg/L	09/28/2012 1350 MS	6020A
Nickel	0.8	0.7		µg/L	09/28/2012 1350 MS	6020A
Potassium	ND	400		µg/L	09/26/2012 1306 DG	6010C
Selenium	ND	2		µg/L	09/28/2012 1350 MS	6020A
Silicon	3700	400		µg/L	09/26/2012 1306 DG	6010C
Silver	ND	0.2		µg/L	09/28/2012 1350 MS	6020A
Sodium	1900	200		µg/L	09/26/2012 1306 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1350 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1350 MS	6020A
Zinc	ND	10		µg/L	09/26/2012 1306 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/16/12

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209431001

Project: Red Devil Mine
Lab ID: S1209431-002
Client Sample ID: 0912RD08SW
COC: RDM-0912-004

Work Order: S1209431
Collection Date: 9/11/2012 11:11:00 AM
Date Received: 9/25/2012 11:47:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2110 DG	6010C
Antimony	243	0.07		µg/L	09/28/2012 1355 MS	6020A
Arsenic	90	2		µg/L	09/28/2012 1355 MS	6020A
Barium	30	10		µg/L	09/28/2012 1355 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1355 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1355 MS	6020A
Calcium	16800	50		µg/L	10/01/2012 2110 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1355 MS	6020A
Cobalt	0.2	0.1		µg/L	09/28/2012 1355 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1355 MS	6020A
Iron	130	20		µg/L	10/01/2012 2110 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1355 MS	6020A
Magnesium	10000	20		µg/L	10/01/2012 2110 DG	6010C
Manganese	22	2		µg/L	09/28/2012 1355 MS	6020A
Nickel	ND	2		µg/L	09/28/2012 1355 MS	6020A
Potassium	ND	400		µg/L	10/01/2012 2110 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1355 MS	6020A
Silicon	4000	400		µg/L	10/01/2012 2110 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1355 MS	6020A
Sodium	1900	200		µg/L	10/01/2012 2110 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1355 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1355 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2110 DG	6010C

11/16/12

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209431001

Project: Red Devil Mine
Lab ID: S1209431-003
Client Sample ID: 0912RD10SW
COC: RDM-0912-004

Work Order: S1209431
Collection Date: 9/12/2012 11:52:00 AM
Date Received: 9/25/2012 11:47:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	120 J	10	H	mg/L	09/25/2012 1518 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1633 JCG	SM 2540
Alkalinity, Total (As CaCO3)	72	5		mg/L	09/25/2012 2156 KV	SM 2320B
Total Organic Carbon	2	1		mg/L	09/26/2012 1141 AMB	SM 5310B
Anions						
Alkalinity, Bicarbonate as HCO3	88 J	5		mg/L	09/25/2012 2156 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5		mg/L	09/25/2012 2156 KV	SM 2320B
Chloride	0.4 J	0.2		mg/L	09/26/2012 040 AM	EPA 300.0
Fluoride	ND UJ	0.2		mg/L	09/26/2012 040 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	ND UJ	0.05		mg/L	09/25/2012 1641 RH	EPA 353.2
Sulfate	6.2 J	0.2		mg/L	09/26/2012 040 AM	EPA 300.0
Dissolved Metals						
Aluminum	ND	50		µg/L	09/26/2012 1308 DG	6010C
Antimony	1.6	0.2		µg/L	09/28/2012 1400 MS	6020A
Arsenic	ND	2		µg/L	09/28/2012 1400 MS	6020A
Barium	20	10		µg/L	09/28/2012 1400 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1400 MS	6020A
Cadmium	ND	0.9		µg/L	09/28/2012 1400 MS	6020A
Calcium	14500	50		µg/L	09/26/2012 1308 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1400 MS	6020A
Cobalt	ND	0.1		µg/L	09/28/2012 1400 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1400 MS	6020A
Iron	40	20		µg/L	09/26/2012 1308 DG	6010C
Lead	ND	0.14		µg/L	09/28/2012 1400 MS	6020A
Magnesium	7830	20		µg/L	09/26/2012 1308 DG	6010C
Manganese	6	2		µg/L	09/28/2012 1400 MS	6020A
Nickel	ND	0.7		µg/L	09/28/2012 1400 MS	6020A
Potassium	ND	400		µg/L	09/26/2012 1308 DG	6010C
Selenium	ND	2		µg/L	09/28/2012 1400 MS	6020A
Silicon	3500	400		µg/L	09/26/2012 1308 DG	6010C
Silver	ND	0.2		µg/L	09/28/2012 1400 MS	6020A
Sodium	1500	200		µg/L	09/26/2012 1308 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1400 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1400 MS	6020A
Zinc	ND	10		µg/L	09/26/2012 1308 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/16/12

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209431001

Work Order: S1209431
Project: Red Devil Mine
Collection Date: 9/12/2012 11:52:00 AM
Lab ID: S1209431-003
Date Received: 9/25/2012 11:47:00 AM
Client Sample ID: 0912RD10SW
Sampler:
COC: RDM-0912-004
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2112 DG	6010C
Antimony	1.60	0.07		µg/L	09/28/2012 1405 MS	6020A
Arsenic	ND	2		µg/L	09/28/2012 1405 MS	6020A
Barium	20	10		µg/L	09/28/2012 1405 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1405 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1405 MS	6020A
Calcium	16000	50		µg/L	10/01/2012 2112 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1405 MS	6020A
Cobalt	ND	0.1		µg/L	09/28/2012 1405 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1405 MS	6020A
Iron	90	20		µg/L	10/01/2012 2112 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1405 MS	6020A
Magnesium	8580	20		µg/L	10/01/2012 2112 DG	6010C
Manganese	10	2		µg/L	09/28/2012 1405 MS	6020A
Nickel	ND	2		µg/L	09/28/2012 1405 MS	6020A
Potassium	ND	400		µg/L	10/01/2012 2112 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1405 MS	6020A
Silicon	3900	400		µg/L	10/01/2012 2112 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1405 MS	6020A
Sodium	1500	200		µg/L	10/01/2012 2112 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1405 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1405 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2112 DG	6010C

11/16/12

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209431001

Work Order: S1209431
Project: Red Devil Mine
Collection Date: 9/11/2012 4:27:00 PM
Lab ID: S1209431-004
Date Received: 9/25/2012 11:47:00 AM
Client Sample ID: 0912RD12SW
Sampler:
COC: RDM-0912-004
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	120 J	10	H	mg/L	09/25/2012 1519 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1634 JCG	SM 2540
Alkalinity, Total (As CaCO3)	70	5		mg/L	09/25/2012 2204 KV	SM 2320B
Total Organic Carbon	2	1		mg/L	09/26/2012 1154 AMB	SM 5310B
Anions						
Alkalinity, Bicarbonate as HCO3	85 J	5		mg/L	09/25/2012 2204 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5		mg/L	09/25/2012 2204 KV	SM 2320B
Chloride	0.5 J	0.2		mg/L	09/26/2012 053 AM	EPA 300.0
Fluoride	ND UJ	0.2		mg/L	09/26/2012 053 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	0.20 J	0.05		mg/L	09/25/2012 1642 RH	EPA 353.2
Sulfate	7.1 J	0.2		mg/L	09/26/2012 053 AM	EPA 300.0
Dissolved Metals						
Aluminum	ND	50		µg/L	09/26/2012 1310 DG	6010C
Antimony	77.3	0.2		µg/L	09/27/2012 1631 MS	6020A
Arsenic	28	2		µg/L	09/27/2012 1631 MS	6020A
Barium	20	10		µg/L	09/28/2012 1420 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1420 MS	6020A
Cadmium	ND	0.9		µg/L	09/28/2012 1420 MS	6020A
Calcium	14300	50		µg/L	09/26/2012 1310 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1420 MS	6020A
Cobalt	ND	0.1		µg/L	09/28/2012 1420 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1420 MS	6020A
Iron	50	20		µg/L	09/26/2012 1310 DG	6010C
Lead	ND	0.14		µg/L	09/28/2012 1420 MS	6020A
Magnesium	7960	20		µg/L	09/26/2012 1310 DG	6010C
Manganese	8	2		µg/L	09/28/2012 1420 MS	6020A
Nickel	ND	0.7		µg/L	09/28/2012 1420 MS	6020A
Potassium	ND	400		µg/L	09/26/2012 1310 DG	6010C
Selenium	ND	2		µg/L	09/28/2012 1420 MS	6020A
Silicon	3500	400		µg/L	09/26/2012 1310 DG	6010C
Silver	ND	0.2		µg/L	09/28/2012 1420 MS	6020A
Sodium	1500	200		µg/L	09/26/2012 1310 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1420 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1420 MS	6020A
Zinc	ND	10		µg/L	09/26/2012 1310 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

11/16/12

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209431001

Project: Red Devil Mine
Lab ID: S1209431-004
Client Sample ID: 0912RD12SW
COC: RDM-0912-004

Work Order: S1209431
Collection Date: 9/11/2012 4:27:00 PM
Date Received: 9/25/2012 11:47:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2122 DG	6010C
Antimony	80.3	0.07		µg/L	09/28/2012 1425 MS	6020A
Arsenic	30	2		µg/L	09/28/2012 1425 MS	6020A
Barium	20	10		µg/L	09/28/2012 1425 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1425 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1425 MS	6020A
Calcium	15700	50		µg/L	10/01/2012 2122 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1425 MS	6020A
Cobalt	ND	0.1		µg/L	09/28/2012 1425 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1425 MS	6020A
Iron	100	20		µg/L	10/01/2012 2122 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1425 MS	6020A
Magnesium	8640	20		µg/L	10/01/2012 2122 DG	6010C
Manganese	11	2		µg/L	09/28/2012 1425 MS	6020A
Nickel	ND	2		µg/L	09/28/2012 1425 MS	6020A
Potassium	ND	400		µg/L	10/01/2012 2122 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1425 MS	6020A
Silicon	3900	400		µg/L	10/01/2012 2122 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1425 MS	6020A
Sodium	1500	200		µg/L	10/01/2012 2122 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1425 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1425 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2122 DG	6010C

11/16/12

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209431
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209431001

Dissolved Metals by ICPMS (6020A)

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87727	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
MBLK	09/28/12 11:32	Antimony	ND	0.005					
		Arsenic	ND	0.005					
		Barium	ND	0.1					
		Beryllium	ND	0.002					
		Cadmium	ND	0.002					
		Chromium	ND	0.001					
		Cobalt	ND	0.01					
		Copper	ND	0.01					
		Lead	ND	0.02					
		Manganese	ND	0.01					
		Nickel	ND	0.01					
		Selenium	ND	0.005					
		Silver	ND	0.003					
		Thallium	ND	0.001					
		Vanadium	ND	0.02					

10/16/12

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87727	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	09/28/12 11:28	Antimony	0.101	0.005	0.1		101	80 - 120	
		Arsenic	0.099	0.005	0.1		98.6	80 - 120	
		Barium	0.1	0.1	0.1		102	80 - 120	
		Beryllium	0.099	0.002	0.1		98.6	80 - 120	
		Cadmium	0.098	0.002	0.1		97.6	80 - 120	
		Chromium	0.100	0.001	0.1		100	80 - 120	
		Cobalt	0.10	0.01	0.1		101	80 - 120	
		Copper	0.10	0.01	0.1		102	80 - 120	
		Lead	0.10	0.02	0.1		102	80 - 120	
		Manganese	0.10	0.01	0.1		101	80 - 120	
		Nickel	0.10	0.01	0.1		99.5	80 - 120	
		Selenium	0.099	0.005	0.1		98.8	80 - 120	
		Silver	0.097	0.003	0.1		97.4	80 - 120	
		Thallium	0.102	0.001	0.1		102	80 - 120	
		Vanadium	0.10	0.02	0.1		98.6	80 - 120	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209431
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209431001

Anions by ION Chromatography

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLK	09/25/12 11:41	Chloride	ND	1					
		Fluoride	ND	0.1					
		Sulfate	ND	1					

11/16/12

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
DIONEX	09/25/12 11:16	Chloride	31	1	30		102	90 - 110	
		Fluoride	20.7	0.1	20		104	90 - 110	
		Sulfate	144	1	150		95.8	90 - 110	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209429-001ASPK	09/25/12 23:01	Chloride	5	1	5	ND	95.0	80 - 120	
		Fluoride	2.2	0.1	2	ND	108	80 - 120	
		Sulfate	49	1	40	9	99.7	80 - 120	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209429-001ASPK	09/25/12 23:14	Chloride	5	1	5	0.426	95.5	20	
		Fluoride	2.2	0.1	2.2	0.498	107	20	
		Sulfate	50	1	49	1.10	101	20	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-001A	09/25/12 22:49	Chloride	0.5	0.2	0.5	4.92		20	
		Fluoride	ND	0.2	ND			20	
		Sulfate	9.2	0.2	9.2	0.0347		20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209431
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209431001

Nitrogen, Nitrate-Nitrite (as N)

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLANK	09/25/12 15:51	Nitrogen, Nitrate-Nitrite (as N)	ND	0.1					

11/16/12

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
QC	09/25/12 15:53	Nitrogen, Nitrate-Nitrite (as N)	18.5	0.1	19.3		95.7	90 - 110	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209429-001B	09/25/12 16:36	Nitrogen, Nitrate-Nitrite (as N)	4.78	0.05	5	ND	95.6	80 - 120	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209429-001B	09/25/12 16:37	Nitrogen, Nitrate-Nitrite (as N)	5.22	0.05	4.78	9.33	104	20	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-001B	09/25/12 16:35	Nitrogen, Nitrate-Nitrite (as N)	ND	0.05	ND			20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209431
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209431001

Solids By SM 2540

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87559	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLANK	09/25/12 16:02	Total Suspended Solids	ND	5					

Sample ID	RunNo: 87637	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
DI	09/25/12 14:32	Total Dissolved Solids (180)	ND	10					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87559	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
CONTROL	09/25/12 16:03	Total Suspended Solids	102	5	100		102	90 - 110	

Sample ID	RunNo: 87637	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
CONTROL	09/25/12 14:33	Total Dissolved Solids (180)	240	10	226		106	90 - 110	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87559	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-002A	09/25/12 16:14	Total Suspended Solids	ND	5	ND			20	H

Sample ID	RunNo: 87637	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-001A	09/25/12 14:57	Total Dissolved Solids (180)	120	10	110	7.27		20	H

Total Organic Carbon

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87635	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLANK	09/26/12 12:33	Total Organic Carbon	ND	0.5					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87635	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	09/26/12 9:55	Total Organic Carbon	55.8	0.5	56.3		99.2	90 - 110	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87635	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209429-001ESPK	09/26/12 10:42	Total Organic Carbon	51.5	0.5	50	2.2	98.6	80 - 120	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87635	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209429-001ESPK	09/26/12 10:53	Total Organic Carbon	51.4	0.5	51.5	0.252	98.4	20	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87635	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-001E	09/26/12 10:30	Total Organic Carbon	2	1	2	5.51		20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

11/16/12

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209431
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209431001

Total(3020) Metals by ICP - 6010C

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
ICB	10/01/12 13:09	Aluminum	ND	0.005					
		Calcium	ND	0.2					
		Iron	ND	0.05					
		Magnesium	0.14	0.02					B
		Potassium	ND	0.1					
		Silicon	ND	0.1					
		Sodium	ND	0.1					
		Zinc	ND	0.005					

11/16/12

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
ICV Q	10/01/12 13:11	Silicon	1.0	0.1	1		102	80 - 120	

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
ICV 3	10/01/12 13:13	Calcium	39.9	0.2	40		99.7	80 - 120	
		Magnesium	39.1	0.02	40		97.7	80 - 120	
		Potassium	40.4	0.1	40		101	80 - 120	
		Sodium	39.4	0.1	40		98.5	80 - 120	

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS-6432	10/01/12 19:51	Aluminum	0.525	0.005	0.5		105	80 - 120	
		Iron	0.57	0.05	0.5		113	80 - 120	
		Zinc	0.206	0.005	0.2		103	80 - 120	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209429-001DS	10/01/12 19:56	Aluminum	0.550	0.005	0.5	0.031	104	75 - 125	
		Iron	0.69	0.05	0.5	0.15	109	75 - 125	
		Zinc	0.206	0.005	0.2	ND	103	75 - 125	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209429-001DMSD	10/01/12 19:58	Aluminum	0.546	0.005	0.550	0.673	103	20	
		Iron	0.68	0.05	0.69	1.35	107	20	
		Zinc	0.205	0.005	0.206	0.388	103	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209431
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209431001

Total(3020) Metals by ICP - 6010C
Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-002DD	10/01/12 20:03	Aluminum	0.028	0.005	0.028	1.78		20	
		Calcium	16.7	0.2	16.7	0.0228		20	
		Iron	0.14	0.05	0.14	0.861		20	
		Magnesium	9.92	0.02	9.96	0.463		20	
		Potassium	0.3	0.1	0.4	0.172		20	
		Silicon	4.0	0.1	4.0	0.145		20	
		Sodium	1.9	0.1	1.9	0.423		20	
		Zinc	ND	0.005	ND			20	

Total (3020) Metals by ICPMS - 6020A
Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87728	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
MB-6432	09/28/12 12:22	Antimony	ND	0.005					
		Arsenic	ND	0.005					
		Barium	ND	0.01					
		Beryllium	ND	0.002					
		Cadmium	ND	0.002					
		Chromium	ND	0.001					
		Cobalt	ND	0.01					
		Copper	ND	0.001					
		Lead	ND	0.001					
		Manganese	ND	0.01					
		Nickel	ND	0.01					
		Selenium	ND	0.005					
		Silver	ND	0.003					
		Thallium	ND	0.01					
		Vanadium	ND	0.02					

11/16/12

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

CHAIN OF CUSTODY RECORD

Red Devil Mine Project
Contact Name: Bill Richards
Contact Phone: 206-624-9537

No: RDM-0912-004

Cooler #: 4
Lab: Inter-Mountain Laboratories, Inc.
Lab Phone: 800-828-1097

Ecology and Environment, Inc

SL209431

Lab #	Location		Analyses	Collected	Sample Time	Numb Cont	Container	Preservative	MS/MSD
	0912RD04SW		Total Inorganic Elements	9/11/2012	17:26	1	250 mL HDPE	HNO3 pH<2	
	0912RD04SW		Dissolved Inorganic Elements	9/11/2012	17:26	1	250 mL HDPE	HNO3 pH<2	
001	0912RD04SW	F	Methyl Mercury	9/11/2012	17:26	1	500 mL FLPE	HCl	
	0912RD04SW	G	Arsenic Speciation	9/11/2012	17:26	1	250 mL HDPE	HCl	
	0912RD04SW		Anions, TSS, TDS, Carbonate, Bicarbonate	9/11/2012	17:26	1	500 mL HDPE	None	
	0912RD04SW		Nitrate/Nitrite	9/11/2012	17:26	1	125 mL HDPE	H2SO4 pH<2	
	0912RD04SW		Total Organic Carbon	9/11/2012	17:26	2	40 ml Amber Glass	HCl	
	0912RD08SW		Total Inorganic Elements	9/11/2012	11:11	1	250 mL HDPE	HNO3 pH<2	
	0912RD08SW		Dissolved Inorganic Elements	9/11/2012	11:11	1	250 mL HDPE	HNO3 pH<2	
002	0912RD08SW	F	Methyl Mercury	9/11/2012	11:11	1	500 mL FLPE	HCl	
	0912RD08SW	G	Arsenic Speciation	9/11/2012	11:11	1	250 mL HDPE	HCl	
	0912RD08SW		Anions, TSS, TDS, Carbonate, Bicarbonate	9/11/2012	11:11	1	500 mL HDPE	None	
	0912RD08SW		Nitrate/Nitrite	9/11/2012	11:11	1	125 mL HDPE	H2SO4 pH<2	
	0912RD08SW		Total Organic Carbon	9/11/2012	11:11	2	40 ml Amber Glass	HCl	
	0912RD10SW		Total Inorganic Elements	9/12/2012	11:52	1	250 mL HDPE	HNO3 pH<2	
	0912RD10SW		Dissolved Inorganic Elements	9/12/2012	11:52	1	250 mL HDPE	HNO3 pH<2	
003	0912RD10SW	F	Methyl Mercury	9/12/2012	11:52	1	500 mL FLPE	HCl	
	0912RD10SW	G	Arsenic Speciation	9/12/2012	11:52	1	250 mL HDPE	HCl	

Special Instructions: Lab Filter Anions, Carbonate, and bicarbonate

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Kathy Boyd IML	9.25.12	11:47						

7.8 °C

CHAIN OF CUSTODY RECORD

Red Devil Mine Project
Contact Name: Bill Richards
Contact Phone: 206-624-9537

No: RDM-0912-004

Cooler #: 4

Ecology and Environment, Inc

Lab: Inter-Mountain Laboratories, Inc.
Lab Phone: 800-828-1097

Lab #	Location	Analyses	Collected	Sample Time	Numb Cont	Container	Preservative	MS/MSD
	0912RD10SW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/12/2012	11:52	1	500 mL HDPE	None	
	0912RD10SW	Nitrate/Nitrite	9/12/2012	11:52	1	125 mL HDPE	H2SO4 pH<2	
	0912RD10SW	Total Organic Carbon	9/12/2012	11:52	2	40 ml Amber Glass	HCl	
	0912RD12SW	Total Inorganic Elements	9/11/2012	16:27	1	250 mL HDPE	HNO3 pH<2	
	0912RD12SW	Dissolved Inorganic Elements	9/11/2012	16:27	1	250 mL HDPE	HNO3 pH<2	
004	0912RD12SW	Methyl Mercury	9/11/2012	16:27	1	500 mL FLPE	HCl	
	0912RD12SW	Arsenic Speciation	9/11/2012	16:27	1	250 mL HDPE	HCl	
	0912RD12SW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/11/2012	16:27	1	500 mL HDPE	None	
	0912RD12SW	Nitrate/Nitrite	9/11/2012	16:27	1	125 mL HDPE	H2SO4 pH<2	
	0912RD12SW	Total Organic Carbon	9/11/2012	16:27	2	40 ml Amber Glass	HCl	

Special Instructions: Lab Filter Anions, Carbonate, and bicarbonate

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Kathy Boyd IML	9.25.12	11:47						

7.8.C

DATA REVIEW MEMORANDUM

DATE: November 15, 2012

TO: Bill Richards, Project Manager, E & E, Seattle, WA

FROM: Mindy Song, E & E, Long Beach, CA 11/16/12

SUBJ: Data Review: Red Devil Mine

REFERENCE:

Project ID	Lab Work Order	Lab
EE-1096-0070	S1209432	Inter-Mountain Labs

I. SAMPLE IDENTIFICATION

For the sampling activities at Red Devil Mine, Ecology and Environment, Inc. (E & E) collected the samples listed on Table 1. Project-specific matrix spike/matrix spike duplicates (MS/MSD) were designated in the field, laboratory also identified batch MS/MSD's as batch QC for additional analytical testing. All samples were sent to Inter-Mountain Labs in Sheridan, WY for analysis. All tables are included at the end of this memorandum.

Data were reviewed for field and laboratory precision, accuracy, and completeness in accordance with procedures and quality control (QC) limits, the current laboratory Quality Assurance Manual (QAM) and current standard operating procedures (SOPs). Laboratory data qualifiers for compound identification and quantitation were accepted. Any additional data review qualifiers added are noted below and listed on the tables at the end of this memorandum. Definitions of all data qualifiers are given in the report.

Table 1 Sample Listing

Work Order	Matrix	Sample ID	Lab ID	Sample Date	MS/MSD	ID Corrections
S1209432	Water	0912MW04GW	S1209432-001	09/10/2012		
S1209432	Water	0912MW10GW	S1209432-002	09/10/2012		
S1209432	Water	0912MW14GW	S1209432-003	09/10/2012		
S1209432	Water	0912MW28GW	S1209432-004	09/10/2012		
S1209432	Water	0912R101D1	S1209432-005	09/16/2012		
S1209432	Water	0912RD05SW	S1209432-006	09/11/2012		
S1209432	Water	0912RD06SW	S1209432-007	09/11/2012		
S1209432	Water	0912EB02D1	S1209432-008	09/12/2012		
S1209432	Water	0912MW09GW	S1209432-009	09/11/2012		

Work Orders, Tests and Number of Samples included in this DVM

Work Orders	Matrix	Test Method	Method Name	Number of Samples	Sample Type
S1209432	Water	SM 2540	TDS	7	
S1209432	Water	SM 2540	TSS	7	
S1209432	Water	SM 2320B	Alkalinity	7	
S1209432	Water	EPA 300.0/353.2	Anions	7	
S1209432	Water	EPA 6010C/6020A	Total Metals	9	
S1209432	Water	EPA 6010C/6020A	Dissolved Metals	3	
S1209432	Water	SM 5310B	TOC	2	

II. SAMPLE PROCEDURES

All samples were collected as specified in the work plan and documented on the chain-of-custody (COC) and in field notebooks. Samples were analyzed as specified on the COC. Samples were packaged, shipped and received as specified in the work plan. All samples must be received cold (4 ±2) °C and in good condition as documented on the Cooler Receipt Form.

REVIEW RESULTS:

All sample procedures were followed and the sample coolers were received at 7.4 °C. No problems with the condition of the sample upon receipt are documented. Since the samples were received at temperature outside of range (>6 °C), the detected results were qualified as estimated (J) and the non-detected results were qualified as estimated (UJ) for the analyses of Anions. Qualification for metals, TDS, TSS, Total Alkalinity, and TOC was not necessary.

III. LABORATORY DATA

1.0 HOLDING TIMES

Holding times are established and monitored to ensure analytical results accurately represent analyte concentrations in a sample at the time of collection. Exceeding the holding time for a sample generally results in a loss of the analyte due to a variety of mechanisms, such as deposition on the sample container walls or precipitation.

REVIEW RESULTS:

All samples were analyzed within the project and method specified holding times for all analytes except Alkalinity, Total Dissolved solids, and Total Suspended Solids. The detected Alkalinity, TDS and TSS results were qualified as estimated (J) and the non-detected Alkalinity, TDS and TSS results were qualified as estimated (UJ).

2.0 BLANKS

Laboratory and field blank samples are analyzed and evaluated to determine the existence and magnitude of possible contamination during the sampling and analysis process. As noted in Table 2, analyte concentrations in the blanks are generally below the practical quantitation limit (PQL). If the analyte is present in the sample at similar trace levels, then the analyte is likely a common background contaminant from some phase of the sampling, extraction, or analytical procedure and associated low level sample concentrations are not considered to be site related. If the analyte concentration is above the PQL, then there is a potential contamination problem and sample results may be biased high or the data unusable.

REVIEW RESULTS:

All blanks were performed at the required frequency. No analytes except trace amount (0.14 mg/L) of magnesium were detected in the method blank at reporting limit levels. Also, trace amount of antimony (0.07ug/L) and magnesium (60ug/L) were detected in the equipment blank (0912EB02D1). The detected antimony and magnesium results were qualified as non-detect (U) in sample 0912RI01DI since the sample concentration was less than 5X the blank concentration.

3.0 SURROGATE SPIKE RECOVERY

Laboratory performance for individual samples analyzed for organic compounds is established by means of surrogate spiking activities. Samples are spiked with surrogate compounds prior to preparation and analysis. Unusually low or high surrogate recovery values may indicate some deficiency in the analytical system or that some matrix effects exist, resulting in low or high sample results for target compounds. Sample surrogate recoveries outside QC limits (if applicable) are presented in Table 3.

REVIEW RESULTS:

Not applicable for these analyses.

4.0 MATRIX SPIKE AND MATRIX SPIKE DUPLICATE ANALYSIS

The matrix spike and matrix spike duplicate (MS/MSD) analyses are intended to provide information about the affects that the sample matrix exerts on the

digestion/extraction and measurement methodology. MS recovery values that do not meet laboratory QC criteria may indicate that sample analyte results are being attenuated in the analysis procedure. These results are presented in Table 4 (if applicable). The potential sample bias may be estimated by noting the degree to which the MS concentration was elevated or lowered in the spike analysis. However, this bias should serve only as approximations; sample-specific problems may be the cause of the discrepancy, particularly in soil samples. Recoveries of a post-digestion spike or a laboratory control sample (LCS) are used to verify that the analytical methodology is acceptable and that MS recoveries are due to matrix effects. An MSD analysis is performed to evaluate the precision of the sample results. Precision is measured as the relative percent difference (RPD) between analytical results for duplicate samples. The laboratory's failure to produce similar results for MSD samples may indicate that the samples were non-homogeneous (particularly in soil samples), or that method defects may exist in the laboratory's techniques.

REVIEW RESULTS:

The MS/MSD sample analyses were performed on samples 0912MW04GW and 0912RD09SW at the required frequency. MS/MSD recoveries were within the control limits except Manganese generated by the laboratory. The detected Mn results in all samples were qualified as estimated (J).

5.0 LABORATORY CONTROL SAMPLE ANALYSIS

The LCS is analyzed to monitor the efficiency of the digestion/extraction procedure and analytical instrument operation. The ability of the laboratory to successfully analyze an LCS demonstrates that there are no analytical problems related to the digestion/sample preparation procedures and/or instrument operations. The LCS results outside QC limits are presented in Table 5 (if applicable). Sporadic and marginal QC failures for multiple component methods do not indicate an analytical concern. If recoveries are high and the compounds are not detected in the samples, then no data qualification is required. All recoveries should be above 10% or the non-detect results flagged "UR" as rejected.

REVIEW RESULTS:

All LCS analyses were within control limits and performed at the required frequency.

IV. COMPOUND IDENTIFICATION AND QUANTITATION

Compound identities are assigned by comparing sample compound retention times to retention times from known (standard) compounds and identification of an acceptable mass spectrum. Compounds detected below the PQL in samples should be considered estimated and are qualified "J." The samples with compounds above the linear range were all re-analyzed at a higher dilution factor.

REVIEW RESULTS:

All compound identification and quantitation criteria were achieved.

V. FIELD DUPLICATE SAMPLE RESULTS

Field duplicate samples were collected and analyzed as an indication of overall precision for both field and laboratory. Field duplicate results are summarized in Table 7 (if applicable). The results are expected to have more variability than laboratory duplicates, which measure only laboratory precision. It is expected also that soil field duplicates will exhibit greater variance than water field duplicates due to the difficulties associated with collecting identical field samples. The QC criteria used to assess field duplicate samples for this project was limits of 70% RPD for soils and 40% RPD for waters, or twice the general laboratory duplicate criteria. If both compounds were below the laboratory PQL or one of the compounds was present as a non-detect, then the compounds are generally not qualified due to field duplicate precision. There are no guidelines regarding data qualification based on poor field duplicate precision. Professional judgment was used to determine whether or not to qualify results.

REVIEW RESULTS:

No Field duplicates analyses were performed on this SDG. The RPD ratings are listed on Table 7 as "Good" if the RPD is less than field duplicate QC criteria of 40% and as "Poor" if the RPD exceeded the field duplicate QC criteria.

All the results show good precision in the sample pair as noted on table 7. Qualifiers were only added to the field duplicate sample pair results as noted.

6.0 OVERALL ASSESSMENT OF DATA

All data were reviewed and considered usable with qualification as noted in this report.

Table 2 - List of Positive Results for Blank Samples

Method	Sample ID	Sample Type	Analyte	Result	Qual	Anal Type	Units	PQL
EPA 6020A	0912EB02DI		Antimony	0.07			ug/L	
EPA 6010C	0912EB02D2		Magnesium	60			ug/L	
EPA 6010C	MBLK		Magnesium	0.14			mg/L	

Table 2A - List of Samples Qualified for Method Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
EPA 6020A	0912RI01DI	Antimony	0.07	0.22	U	
EPA 6010C	0912R101DI	Mg	60	60	U	

Table 2B - List of Samples Qualified for Field Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
None.						

Table 3 - List of Samples with Surrogates outside Control Limits

Method	Sample ID	Sample Type	Analyte	Rec.	Low Limit	High Limit	Dil Fac	Sample Qual.
None.								

Table 4 - List MS/MSD Recoveries and RPDs outside Control Limits

Method	Sample ID	Sample Type	Analyte	Orig. Result	Spike Amount	Rec.	Dil Fac.	Low Limit	High Limit	Sample Qual	Reportable
EPA 6020A	0912MW04GW	MS	Manganese	1.75	0.2	43%	1	75	125	J	Yes
EPA 6020A	0912MW04GW	MSD	Manganese	1.75	0.2	47	1	75	125	J	Yes

Sample ID	Analyte	Method	RPD	RPD Limit	No. of Affected Samples	Samp Qual
None.						

Table 5 - List LCS Recoveries outside Control Limits

Method	Sample ID	Analyte	Rec.	Low Limit	High Limit	No. of Affected Samples	Samp Qual
None.							

Table 6 –Samples that were Re-analyzed

Sample ID	Lab ID	Method	Sample Type	Action
None.				

Table 7 – Summary of Field Duplicate Results:

Method	Analyte	Units			RPD	Rating	Sample Qualifier
None.							

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209432001

Project: Red Devil Mine
Lab ID: S1209432-001
Client Sample ID: 0912MW04GW
COC: RDM-0912-005

Work Order: S1209432
Collection Date: 9/10/2012 2:41:00 PM
Date Received: 9/25/2012 11:49:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	760 J	10	H	mg/L	09/25/2012 1520 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1635 JCG	SM 2540
Alkalinity, Total (As CaCO3)	117 J	5	H	mg/L	09/25/2012 2211 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	143 J	5	H	mg/L	09/25/2012 2211 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 2211 KV	SM 2320B
Chloride	0.5 J	0.2		mg/L	09/26/2012 105 AM	EPA 300.0
Fluoride	ND UJ	0.2		mg/L	09/26/2012 105 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	ND UJ	0.05		mg/L	09/25/2012 1621 RH	EPA 353.2
Sulfate	424 J	0.2		mg/L	09/26/2012 105 AM	EPA 300.0
Total Metals						
Aluminum	90	50		µg/L	10/01/2012 2134 DG	6010C
Antimony	32.7	0.07		µg/L	09/28/2012 1723 MS	6020A
Arsenic	10	2		µg/L	09/28/2012 1723 MS	6020A
Barium	60	10		µg/L	09/28/2012 1723 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1723 MS	6020A
Cadmium	0.6	0.5		µg/L	09/28/2012 1723 MS	6020A
Calcium	64400	50		µg/L	10/01/2012 2134 DG	6010C
Chromium	4.2	0.5		µg/L	09/28/2012 1723 MS	6020A
Cobalt	3.4	0.1		µg/L	09/28/2012 1723 MS	6020A
Copper	6.4	0.9		µg/L	09/28/2012 1723 MS	6020A
Iron	190	20		µg/L	10/01/2012 2134 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1723 MS	6020A
Magnesium	98100	20		µg/L	10/01/2012 2134 DG	6010C
Manganese	1750 J	2		µg/L	09/28/2012 1723 MS	6020A
Nickel	50	2		µg/L	09/28/2012 1723 MS	6020A
Potassium	1400	400		µg/L	10/01/2012 2134 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1723 MS	6020A
Silicon	5600	400		µg/L	10/01/2012 2134 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1723 MS	6020A
Sodium	8800	200		µg/L	10/01/2012 2134 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1723 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1723 MS	6020A
Zinc	20	10		µg/L	10/01/2012 2134 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

11/16/12

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209432001

Work Order: S1209432
Project: Red Devil Mine
Collection Date: 9/10/2012 12:15:00 PM
Lab ID: S1209432-002
Date Received: 9/25/2012 11:49:00 AM
Client Sample ID: 0912MW10GW
Sampler:
COC: RDM-0912-005
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	200 J	10	H	mg/L	09/25/2012 1521 JCG	SM 2540
Total Suspended Solids	8 J	5	H	mg/L	09/25/2012 1637 JCG	SM 2540
Alkalinity, Total (As CaCO3)	178 J	5	H	mg/L	09/25/2012 2219 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	218 J	5	H	mg/L	09/25/2012 2219 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 2219 KV	SM 2320B
Chloride	1.2 J	0.2		mg/L	09/26/2012 117 AM	EPA 300.0
Fluoride	ND UJ	0.2		mg/L	09/26/2012 117 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	ND UJ	0.05		mg/L	09/25/2012 1643 RH	EPA 353.2
Sulfate	9.3 J	0.2		mg/L	09/26/2012 117 AM	EPA 300.0
Total Metals						
Aluminum	160	50		µg/L	10/01/2012 2141 DG	6010C
Antimony	2.65	0.07		µg/L	09/28/2012 1738 MS	6020A
Arsenic	110	2		µg/L	09/28/2012 1738 MS	6020A
Barium	100	10		µg/L	09/28/2012 1738 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1738 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1738 MS	6020A
Calcium	22400	50		µg/L	10/01/2012 2141 DG	6010C
Chromium	4.0	0.5		µg/L	09/28/2012 1738 MS	6020A
Cobalt	0.4	0.1		µg/L	09/28/2012 1738 MS	6020A
Copper	1.2	0.9		µg/L	09/28/2012 1738 MS	6020A
Iron	1360	20		µg/L	10/01/2012 2141 DG	6010C
Lead	0.4	0.3		µg/L	09/28/2012 1738 MS	6020A
Magnesium	32100	20		µg/L	10/01/2012 2141 DG	6010C
Manganese	184 J	2		µg/L	09/28/2012 1738 MS	6020A
Nickel	3	2		µg/L	09/28/2012 1738 MS	6020A
Potassium	1200	400		µg/L	10/01/2012 2141 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1738 MS	6020A
Silicon	4700	400		µg/L	10/01/2012 2141 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1738 MS	6020A
Sodium	3400	200		µg/L	10/01/2012 2141 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1738 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1738 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2141 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

11/16/12

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209432001

Project: Red Devil Mine
Lab ID: S1209432-003
Client Sample ID: 0912MW14GW
COC: RDM-0912-005

Work Order: S1209432
Collection Date: 9/10/2012 6:03:00 PM
Date Received: 9/25/2012 11:49:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	200 J	10	H	mg/L	09/25/2012 1522 JCG	SM 2540
Total Suspended Solids	135 J	5	H	mg/L	09/25/2012 1638 JCG	SM 2540
Alkalinity, Total (As CaCO3)	100 J	5	H	mg/L	09/25/2012 2225 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	122 J	5	H	mg/L	09/25/2012 2225 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND VJ	5	H	mg/L	09/25/2012 2225 KV	SM 2320B
Chloride	0.7 J	0.2		mg/L	09/26/2012 130 AM	EPA 300.0
Fluoride	0.2 J	0.2		mg/L	09/26/2012 130 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	ND VJ	0.05		mg/L	09/28/2012 1614 RH	EPA 353.2
Sulfate	41.0 J	0.2		mg/L	09/26/2012 130 AM	EPA 300.0
Total Metals						
Aluminum	1920	50		µg/L	10/01/2012 2143 DG	6010C
Antimony	74.8	0.07		µg/L	09/28/2012 1743 MS	6020A
Arsenic	9710	2		µg/L	09/28/2012 1832 MS	6020A
Barium	140	10		µg/L	09/28/2012 1743 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1743 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1743 MS	6020A
Calcium	22500	50		µg/L	10/01/2012 2143 DG	6010C
Chromium	11.1	0.5		µg/L	09/28/2012 1743 MS	6020A
Cobalt	8.8	0.1		µg/L	09/28/2012 1743 MS	6020A
Copper	10.6	0.9		µg/L	09/28/2012 1743 MS	6020A
Iron	25400	20		µg/L	10/01/2012 2143 DG	6010C
Lead	1.9	0.3		µg/L	09/28/2012 1743 MS	6020A
Magnesium	18700	20		µg/L	10/01/2012 2143 DG	6010C
Manganese	4390 J	2		µg/L	09/28/2012 1832 MS	6020A
Nickel	15	2		µg/L	09/28/2012 1743 MS	6020A
Potassium	1100	400		µg/L	10/01/2012 2143 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1743 MS	6020A
Silicon	9900	400		µg/L	10/01/2012 2143 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1743 MS	6020A
Sodium	4100	200		µg/L	10/01/2012 2143 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1743 MS	6020A
Vanadium	9	2		µg/L	09/28/2012 1743 MS	6020A
Zinc	20	10		µg/L	10/01/2012 2143 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

11/16/12

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209432001

Project: Red Devil Mine
Lab ID: S1209432-004
Client Sample ID: 0912MW28GW
COC: RDM-0912-005

Work Order: S1209432
Collection Date: 9/10/2012 4:20:00 PM
Date Received: 9/25/2012 11:49:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	280 J	10	H	mg/L	09/25/2012 1523 JCG	SM 2540
Total Suspended Solids	38 J	5	H	mg/L	09/25/2012 1639 JCG	SM 2540
Alkalinity, Total (As CaCO3)	209 J	5	H	mg/L	09/25/2012 2239 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	255 J	5	H	mg/L	09/25/2012 2239 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5	H	mg/L	09/25/2012 2239 KV	SM 2320B
Chloride	0.6 J	0.2		mg/L	09/26/2012 142 AM	EPA 300.0
Fluoride	0.2 J	0.2		mg/L	09/26/2012 142 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	ND UJ	0.05		mg/L	09/28/2012 1615 RH	EPA 353.2
Sulfate	40.5 J	0.2		mg/L	09/26/2012 142 AM	EPA 300.0
Total Metals						
Aluminum	440	50		µg/L	10/01/2012 2153 DG	6010C
Antimony	17.4	0.07		µg/L	09/28/2012 1747 MS	6020A
Arsenic	68	2		µg/L	09/28/2012 1747 MS	6020A
Barium	70	10		µg/L	09/28/2012 1747 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1747 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1747 MS	6020A
Calcium	40900	50		µg/L	10/01/2012 2153 DG	6010C
Chromium	8.0	0.5		µg/L	09/28/2012 1747 MS	6020A
Cobalt	3.9	0.1		µg/L	09/28/2012 1747 MS	6020A
Copper	2.6	0.9		µg/L	09/28/2012 1747 MS	6020A
Iron	2250	20		µg/L	10/01/2012 2153 DG	6010C
Lead	0.8	0.3		µg/L	09/28/2012 1747 MS	6020A
Magnesium	29200	20		µg/L	10/01/2012 2153 DG	6010C
Manganese	1070 J	2		µg/L	09/28/2012 1747 MS	6020A
Nickel	11	2		µg/L	09/28/2012 1747 MS	6020A
Potassium	1200	400		µg/L	10/01/2012 2153 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1747 MS	6020A
Silicon	5600	400		µg/L	10/01/2012 2153 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1747 MS	6020A
Sodium	11100	200		µg/L	10/01/2012 2153 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1747 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1747 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2153 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

11/16/12

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209432001

Project: Red Devil Mine
Lab ID: S1209432-005
Client Sample ID: 0912RI01DI
COC: RDM-0912-005

Work Order: S1209432
Collection Date: 9/16/2012 11:00:00 AM
Date Received: 9/25/2012 11:49:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2155 DG	6010C
Antimony	0.22	0.07	U	µg/L	09/28/2012 1752 MS	6020A
Arsenic	ND	2		µg/L	09/28/2012 1752 MS	6020A
Barium	ND	10		µg/L	09/28/2012 1752 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1752 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1752 MS	6020A
Calcium	ND	50		µg/L	10/01/2012 2155 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1752 MS	6020A
Cobalt	ND	0.1		µg/L	09/28/2012 1752 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1752 MS	6020A
Iron	ND	20		µg/L	10/01/2012 2155 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1752 MS	6020A
Magnesium	60	20	U	µg/L	10/01/2012 2155 DG	6010C
Manganese	ND	2		µg/L	09/28/2012 1752 MS	6020A
Nickel	ND	2		µg/L	09/28/2012 1752 MS	6020A
Potassium	ND	400		µg/L	10/01/2012 2155 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1752 MS	6020A
Silicon	ND	400		µg/L	10/01/2012 2155 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1752 MS	6020A
Sodium	ND	200		µg/L	10/01/2012 2155 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1752 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1752 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2155 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

11/16/12

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209432001

Project: Red Devil Mine
Lab ID: S1209432-006
Client Sample ID: 0912RD05SW
COC: RDM-0912-005

Work Order: S1209432
Collection Date: 9/11/2012 3:23:00 PM
Date Received: 9/25/2012 11:49:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	300 J	10	H	mg/L	09/25/2012 1524 JCG	SM 2540
Total Suspended Solids	7 J	5	H	mg/L	09/25/2012 1640 JCG	SM 2540
Alkalinity, Total (As CaCO3)	261 J	5		mg/L	09/25/2012 2246 KV	SM 2320B
Total Organic Carbon	ND UJ	1		mg/L	09/26/2012 1207 AMB	SM 5310B
Anions						
Alkalinity, Bicarbonate as HCO3	319 J	5		mg/L	09/25/2012 2246 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND U	5		mg/L	09/25/2012 2246 KV	SM 2320B
Chloride	0.7 J	0.2		mg/L	09/26/2012 154 AM	EPA 300.0
Fluoride	ND UJ	0.2		mg/L	09/26/2012 154 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	ND UJ	0.05		mg/L	09/25/2012 1652 RH	EPA 353.2
Sulfate	36.5 J	0.2		mg/L	09/26/2012 154 AM	EPA 300.0
Dissolved Metals						
Aluminum	ND	50		µg/L	09/26/2012 1320 DG	6010C
Antimony	15.8	0.2		µg/L	09/28/2012 1440 MS	6020A
Arsenic	619	2		µg/L	09/28/2012 1440 MS	6020A
Barium	100	10		µg/L	09/28/2012 1440 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1440 MS	6020A
Cadmium	ND	0.9		µg/L	09/28/2012 1440 MS	6020A
Calcium	37400	50		µg/L	09/26/2012 1320 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1440 MS	6020A
Cobalt	4.7	0.1		µg/L	09/28/2012 1440 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1440 MS	6020A
Iron	1570	20		µg/L	09/26/2012 1320 DG	6010C
Lead	ND	0.14		µg/L	09/28/2012 1440 MS	6020A
Magnesium	38700	20		µg/L	09/26/2012 1320 DG	6010C
Manganese	386 J	2		µg/L	09/28/2012 1440 MS	6020A
Nickel	17.6	0.7		µg/L	09/28/2012 1440 MS	6020A
Potassium	1300	400		µg/L	09/26/2012 1320 DG	6010C
Selenium	ND	2		µg/L	09/28/2012 1440 MS	6020A
Silicon	4200	400		µg/L	09/26/2012 1320 DG	6010C
Silver	ND	0.2		µg/L	09/28/2012 1440 MS	6020A
Sodium	10300	200		µg/L	09/26/2012 1320 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1440 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1440 MS	6020A
Zinc	ND	10		µg/L	09/26/2012 1320 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

11/16/12

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209432001

Project: Red Devil Mine
Lab ID: S1209432-006
Client Sample ID: 0912RD05SW
COC: RDM-0912-005

Work Order: S1209432
Collection Date: 9/11/2012 3:23:00 PM
Date Received: 9/25/2012 11:49:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2158 DG	6010C
Antimony	38.2	0.07		µg/L	09/28/2012 1450 MS	6020A
Arsenic	842	2		µg/L	09/28/2012 1450 MS	6020A
Barium	110	10		µg/L	09/28/2012 1450 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1450 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1450 MS	6020A
Calcium	41500	50		µg/L	10/01/2012 2158 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1450 MS	6020A
Cobalt	5.9	0.1		µg/L	09/28/2012 1450 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1450 MS	6020A
Iron	2320	20		µg/L	10/01/2012 2158 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1450 MS	6020A
Magnesium	42600	20		µg/L	10/01/2012 2158 DG	6010C
Manganese	420	2	J	µg/L	09/28/2012 1450 MS	6020A
Nickel	22	2		µg/L	09/28/2012 1450 MS	6020A
Potassium	1400	400		µg/L	10/01/2012 2158 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1450 MS	6020A
Silicon	4600	400		µg/L	10/01/2012 2158 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1450 MS	6020A
Sodium	10900	200		µg/L	10/01/2012 2158 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1450 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1450 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2158 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

11/16/12

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209432001

Project: Red Devil Mine
Lab ID: S1209432-007
Client Sample ID: 0912RD06SW
COC: RDM-0912-005

Work Order: S1209432
Collection Date: 9/11/2012 11:57:00 AM
Date Received: 9/25/2012 11:49:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	120 J	10	H	mg/L	09/25/2012 1525 JCG	SM 2540
Total Suspended Solids	ND UJ	5	H	mg/L	09/25/2012 1641 JCG	SM 2540
Alkalinity, Total (As CaCO3)	73 J	5		mg/L	09/25/2012 2254 KV	SM 2320B
Total Organic Carbon	2 J (MS)	1		mg/L	09/26/2012 1220 AMB	SM 5310B
Anions						
Alkalinity, Bicarbonate as HCO3	89 J	5		mg/L	09/25/2012 2254 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5		mg/L	09/25/2012 2254 KV	SM 2320B
Chloride	0.4 J	0.2		mg/L	09/26/2012 256 AM	EPA 300.0
Fluoride	ND UJ	0.2		mg/L	09/26/2012 256 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	0.43 J	0.05		mg/L	09/25/2012 1653 RH	EPA 353.2
Sulfate	9.1 J	0.2		mg/L	09/26/2012 256 AM	EPA 300.0
Dissolved Metals						
Aluminum	ND	50		µg/L	09/26/2012 1322 DG	6010C
Antimony	192	0.2		µg/L	09/28/2012 1455 MS	6020A
Arsenic	71	2		µg/L	09/28/2012 1455 MS	6020A
Barium	20	10		µg/L	09/28/2012 1455 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1455 MS	6020A
Cadmium	ND	0.9		µg/L	09/28/2012 1455 MS	6020A
Calcium	15300	50		µg/L	09/26/2012 1322 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1455 MS	6020A
Cobalt	0.1	0.1		µg/L	09/28/2012 1455 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1455 MS	6020A
Iron	70	20		µg/L	09/26/2012 1322 DG	6010C
Lead	ND	0.14		µg/L	09/28/2012 1455 MS	6020A
Magnesium	9250	20		µg/L	09/26/2012 1322 DG	6010C
Manganese	18 J	2		µg/L	09/28/2012 1455 MS	6020A
Nickel	0.7	0.7		µg/L	09/28/2012 1455 MS	6020A
Potassium	ND	400		µg/L	09/26/2012 1322 DG	6010C
Selenium	ND	2		µg/L	09/28/2012 1455 MS	6020A
Silicon	3600	400		µg/L	09/26/2012 1322 DG	6010C
Silver	ND	0.2		µg/L	09/28/2012 1455 MS	6020A
Sodium	1900	200		µg/L	09/26/2012 1322 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1455 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1455 MS	6020A
Zinc	ND	10		µg/L	09/26/2012 1322 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

11/16/12

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209432001

Project: Red Devil Mine
Lab ID: S1209432-007
Client Sample ID: 0912RD06SW
COC: RDM-0912-005

Work Order: S1209432
Collection Date: 9/11/2012 11:57:00 AM
Date Received: 9/25/2012 11:49:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2200 DG	6010C
Antimony	227	0.07		µg/L	09/28/2012 1500 MS	6020A
Arsenic	88	2		µg/L	09/28/2012 1500 MS	6020A
Barium	30	10		µg/L	09/28/2012 1500 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1500 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1500 MS	6020A
Calcium	16900	50		µg/L	10/01/2012 2200 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1500 MS	6020A
Cobalt	0.2	0.1		µg/L	09/28/2012 1500 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1500 MS	6020A
Iron	150	20		µg/L	10/01/2012 2200 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1500 MS	6020A
Magnesium	10200	20		µg/L	10/01/2012 2200 DG	6010C
Manganese	24	2	J	µg/L	09/28/2012 1500 MS	6020A
Nickel	ND	2		µg/L	09/28/2012 1500 MS	6020A
Potassium	ND	400		µg/L	10/01/2012 2200 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1500 MS	6020A
Silicon	4100	400		µg/L	10/01/2012 2200 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1500 MS	6020A
Sodium	1900	200		µg/L	10/01/2012 2200 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1500 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1500 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2200 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

11/16/12

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209432001

Project: Red Devil Mine
Lab ID: S1209432-008
Client Sample ID: 0912EB02DI
COC: RDM-0912-005

Work Order: S1209432
Collection Date: 9/12/2012 10:58:00 AM
Date Received: 9/25/2012 11:49:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Aluminum	ND	50		µg/L	09/26/2012 1324 DG	6010C
Antimony	ND	0.2		µg/L	09/28/2012 1505 MS	6020A
Arsenic	ND	2		µg/L	09/28/2012 1505 MS	6020A
Barium	ND	10		µg/L	09/28/2012 1505 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1505 MS	6020A
Cadmium	ND	0.9		µg/L	09/28/2012 1505 MS	6020A
Calcium	ND	50		µg/L	09/26/2012 1324 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1505 MS	6020A
Cobalt	ND	0.1		µg/L	09/28/2012 1505 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1505 MS	6020A
Iron	ND	20		µg/L	09/26/2012 1324 DG	6010C
Lead	ND	0.14		µg/L	09/28/2012 1505 MS	6020A
Magnesium	ND	20		µg/L	09/26/2012 1324 DG	6010C
Manganese	ND	2		µg/L	09/28/2012 1505 MS	6020A
Nickel	ND	0.7		µg/L	09/28/2012 1505 MS	6020A
Potassium	ND	400		µg/L	09/26/2012 1324 DG	6010C
Selenium	ND	2		µg/L	09/28/2012 1505 MS	6020A
Silicon	ND	400		µg/L	09/26/2012 1324 DG	6010C
Silver	ND	0.2		µg/L	09/28/2012 1505 MS	6020A
Sodium	ND	200		µg/L	09/26/2012 1324 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1505 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1505 MS	6020A
Zinc	ND	10		µg/L	09/26/2012 1324 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

11/16/12

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209432001

Project: Red Devil Mine
Lab ID: S1209432-008
Client Sample ID: 0912EB02DI
COC: RDM-0912-005

Work Order: S1209432
Collection Date: 9/12/2012 10:58:00 AM
Date Received: 9/25/2012 11:49:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals						
Aluminum	ND	50		µg/L	10/01/2012 2202 DG	6010C
Antimony	0.07	0.07		µg/L	09/28/2012 1520 MS	6020A
Arsenic	ND	2		µg/L	09/28/2012 1520 MS	6020A
Barium	ND	10		µg/L	09/28/2012 1520 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1520 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1520 MS	6020A
Calcium	ND	50		µg/L	10/01/2012 2202 DG	6010C
Chromium	ND	0.5		µg/L	09/28/2012 1520 MS	6020A
Cobalt	ND	0.1		µg/L	09/28/2012 1520 MS	6020A
Copper	ND	0.9		µg/L	09/28/2012 1520 MS	6020A
Iron	ND	20		µg/L	10/01/2012 2202 DG	6010C
Lead	ND	0.3		µg/L	09/28/2012 1520 MS	6020A
Magnesium	60	20		µg/L	10/01/2012 2202 DG	6010C
Manganese	ND	2		µg/L	09/28/2012 1520 MS	6020A
Nickel	ND	2		µg/L	09/28/2012 1520 MS	6020A
Potassium	ND	400		µg/L	10/01/2012 2202 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1520 MS	6020A
Silicon	ND	400		µg/L	10/01/2012 2202 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1520 MS	6020A
Sodium	ND	200		µg/L	10/01/2012 2202 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1520 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1520 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2202 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

11/16/12

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209432001

Work Order: S1209432
Project: Red Devil Mine
Collection Date: 9/11/2012 11:50:00 AM
Lab ID: S1209432-009
Date Received: 9/25/2012 11:49:00 AM
Client Sample ID: 0912MW09GW
Sampler:
COC: RDM-0912-005
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
General Parameters						
Total Dissolved Solids (180)	310 J	10	H	mg/L	09/25/2012 1526 JCG	SM 2540
Total Suspended Solids	22 J	5	H	mg/L	09/25/2012 1642 JCG	SM 2540
Alkalinity, Total (As CaCO3)	258	5		mg/L	09/25/2012 2301 KV	SM 2320B
Anions						
Alkalinity, Bicarbonate as HCO3	315 J	5		mg/L	09/25/2012 2301 KV	SM 2320B
Alkalinity, Carbonate as CO3	ND UJ	5		mg/L	09/25/2012 2301 KV	SM 2320B
Chloride	0.5 J	0.2		mg/L	09/26/2012 308 AM	EPA 300.0
Fluoride	ND UJ	0.2		mg/L	09/26/2012 308 AM	EPA 300.0
Nitrogen, Nitrate-Nitrite (as N)	0.10 J	0.05		mg/L	09/25/2012 1654 RH	EPA 353.2
Sulfate	20.5 J	0.2		mg/L	09/26/2012 308 AM	EPA 300.0
Total Metals						
Aluminum	500	50		µg/L	10/01/2012 2205 DG	6010C
Antimony	11.7	0.07		µg/L	09/28/2012 1757 MS	6020A
Arsenic	13	2		µg/L	09/28/2012 1757 MS	6020A
Barium	340	10		µg/L	09/28/2012 1757 MS	6020A
Beryllium	ND	0.2		µg/L	09/28/2012 1757 MS	6020A
Cadmium	ND	0.5		µg/L	09/28/2012 1757 MS	6020A
Calcium	53100	50		µg/L	10/01/2012 2205 DG	6010C
Chromium	47.7	0.5		µg/L	09/28/2012 1757 MS	6020A
Cobalt	6.6	0.1		µg/L	09/28/2012 1757 MS	6020A
Copper	4.3	0.9		µg/L	09/28/2012 1757 MS	6020A
Iron	2070	20		µg/L	10/01/2012 2205 DG	6010C
Lead	0.7	0.3		µg/L	09/28/2012 1757 MS	6020A
Magnesium	34400	20		µg/L	10/01/2012 2205 DG	6010C
Manganese	4880 J	2		µg/L	09/28/2012 1837 MS	6020A
Nickel	33	2		µg/L	09/28/2012 1757 MS	6020A
Potassium	2600	400		µg/L	10/01/2012 2205 DG	6010C
Selenium	ND	3		µg/L	09/28/2012 1757 MS	6020A
Silicon	8800	400		µg/L	10/01/2012 2205 DG	6010C
Silver	ND	0.3		µg/L	09/28/2012 1757 MS	6020A
Sodium	4700	200		µg/L	10/01/2012 2205 DG	6010C
Thallium	ND	0.3		µg/L	09/28/2012 1757 MS	6020A
Vanadium	ND	2		µg/L	09/28/2012 1757 MS	6020A
Zinc	ND	10		µg/L	10/01/2012 2205 DG	6010C

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

11/16/12

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209432
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209432001

Alkalinity

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87577	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLANK	09/25/12 12:57	Alkalinity, Total (As CaCO3)	ND	5					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87577	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
ATQC	09/25/12 12:51	Alkalinity, Total (As CaCO3)	585	5	601		97.4	90 - 110	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87577	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209432-003AD	09/25/12 22:32	Alkalinity, Bicarbonate as HCO3	121	5	122	0.788		20	H
		Alkalinity, Carbonate as CO3	ND	5	ND			20	H
		Alkalinity, Total (As CaCO3)	99	5	100	0.788		20	H

Dissolved Metals by ICP (6010C)

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87609	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
MBLK DISS/CAT	09/26/12 12:38	Aluminum	ND	0.1					
		Calcium	ND	0.1					
		Iron	ND	0.05					
		Magnesium	ND	0.1					
		Potassium	ND	1					
		Silicon	ND	0.01					
		Sodium	ND	0.1					
		Zinc	ND	0.01					

11/12/12

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87609	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
DISS LCS Q	09/26/12 12:41	Aluminum	1.0	0.1	1		102	80 - 120	
		Iron	1.01	0.05	1		101	80 - 120	
		Silicon	1.00	0.01	1		99.6	80 - 120	
		Zinc	1.04	0.01	1		104	80 - 120	

Sample ID	RunNo: 87609	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
CAT LCS IML3	09/26/12 12:43	Calcium	40.1	0.1	40		100	80 - 120	
		Magnesium	39.6	0.1	40		99.0	80 - 120	
		Potassium	40	1	40		101	80 - 120	
		Sodium	39.5	0.1	40		98.8	80 - 120	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209432
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209432001

Dissolved Metals by ICPMS (6020A)

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87727	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
MBLK	09/28/12 11:32	Antimony	ND	0.005					
		Arsenic	ND	0.005					
		Barium	ND	0.1					
		Beryllium	ND	0.002					
		Cadmium	ND	0.002					
		Chromium	ND	0.001					
		Cobalt	ND	0.01					
		Copper	ND	0.01					
		Lead	ND	0.02					
		Manganese	ND	0.01					
		Nickel	ND	0.01					
		Selenium	ND	0.005					
		Silver	ND	0.003					
		Thallium	ND	0.001					
		Vanadium	ND	0.02					

11/16/12

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87727	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	09/28/12 11:28	Antimony	0.101	0.005	0.1		101	80 - 120	
		Arsenic	0.099	0.005	0.1		98.6	80 - 120	
		Barium	0.1	0.1	0.1		102	80 - 120	
		Beryllium	0.099	0.002	0.1		98.6	80 - 120	
		Cadmium	0.098	0.002	0.1		97.6	80 - 120	
		Chromium	0.100	0.001	0.1		100	80 - 120	
		Cobalt	0.10	0.01	0.1		101	80 - 120	
		Copper	0.10	0.01	0.1		102	80 - 120	
		Lead	0.10	0.02	0.1		102	80 - 120	
		Manganese	0.10	0.01	0.1		101	80 - 120	
		Nickel	0.10	0.01	0.1		99.5	80 - 120	
		Selenium	0.099	0.005	0.1		98.8	80 - 120	
		Silver	0.097	0.003	0.1		97.4	80 - 120	
		Thallium	0.102	0.001	0.1		102	80 - 120	
		Vanadium	0.10	0.02	0.1		98.6	80 - 120	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209432
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209432001

Anions by ION Chromatography

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLK	09/25/12 11:41	Chloride	ND	1					
		Fluoride	ND	0.1					
		Sulfate	ND	1					

11/14/12

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
DIONEX	09/25/12 11:16	Chloride	31	1	30		102	90 - 110	
		Fluoride	20.7	0.1	20		104	90 - 110	
		Sulfate	144	1	150		95.8	90 - 110	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209429-001ASPK	09/25/12 23:01	Chloride	5	1	5	ND	95.0	80 - 120	
		Fluoride	2.2	0.1	2	ND	108	80 - 120	
		Sulfate	49	1	40	9	99.7	80 - 120	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209429-001ASPK	09/25/12 23:14	Chloride	5	1	5	0.426	95.5	20	
		Fluoride	2.2	0.1	2.2	0.498	107	20	
		Sulfate	50	1	49	1.10	101	20	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87638	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-001A	09/25/12 22:49	Chloride	0.5	0.2	0.5	4.92		20	
		Fluoride	ND	0.2	ND			20	
		Sulfate	9.2	0.2	9.2	0.0347		20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209432
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209432001

Nitrogen, Nitrate-Nitrite (as N)

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLANK	09/25/12 15:51	Nitrogen, Nitrate-Nitrite (as N)	ND	0.1					

11/16/12

Sample ID	RunNo: 87734	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLANK	09/28/12 15:09	Nitrogen, Nitrate-Nitrite (as N)	ND	0.1					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
QC	09/25/12 15:53	Nitrogen, Nitrate-Nitrite (as N)	18.5	0.1	19.3		95.7	90 - 110	

Sample ID	RunNo: 87734	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
QC	09/28/12 15:12	Nitrogen, Nitrate-Nitrite (as N)	17.8	0.1	19.3		92.0	90 - 110	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209430-009B	09/25/12 16:19	Nitrogen, Nitrate-Nitrite (as N)	5.03	0.05	5	ND	101	80 - 120	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209430-009B	09/25/12 16:20	Nitrogen, Nitrate-Nitrite (as N)	4.94	0.05	5.03	1.65	98.9	20	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87583	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209430-009B	09/25/12 16:18	Nitrogen, Nitrate-Nitrite (as N)	ND	0.05	ND			20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209432
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209432001

Solids By SM 2540

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87559	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLANK	09/25/12 16:02	Total Suspended Solids	ND	5					

11/16/12

Sample ID	RunNo: 87637	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
DI	09/25/12 14:32	Total Dissolved Solids (180)	ND	10					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87559	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
CONTROL	09/25/12 16:03	Total Suspended Solids	102	5	100		102	90 - 110	

Sample ID	RunNo: 87637	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
CONTROL	09/25/12 14:33	Total Dissolved Solids (180)	240	10	226		106	90 - 110	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87559	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209432-009A	09/25/12 16:43	Total Suspended Solids	22	5	22	0		20	H

Sample ID	RunNo: 87637	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209430-009A	09/25/12 15:08	Total Dissolved Solids (180)	640	10	640	0		20	H

Total Organic Carbon

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87635	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
BLANK	09/26/12 12:33	Total Organic Carbon	ND	0.5					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87635	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	09/26/12 9:55	Total Organic Carbon	55.8	0.5	56.3		99.2	90 - 110	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87635	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209429-001ESPK	09/26/12 10:42	Total Organic Carbon	51.5	0.5	50	2.2	98.6	80 - 120	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87635	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209429-001ESPK	09/26/12 10:53	Total Organic Carbon	51.4	0.5	51.5	0.252	98.4	20	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87635	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-001E	09/26/12 10:30	Total Organic Carbon	2	1	2	5.51		20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209432
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209432001

Total(3020) Metals by ICP - 6010C

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
ICB	10/01/12 13:09	Aluminum	ND	0.005					
		Calcium	ND	0.2					
		Iron	ND	0.05					
		Magnesium	0.14	0.02					B
		Potassium	ND	0.1					
		Silicon	ND	0.1					
		Sodium	ND	0.1					
		Zinc	ND	0.005					

11/16/12

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
ICV Q	10/01/12 13:11	Silicon	1.0	0.1	1		102	80 - 120	

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
ICV 3	10/01/12 13:13	Calcium	39.9	0.2	40		99.7	80 - 120	
		Magnesium	39.1	0.02	40		97.7	80 - 120	
		Potassium	40.4	0.1	40		101	80 - 120	
		Sodium	39.4	0.1	40		98.5	80 - 120	

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS-6432	10/01/12 19:51	Aluminum	0.525	0.005	0.5		105	80 - 120	
		Iron	0.57	0.05	0.5		113	80 - 120	
		Zinc	0.206	0.005	0.2		103	80 - 120	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209432-001CS	10/01/12 21:36	Aluminum	0.595	0.005	0.5	0.089	101	75 - 125	
		Iron	0.71	0.05	0.5	0.19	103	75 - 125	
		Zinc	0.229	0.005	0.2	0.021	104	75 - 125	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209432-001CMSD	10/01/12 21:38	Aluminum	0.592	0.005	0.595	0.538	101	20	
		Iron	0.71	0.05	0.71	0.522	104	20	
		Zinc	0.228	0.005	0.229	0.480	103	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209432
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209432001

Total(3020) Metals by ICP - 6010C

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87797	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209431-004DD	10/01/12 21:24	Aluminum	0.031	0.005	0.029	8.36		20	
		Calcium	15.9	0.2	15.7	0.933		20	
		Iron	0.11	0.05	0.10	3.14		20	
		Magnesium	8.77	0.02	8.64	1.51		20	
		Potassium	0.3	0.1	0.3	0.134		20	
		Silicon	3.9	0.1	3.9	0.987		20	
		Sodium	1.5	0.1	1.5	0.273		20	
		Zinc	ND	0.005	ND			20	

Total (3020) Metals by ICPMS - 6020A

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87728	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
MB-6432	09/28/12 12:22	Antimony	ND	0.005					
		Arsenic	ND	0.005					
		Barium	ND	0.01					
		Beryllium	ND	0.002					
		Cadmium	ND	0.002					
		Chromium	ND	0.001					
		Cobalt	ND	0.01					
		Copper	ND	0.001					
		Lead	ND	0.001					
		Manganese	ND	0.01					
		Nickel	ND	0.01					
		Selenium	ND	0.005					
		Silver	ND	0.003					
		Thallium	ND	0.01					
		Vanadium	ND	0.02					

10/11/12

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

CHAIN OF CUSTODY RECORD

Red Devil Mine Project

Contact Name: Bill Richards

Contact Phone: 206-624-9537

No: RDM-0912-005

Cooler #. 5

Ecology and Environment, Inc

Lab: Inter-Mountain Laboratories, Inc.

Lab Phone: 800-828-1097

SI 209432

Lab #	Location		Analyses	Collected	Sample Time	Numb Cont	Container	Preservative	MS/MSD
	0912MW04GW		Total Inorganic Elements	9/10/2012	14:41	1	250 mL HDPE	HNO3 pH<2	
001	0912MW04GW		Anions, TSS, TDS, Carbonate, Bicarbonate	9/10/2012	14:41	1	500 mL HDPE	None	
	0912MW04GW		Nitrate/Nitrite	9/10/2012	14:41	1	125 mL HDPE	H2SO4 pH<2	
	0912MW10GW		Total Inorganic Elements	9/10/2012	12:15	1	250 mL HDPE	HNO3 pH<2	
002	0912MW10GW		Anions, TSS, TDS, Carbonate, Bicarbonate	9/10/2012	12:15	1	500 mL HDPE	None	
	0912MW10GW		Nitrate/Nitrite	9/10/2012	12:15	1	125 mL HDPE	H2SO4 pH<2	
	0912MW14GW		Total Inorganic Elements	9/10/2012	18:03	1	250 mL HDPE	HNO3 pH<2	
003	0912MW14GW		Anions, TSS, TDS, Carbonate, Bicarbonate	9/10/2012	18:03	1	500 mL HDPE	None	
	0912MW14GW		Nitrate/Nitrite	9/10/2012	18:03	1	125 mL HDPE	H2SO4 pH<2	
	0912MW28GW		Total Inorganic Elements	9/10/2012	16:20	1	250 mL HDPE	HNO3 pH<2	
004	0912MW28GW		Anions, TSS, TDS, Carbonate, Bicarbonate	9/10/2012	16:20	1	500 mL HDPE	None	
	0912MW28GW		Nitrate/Nitrite	9/10/2012	16:20	1	125 mL HDPE	H2SO4 pH<2	
005	0912RI01DI		Total Inorganic Elements	9/16/2012	11:00	1	250 mL HDPE	HNO3 pH<2	
	0912RD05SW		Total Inorganic Elements	9/11/2012	15:23	1	250 mL HDPE	HNO3 pH<2	
	0912RD05SW		Dissolved Inorganic Elements	9/11/2012	15:23	1	250 mL HDPE	HNO3 pH<2	
006	0912RD05SW	F	Methyl Mercury	9/11/2012	15:23	1	500 mL FLPE	HCl	
	0912RD05SW	G	Arsenic Speciation	9/11/2012	15:23	1	250 mL HDPE	HCl	

Special Instructions: Lab Filter Anions, carbonate, bicarbonate

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Kathy Boyd IML	9.25.12	11:49						

7.4.c

CHAIN OF CUSTODY RECORD

No: RDM-0912-005

Ecology and Environment, Inc

Red Devil Mine Project
Contact Name: Bill Richards
Contact Phone: 206-624-9537

Cooler #: 5
Lab: Inter-Mountain Laboratories, Inc.
Lab Phone: 800-828-1097

Lab #	Location	Analyses	Collected	Sample Time	Numb Cont	Container	Preservative	MS/MSD
006	0912RD05SW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/11/2012	15:23	1	500 mL HDPE	None	
	0912RD05SW	Nitrate/Nitrite	9/11/2012	15:23	1	125 mL HDPE	H2SO4 pH<2	
	0912RD05SW	Total Organic Carbon	9/11/2012	15:23	2	40 ml Amber Glass	HCl	
	0912RD06SW	Total Inorganic Elements	9/11/2012	11:57	1	250 mL HDPE	HNO3 pH<2	
	0912RD06SW	Dissolved Inorganic Elements	9/11/2012	11:57	1	250 mL HDPE	HNO3 pH<2	
007	0912RD06SW	Methyl Mercury	9/11/2012	11:57	1	500 mL FLPE	HCl	
	0912RD06SW	Arsenic Speciation	9/11/2012	11:57	1	250 mL HDPE	HCl	
	0912RD06SW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/11/2012	11:57	1	500 mL HDPE	None	
	0912RD06SW	Nitrate/Nitrite	9/11/2012	11:57	1	125 mL HDPE	H2SO4 pH<2	
	0912RD06SW	Total Organic Carbon	9/11/2012	11:57	2	40 ml Amber Glass	HCl	
008	0912EB02DI	Total Inorganic Elements	9/12/2012	10:58	1	250 mL HDPE	HNO3 pH<2	
	0912EB02DI	Dissolved Inorganic Elements	9/12/2012	10:58	1	250 mL HDPE	HNO3 pH<2	
	0912MW09GW	Total Inorganic Elements	9/11/2012	11:50	1	250 mL HDPE	HNO3 pH<2	
009	0912MW09GW	Anions, TSS, TDS, Carbonate, Bicarbonate	9/11/2012	11:50	1	500 mL HDPE	None	
	0912MW09GW	Nitrate/Nitrite	9/11/2012	11:50	1	125 mL HDPE	H2SO4 pH<2	

Special Instructions: Lab filter Anions, Carbonate, bicarbonate

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Kathy Bapp IML	9.25.12	11.47						

7.4 °C

DATA REVIEW MEMORANDUM

DATE: November 15, 2012

TO: Bill Richards, Project Manager, E & E, Seattle, WA

FROM: Mindy Song, E & E, Long Beach, CA 11/16/12

SUBJ: Data Review: Red Devil Mine

REFERENCE:

Project ID	Lab Work Order	Lab
EE-1096-0070	S1209437	Inter-Mountain Labs

I. SAMPLE IDENTIFICATION

For the sampling activities at Red Devil Mine, Ecology and Environment, Inc. (E & E) collected the samples listed on Table 1. Project-specific matrix spike/matrix spike duplicates (MS/MSD) were designated in the field, laboratory also identified batch MS/MSD's as batch QC for additional analytical testing. All samples were sent to Inter-Mountain Labs in Sheridan, WY for analysis. All tables are included at the end of this memorandum.

Data were reviewed for field and laboratory precision, accuracy, and completeness in accordance with procedures and quality control (QC) limits, the current laboratory Quality Assurance Manual (QAM) and current standard operating procedures (SOPs). Laboratory data qualifiers for compound identification and quantitation were accepted. Any additional data review qualifiers added are noted below and listed on the tables at the end of this memorandum. Definitions of all data qualifiers are given in the report.

Table 1 Sample Listing

Work Order	Matrix	Sample ID	Lab ID	Sample Date	MS/MSD	ID Corrections
S1209437	Water	0912MW15GW	S1209437-001	09/08/2012		
S1209437	Water	0912MW17GW	S1209437-002	09/08/2012		
S1209437	Water	0912MW20GW	S1209437-003	09/09/2012		
S1209437	Water	0912MW25GW	S1209437-004	09/09/2012		
S1209437	Water	0912MW29GW	S1209437-005	09/09/2012		
S1209437	Water	0912MW33GW	S1209437-006	09/08/2012	X	
S1209437	Water	0912MW53GW	S1209437-007	09/09/2012		
S1209437	Water	0912MW54GW	S1209437-008	09/09/2012		

Work Orders, Tests and Number of Samples included in this DVM

Work Orders	Matrix	Test Method	Method Name	Number of Samples	Sample Type
S1209437	Water	EPA 245.1/1631	Dissolved Mercury	8	
S1209437	Water	EPA 245.1/1631	Total Mercury	8	

II. SAMPLE PROCEDURES

All samples were collected as specified in the work plan and documented on the chain-of-custody (COC) and in field notebooks. Samples were analyzed as specified on the COC. Samples were packaged, shipped and received as specified in the work plan. All samples must be received cold (4 ±2) °C and in good condition as documented on the Cooler Receipt Form.

REVIEW RESULTS:

All sample procedures were followed and the sample coolers were received at 9.2 °C. No problems with the condition of the sample upon receipt are documented. Since the samples were received at temperature outside of range (>6 °C), the detected results were qualified as estimated (J) and the non-detected results were qualified as estimated (UJ).

III. LABORATORY DATA

1.0 HOLDING TIMES

Holding times are established and monitored to ensure analytical results accurately represent analyte concentrations in a sample at the time of collection. Exceeding the holding time for a sample generally results in a loss of the analyte due to a variety of mechanisms, such as deposition on the sample container walls or precipitation.

REVIEW RESULTS:

All samples were analyzed within the project and method specified holding times for all analytes. No data were qualified.

2.0 BLANKS

Laboratory and field blank samples are analyzed and evaluated to determine the existence and magnitude of possible contamination during the sampling and analysis process. As noted in Table 2, analyte concentrations in the blanks are generally below the practical quantitation limit (PQL). If the analyte is present in the sample at similar trace levels, then the analyte is likely a common background contaminant from some phase of the sampling, extraction, or analytical procedure and associated low level sample concentrations are not considered to be site related. If the analyte concentration is above the PQL, then there is a potential contamination problem and sample results may be biased high or the data unusable.

REVIEW RESULTS:

All blanks were performed at the required frequency. No analytes were detected in the method blanks at reporting limit levels.

3.0 SURROGATE SPIKE RECOVERY

Laboratory performance for individual samples analyzed for organic compounds is established by means of surrogate spiking activities. Samples are spiked with surrogate compounds prior to preparation and analysis. Unusually low or high surrogate recovery values may indicate some deficiency in the analytical system or that some matrix effects exist, resulting in low or high sample results for target compounds. Sample surrogate recoveries outside QC limits (if applicable) are presented in Table 3.

REVIEW RESULTS:

Not applicable for these analyses.

4.0 MATRIX SPIKE AND MATRIX SPIKE DUPLICATE ANALYSIS

The matrix spike and matrix spike duplicate (MS/MSD) analyses are intended to provide information about the affects that the sample matrix exerts on the digestion/extraction and measurement methodology. MS recovery values that do not meet laboratory QC criteria may indicate that sample analyte results are being attenuated in the analysis procedure. These results are presented in Table 4 (if applicable). The

potential sample bias may be estimated by noting the degree to which the MS concentration was elevated or lowered in the spike analysis. However, this bias should serve only as approximations; sample-specific problems may be the cause of the discrepancy, particularly in soil samples. Recoveries of a post-digestion spike or a laboratory control sample (LCS) are used to verify that the analytical methodology is acceptable and that MS recoveries are due to matrix effects. An MSD analysis is performed to evaluate the precision of the sample results. Precision is measured as the relative percent difference (RPD) between analytical results for duplicate samples. The laboratory's failure to produce similar results for MSD samples may indicate that the samples were non-homogeneous (particularly in soil samples), or that method defects may exist in the laboratory's techniques.

REVIEW RESULTS:

The MS/MSD sample analyses were performed on samples 0912MW33GW (EPA 1631) and 0912RD09SW (EPA 245.1) at the required frequency. MS/MSD recoveries were within the control limits generated by the laboratory.

5.0 LABORATORY CONTROL SAMPLE ANALYSIS

The LCS is analyzed to monitor the efficiency of the digestion/extraction procedure and analytical instrument operation. The ability of the laboratory to successfully analyze an LCS demonstrates that there are no analytical problems related to the digestion/sample preparation procedures and/or instrument operations. The LCS results outside QC limits are presented in Table 5 (if applicable). Sporadic and marginal QC failures for multiple component methods do not indicate an analytical concern. If recoveries are high and the compounds are not detected in the samples, then no data qualification is required. All recoveries should be above 10% or the non-detect results flagged "UR" as rejected.

REVIEW RESULTS:

All LCS analyses were within control limits and performed at the required frequency.

IV. COMPOUND IDENTIFICATION AND QUANTITATION

Compound identities are assigned by comparing sample compound retention times to retention times from known (standard) compounds and identification of an acceptable mass spectrum. Compounds detected below the PQL in samples should be considered estimated and are qualified "J." The samples with compounds above the linear range were all re-analyzed at a higher dilution factor.

REVIEW RESULTS:

All compound identification and quantitation criteria were achieved.

V. FIELD DUPLICATE SAMPLE RESULTS

Field duplicate samples were collected and analyzed as an indication of overall precision for both field and laboratory. Field duplicate results are summarized in Table 7 (if applicable). The results are expected to have more variability than laboratory duplicates, which measure only laboratory precision. It is expected also that soil field duplicates will exhibit greater variance than water field duplicates due to the difficulties associated with collecting identical field samples. The QC criteria used to assess field duplicate samples for this project was limits of 70% RPD for soils and 40% RPD for waters, or twice the general laboratory duplicate criteria. If both compounds were below the laboratory PQL or one of the compounds was present as a non-detect, then the compounds are generally not qualified due to field duplicate precision. There are no guidelines regarding data qualification based on poor field duplicate precision. Professional judgment was used to determine whether or not to qualify results.

REVIEW RESULTS:

Field duplicates analyses were performed on this SDG. The RPD ratings are listed on Table 7 as "Good" if the RPD is less than field duplicate QC criteria of 40% and as "Poor" if the RPD exceeded the field duplicate QC criteria.

All the results show good precision in the sample pair as noted on table 7. Qualifiers were only added to the field duplicate sample pair results as noted.

6.0 OVERALL ASSESSMENT OF DATA

All data were reviewed and considered usable with qualification as noted in this report.

Table 2 - List of Positive Results for Blank Samples

Method	Sample ID	Samp Type	Analyte	Result	Qual	Anal Type	Units	PQL
None.								

Table 2A - List of Samples Qualified for Method Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
None.						

Table 2B - List of Samples Qualified for Field Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
None.						

Table 3 - List of Samples with Surrogates outside Control Limits

Method	Sample ID	Sample Type	Analyte	Rec.	Low Limit	High Limit	Dil Fac	Sample Qual.
None.								

Table 4 - List MS/MSD Recoveries and RPDs outside Control Limits

Method	Sample ID	Sample Type	Analyte	Orig. Result	Spike Amount	Rec.	Dil Fac.	Low Limit	High Limit	Sample Qual	Reportable
None.											

Sample ID	Analyte	Method	RPD	RPD Limit	No. of Affected Samples	Samp Qual
None.						

Table 5 - List LCS Recoveries outside Control Limits

Method	Sample ID	Analyte	Rec.	Low Limit	High Limit	No. of Affected Samples	Samp Qual
None.							

Table 6 –Samples that were Re-analyzed

Sample ID	Lab ID	Method	Sample Type	Action
None.				

Table 7 – Summary of Field Duplicate Results:

Method	Analyte	Units	0912MW20GW	0912MW53GW	RPD	Rating	Sample Qualifier
EPA 245.1	Dissolved Mercury	ng/L	850	709	18	Good	
EPA 245.1	Total Mercury	ng/L	1080	1070	1	Good	

Method	Analyte	Units	0912MW27GW	0912MW57GW	RPD	Rating	Sample Qualifier
EPA 1631	Dissolved Mercury	ng/L	60	58	3	Good	
EPA 1631	Total Mercury	ng/L	112	144	25	Good	

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209437001

Project: Red Devil Mine
Lab ID: S1209437-001
Client Sample ID: 0912MW15GW
COC: RDM-0912-009

Work Order: S1209437
Collection Date: 9/8/2012 2:00:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	2000	1	J	ng/L	09/27/2012 000 CS	EPA 245.1
Total Metals						
Mercury	2400	1	J	ng/L	09/27/2012 000 CS	EPA 245.1

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209437001

Project: Red Devil Mine
Lab ID: S1209437-002
Client Sample ID: 0912MW17GW
COC: RDM-0912-009

Work Order: S1209437
Collection Date: 9/8/2012 4:59:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	ND UJ	1		ng/L	10/05/2012 1434 CS	EPA 1631
Total Metals						
Mercury	10 J	1		ng/L	10/06/2012 1725 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209437001

Project: Red Devil Mine
Lab ID: S1209437-003
Client Sample ID: 0912MW20GW
COC: RDM-0912-009

Work Order: S1209437
Collection Date: 9/9/2012 10:40:00 AM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	850 J	1		ng/L	09/27/2012 000 CS	EPA 245.1
Total Metals						
Mercury	1080 J	1		ng/L	09/27/2012 000 CS	EPA 245.1

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209437001

Project: Red Devil Mine
Lab ID: S1209437-004
Client Sample ID: 0912MW25GW
COC: RDM-0912-009

Work Order: S1209437
Collection Date: 9/9/2012 11:10:00 AM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	138 J	1		ng/L	09/27/2012 000 CS	EPA 245.1
Total Metals						
Mercury	951 J	1		ng/L	09/27/2012 000 CS	EPA 245.1

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209437001

Work Order: S1209437
Project: Red Devil Mine
Collection Date: 9/9/2012 4:58:00 PM
Lab ID: S1209437-005
Date Received: 9/25/2012 11:45:00 AM
Client Sample ID: 0912MW29GW
Sampler:
COC: RDM-0912-009
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	7 J	1		ng/L	10/05/2012 1442 CS	EPA 1631
Total Metals						
Mercury	8 J	1		ng/L	10/05/2012 000 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209437001

Work Order: S1209437
Project: Red Devil Mine
Collection Date: 9/8/2012 12:52:00 PM
Lab ID: S1209437-006
Date Received: 9/25/2012 11:45:00 AM
Client Sample ID: 0912MW33GW
Sampler:
COC: RDM-0912-009
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	3 J	1		ng/L	10/05/2012 1356 CS	EPA 1631
Total Metals						
Mercury	10 J	1		ng/L	10/06/2012 1702 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209437001

Project: Red Devil Mine
Lab ID: S1209437-007
Client Sample ID: 0912MW53GW
COC: RDM-0912-009

Work Order: S1209437
Collection Date: 9/9/2012 7:00:00 AM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	709 J	1		ng/L	09/27/2012 000 CS	EPA 245.1
Total Metals						
Mercury	1070 J	1		ng/L	09/27/2012 000 CS	EPA 245.1

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209437001

Work Order: S1209437
Project: Red Devil Mine
Collection Date: 9/9/2012 7:00:00 AM
Lab ID: S1209437-008
Date Received: 9/25/2012 11:45:00 AM
Client Sample ID: 0912MW54GW
Sampler:
COC: RDM-0912-009
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	58 J	1		ng/L	10/06/2012 1453 CS	EPA 1631
Total Metals						
Mercury	144 J	1		ng/L	09/27/2012 000 CS	EPA 245.1

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209437
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209437001

Dissolved Mercury by EPA 245.1 - Water

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	09/27/12 9:29	Mercury	ND	0.001					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	09/27/12 9:28	Mercury	0.002	0.001	0.002		99.3	85 - 115	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209393-001C	09/27/12 9:35	Mercury	0.002	0.001	0.00244	ND	86.1	70 - 130	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209393-001C	09/27/12 9:37	Mercury	0.002	0.001	0.002	9.09	93.9	20	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209393-001C	09/27/12 9:33	Mercury	ND	0.001	ND			20	

Dissolved Mercury by EPA 1631

11/16/12

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87989	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/05/12 11:43	Mercury	ND	0.000001					

Sample ID	RunNo: 87992	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/06/12 11:46	Mercury	ND	0.000001					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87989	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/05/12 11:36	Mercury	0.000005	0.000001	5E-06		104	77 - 123	

Sample ID	RunNo: 87992	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/06/12 11:38	Mercury	0.000005	0.000001	5E-06		107	77 - 123	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87989	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209437-006B	10/05/12 14:04	Mercury	0.000013	0.000001	0.00001	0.000003	103	71 - 125	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87989	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209437-006B	10/05/12 14:11	Mercury	0.000014	0.000001	0.000013	0.752	104	24	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209437
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209437001

Total Mercury by EPA 245.1 - Water

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	09/27/12 9:29	Mercury	ND	0.001					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	09/27/12 9:28	Mercury	0.002	0.001	0.002		99.3	85 - 115	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209429-001D	09/27/12 12:57	Mercury	0.00248	0.00001	0.00244	0.00003	100	70 - 130	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209429-001D	09/27/12 12:59	Mercury	0.00253	0.00001	0.00248	2.22	103	20	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-001D	09/27/12 12:55	Mercury	0.00003	0.00001	0.00003	3.09		20	

Total Mercury by EPA 1631

11/16/12

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87992	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/06/12 11:46	Mercury	ND	0.000001					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87992	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/06/12 11:38	Mercury	0.000005	0.000001	5E-06		107	77 - 123	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87992	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209437-006A	10/06/12 17:09	Mercury	0.000068	0.000001	0.00005	0.000010	116	71 - 125	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87992	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209437-006A	10/06/12 17:17	Mercury	0.000068	0.000001	0.000068	0.293	116	24	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

CHAIN OF CUSTODY RECORD

Red Devil Mine Project
Contact Name: Bill Richards
Contact Phone: 206-624-9537

No: RDM-0912-009

Cooler #: 9
Lab: Inter-Mountain Laboratories, Inc.
Lab Phone: 800-828-1097

Ecology and Environment, Inc

S120937

Lab #	Location	Analyses	Collected	Sample Time	Numb Cont	Container	Preservative	MS/MSD
	0912MW15GW	Total Low Level Mercury	9/8/2012	14:00	1	250 mL Clear Glass	HCl	
-001	0912MW15GW	Dissolved Low Level Mercury	9/8/2012	14:00	1	250 mL Clear Glass	HCl	
	0912MW17GW	Total Low Level Mercury	9/8/2012	16:59	1	250 mL Clear Glass	HCl	
-002	0912MW17GW	Dissolved Low Level Mercury	9/8/2012	16:59	1	250 mL Clear Glass	HCl	
	0912MW20GW	Total Low Level Mercury	9/9/2012	10:40	1	250 mL Clear Glass	HCl	
-003	0912MW20GW	Dissolved Low Level Mercury	9/9/2012	10:40	1	250 mL Clear Glass	HCl	
	0912MW25GW	Total Low Level Mercury	9/9/2012	11:10	1	250 mL Clear Glass	HCl	
-004	0912MW25GW	Dissolved Low Level Mercury	9/9/2012	11:10	1	250 mL Clear Glass	HCl	
	0912MW29GW	Total Low Level Mercury	9/9/2012	16:58	1	250 mL Clear Glass	HCl	
-005	0912MW29GW	Dissolved Low Level Mercury	9/9/2012	16:58	1	250 mL Clear Glass	HCl	
	0912MW33GW	Total Low Level Mercury	9/8/2012	12:52	3	250 mL Clear Glass	HCl	Y
-006								

Special Instructions:

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
				9-25-12	11:45						

9.27

CHAIN OF CUSTODY RECORD

No: RDM-0912-009

Red Devil Mine Project

Cooler #: 9

Ecology and Environment, Inc

Contact Name: Bill Richards

Lab: Inter-Mountain Laboratories, Inc

Contact Phone: 206-624-9537

Lab Phone: 800-828-1097

Lab #	Location	Analyses	Collected	Sample Time	Numb Cont	Container	Preservative	MS/MSD
-006	0912MW33GW	Dissolved Low Level Mercury	9/8/2012	12:52	3	250 mL Clear Glass	HCl	Y
-007	0912MW53GW	Total Low Level Mercury	9/9/2012	07:00	1	250 mL Clear Glass	HCl	
-005	0912MW53GW	Dissolved Low Level Mercury	9/9/2012	07:00	1	250 mL Clear Glass	HCl	
-008	0912MW54GW	Total Low Level Mercury	9/9/2012	07:00	1	250 mL Clear Glass	HCl	
-009	0912MW54GW	Dissolved Low Level Mercury	9/9/2012	07:00	1	250 mL Clear Glass	HCl	

Special Instructions:

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time

0.7°C

DATA REVIEW MEMORANDUM

DATE: November 15, 2012

TO: Bill Richards, Project Manager, E & E, Seattle, WA

FROM: Mindy Song, E & E, Long Beach, CA 11/16/12

SUBJ: Data Review: Red Devil Mine

REFERENCE:

Project ID	Lab Work Order	Lab
EE-1096-0070	S1209439	Inter-Mountain Labs

I. SAMPLE IDENTIFICATION

For the sampling activities at Red Devil Mine, Ecology and Environment, Inc. (E & E) collected the samples listed on Table 1. Project-specific matrix spike/matrix spike duplicates (MS/MSD) were designated in the field, laboratory also identified batch MS/MSD's as batch QC for additional analytical testing. All samples were sent to Inter-Mountain Labs in Sheridan, WY for analysis. All tables are included at the end of this memorandum.

Data were reviewed for field and laboratory precision, accuracy, and completeness in accordance with procedures and quality control (QC) limits, the current laboratory Quality Assurance Manual (QAM) and current standard operating procedures (SOPs). Laboratory data qualifiers for compound identification and quantitation were accepted. Any additional data review qualifiers added are noted below and listed on the tables at the end of this memorandum. Definitions of all data qualifiers are given in the report.

Table 1 Sample Listing

Work Order	Matrix	Sample ID	Lab ID	Sample Date	MS/MSD	ID Corrections
S1209439	Water	0912MW04GW	S1209439-001	09/10/2012		
S1209439	Water	0912MW10GW	S1209439-002	09/10/2012		
S1209439	Water	0912MW14GW	S1209439-003	09/10/2012	X	
S1209439	Water	0912MW16GW	S1209439-004	09/08/2012		
S1209439	Water	0912MW24GW	S1209439-005	09/09/2012		
S1209439	Water	0912MW28GW	S1209439-006	09/10/2012		
S1209439	Water	0912MW32GW	S1209439-007	09/08/2012		
S1209439	Water	0912AB01D1	S1209439-008	09/08/2012		
S1209439	Water	0912AB02D1	S1209439-009	09/12/2012		
S1209439	Water	0912R101D1	S1209439-010	09/16/2012		
S1209439	Water	0912RD05SW	S1209439-011	09/11/2012		
S1209439	Water	0912RD06SW	S1209439-012	09/11/2012		
S1209439	Water	0912EB02D1	S1209439-013	09/12/2012		
S1209439	Water	0912AB03D1	S1209439-014	09/12/2012		
S1209439	Water	0912MW09GW	S1209439-015	09/11/2012		

Work Orders, Tests and Number of Samples included in this DVM

Work Orders	Matrix	Test Method	Method Name	Number of Samples	Sample Type
S1209437	Water	EPA 245.1/1631	Dissolved Mercury	15	
S1209437	Water	EPA 245.1/1631	Total Mercury	15	

II. SAMPLE PROCEDURES

All samples were collected as specified in the work plan and documented on the chain-of-custody (COC) and in field notebooks. Samples were analyzed as specified on the COC. Samples were packaged, shipped and received as specified in the work plan. All samples must be received cold (4 ±2) °C and in good condition as documented on the Cooler Receipt Form.

REVIEW RESULTS:

All sample procedures were followed and the sample coolers were received at 8.8 °C. No problems with the condition of the sample upon receipt are documented. Since the samples were received at temperature outside of range (>6 °C), the detected results were qualified as estimated (J) and the non-detected results were qualified as estimated (UJ).

III. LABORATORY DATA

1.0 HOLDING TIMES

Holding times are established and monitored to ensure analytical results accurately represent analyte concentrations in a sample at the time of collection. Exceeding the holding time for a sample generally results in a loss of the analyte due to a variety of mechanisms, such as deposition on the sample container walls or precipitation.

REVIEW RESULTS:

All samples were analyzed within the project and method specified holding times for all analytes. No data were qualified.

2.0 BLANKS

Laboratory and field blank samples are analyzed and evaluated to determine the existence and magnitude of possible contamination during the sampling and analysis process. As noted in Table 2, analyte concentrations in the blanks are generally below the practical quantitation limit (PQL). If the analyte is present in the sample at similar trace levels, then the analyte is likely a common background contaminant from some phase of the sampling, extraction, or analytical procedure and associated low level sample concentrations are not considered to be site related. If the analyte concentration is above the PQL, then there is a potential contamination problem and sample results may be biased high or the data unusable.

REVIEW RESULTS:

All blanks were performed at the required frequency. No analytes were detected in the method blanks and the equipment blank at reporting limit levels.

3.0 SURROGATE SPIKE RECOVERY

Laboratory performance for individual samples analyzed for organic compounds is established by means of surrogate spiking activities. Samples are spiked with surrogate compounds prior to preparation and analysis. Unusually low or high surrogate recovery values may indicate some deficiency in the analytical system or that some matrix effects exist, resulting in low or high sample results for target compounds. Sample surrogate recoveries outside QC limits (if applicable) are presented in Table 3.

REVIEW RESULTS:

Not applicable for these analyses.

4.0 MATRIX SPIKE AND MATRIX SPIKE DUPLICATE ANALYSIS

The matrix spike and matrix spike duplicate (MS/MSD) analyses are intended to provide information about the affects that the sample matrix exerts on the digestion/extraction and measurement methodology. MS recovery values that do not meet laboratory QC criteria may indicate that sample analyte results are being attenuated in the analysis procedure. These results are presented in Table 4 (if applicable). The

potential sample bias may be estimated by noting the degree to which the MS concentration was elevated or lowered in the spike analysis. However, this bias should serve only as approximations; sample-specific problems may be the cause of the discrepancy, particularly in soil samples. Recoveries of a post-digestion spike or a laboratory control sample (LCS) are used to verify that the analytical methodology is acceptable and that MS recoveries are due to matrix effects. An MSD analysis is performed to evaluate the precision of the sample results. Precision is measured as the relative percent difference (RPD) between analytical results for duplicate samples. The laboratory's failure to produce similar results for MSD samples may indicate that the samples were non-homogeneous (particularly in soil samples), or that method defects may exist in the laboratory's techniques.

REVIEW RESULTS:

The MS/MSD sample analyses were performed on samples 0912MW14GW (EPA 245.1) and 0912MW33GW (EPA 1631) at the required frequency. MS/MSD recoveries were within the control limits generated by the laboratory.

5.0 LABORATORY CONTROL SAMPLE ANALYSIS

The LCS is analyzed to monitor the efficiency of the digestion/extraction procedure and analytical instrument operation. The ability of the laboratory to successfully analyze an LCS demonstrates that there are no analytical problems related to the digestion/sample preparation procedures and/or instrument operations. The LCS results outside QC limits are presented in Table 5 (if applicable). Sporadic and marginal QC failures for multiple component methods do not indicate an analytical concern. If recoveries are high and the compounds are not detected in the samples, then no data qualification is required. All recoveries should be above 10% or the non-detect results flagged "UR" as rejected.

REVIEW RESULTS:

All LCS analyses were within control limits and performed at the required frequency.

IV. COMPOUND IDENTIFICATION AND QUANTITATION

Compound identities are assigned by comparing sample compound retention times to retention times from known (standard) compounds and identification of an acceptable mass spectrum. Compounds detected below the PQL in samples should be considered estimated and are qualified "J." The samples with compounds above the linear range were all re-analyzed at a higher dilution factor.

REVIEW RESULTS:

All compound identification and quantitation criteria were achieved.

V. FIELD DUPLICATE SAMPLE RESULTS

Field duplicate samples were collected and analyzed as an indication of overall precision for both field and laboratory. Field duplicate results are summarized in Table 7 (if applicable). The results are expected to have more variability than laboratory duplicates, which measure only laboratory precision. It is expected also that soil field duplicates will exhibit greater variance than water field duplicates due to the difficulties associated with collecting identical field samples. The QC criteria used to assess field duplicate samples for this project was limits of 70% RPD for soils and 40% RPD for waters, or twice the general laboratory duplicate criteria. If both compounds were below the laboratory PQL or one of the compounds was present as a non-detect, then the compounds are generally not qualified due to field duplicate precision. There are no guidelines regarding data qualification based on poor field duplicate precision. Professional judgment was used to determine whether or not to qualify results.

REVIEW RESULTS:

Field duplicates analyses were performed on this SDG. The RPD ratings are listed on Table 7 as "Good" if the RPD is less than field duplicate QC criteria of 40% and as "Poor" if the RPD exceeded the field duplicate QC criteria. The detected total mercury result in 0912RD06SW and 0912RD21SW were qualified as estimated (J).

All the results show good precision in the sample pair as noted on table 7. Qualifiers were only added to the field duplicate sample pair results as noted.

6.0 OVERALL ASSESSMENT OF DATA

All data were reviewed and considered usable with qualification as noted in this report.

Table 2 - List of Positive Results for Blank Samples

Method	Sample ID	Samp Type	Analyte	Result	Qual	Anal Type	Units	PQL
None.								

Table 2A - List of Samples Qualified for Method Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
None.						

Table 2B - List of Samples Qualified for Field Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
None.						

Table 3 - List of Samples with Surrogates outside Control Limits

Method	Sample ID	Sample Type	Analyte	Rec.	Low Limit	High Limit	Dil Fac	Sample Qual.
None.								

Table 4 - List MS/MSD Recoveries and RPDs outside Control Limits

Method	Sample ID	Sample Type	Analyte	Orig. Result	Spike Amount	Rec.	Dil Fac.	Low Limit	High Limit	Sample Qual	Reportable
None.											

Sample ID	Analyte	Method	RPD	RPD Limit	No. of Affected Samples	Samp Qual
None.						

Table 5 - List LCS Recoveries outside Control Limits

Method	Sample ID	Analyte	Rec.	Low Limit	High Limit	No. of Affected Samples	Samp Qual
None.							

Table 6 –Samples that were Re-analyzed

Sample ID	Lab ID	Method	Sample Type	Action
None.				

Table 7 – Summary of Field Duplicate Results:

Method	Analyte	Units	0912RD06SW	0912RD21SW	RPD	Rating	Sample Qualifier
EPA 1631	Dissolved Mercury	ng/L	12	13	8	Good	
EPA 1631	Total Mercury	ng/L	46	143	103	Poor	J

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209439001

Project: Red Devil Mine
Lab ID: S1209439-001
Client Sample ID: 0912MW04GW
COC: RDM-0912-008

Work Order: S1209439
Collection Date: 9/10/2012 2:41:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	50 J	1		ng/L	10/06/2012 1500 CS	EPA 1631
Total Metals						
Mercury	197 J	1		ng/L	10/11/2012 1159 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209439001

Project: Red Devil Mine
Lab ID: S1209439-002
Client Sample ID: 0912MW10GW
COC: RDM-0912-008

Work Order: S1209439
Collection Date: 9/10/2012 12:15:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	ND UJ	1		ng/L	10/11/2012 1222 CS	EPA 1631
Total Metals						
Mercury	ND UJ	1		ng/L	10/06/2012 1740 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209439001

Project: Red Devil Mine
Lab ID: S1209439-003
Client Sample ID: 0912MW14GW
COC: RDM-0912-008

Work Order: S1209439
Collection Date: 9/10/2012 6:03:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	254 J	1		ng/L	10/12/2012 1118 CS	EPA 245.1
Total Metals						
Mercury	5720 J	1		ng/L	10/12/2012 1119 CS	EPA 245.1

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209439001

Project: Red Devil Mine
Lab ID: S1209439-004
Client Sample ID: 0912MW16GW
COC: RDM-0912-008

Work Order: S1209439
Collection Date: 9/8/2012 3:35:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	285 ~~0~~ J	1		ng/L	10/12/2012 1121 CS	EPA 245.1
Total Metals						
Mercury	664 J	1		ng/L	10/12/2012 1123 CS	EPA 245.1

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209439001

Project: Red Devil Mine
Lab ID: S1209439-005
Client Sample ID: 0912MW24GW
COC: RDM-0912-008

Work Order: S1209439
Collection Date: 9/9/2012 2:50:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	ND U5	1		ng/L	10/05/2012 1458 CS	EPA 1631
Total Metals						
Mercury	35 J	1		ng/L	10/06/2012 1748 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209439001

Project: Red Devil Mine
Lab ID: S1209439-006
Client Sample ID: 0912MW28GW
COC: RDM-0912-008

Work Order: S1209439
Collection Date: 9/10/2012 4:20:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	26 J	1		ng/L	10/06/2012 1508 CS	EPA 1631
Total Metals						
Mercury	183 J	1		ng/L	09/27/2012 000 CS	EPA 245.1

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209439001

Project: Red Devil Mine
Lab ID: S1209439-007
Client Sample ID: 0912MW32GW
COC: RDM-0912-008

Work Order: S1209439
Collection Date: 9/8/2012 4:18:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	28 J	1		ng/L	10/05/2012 1505 CS	EPA 1631
Total Metals						
Mercury	190 J	1		ng/L	10/11/2012 1416 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209439001

Project: Red Devil Mine
Lab ID: S1209439-008
Client Sample ID: 0912AB01DI
COC: RDM-0912-008

Work Order: S1209439
Collection Date: 9/8/2012 4:47:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	ND UJ	1		ng/L	10/05/2012 1513 CS	EPA 1631
Total Metals						
Mercury	ND UJ	1		ng/L	10/06/2012 1818 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209439001

Project: Red Devil Mine
Lab ID: S1209439-009
Client Sample ID: 0912AB02DI
COC: RDM-0912-008

Work Order: S1209439
Collection Date: 9/12/2012 1:08:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	ND UJ	1		ng/L	10/05/2012 1521 CS	EPA 1631
Total Metals						
Mercury	ND UJ	1		ng/L	10/06/2012 1826 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209439001

Project: Red Devil Mine
Lab ID: S1209439-010
Client Sample ID: 0912RI01DI
COC: RDM-0912-008

Work Order: S1209439
Collection Date: 9/16/2012 11:00:00 AM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals						
Mercury	ND UJ	1		ng/L	10/06/2012 1834 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209439001

Project: Red Devil Mine
Lab ID: S1209439-011
Client Sample ID: 0912RD05SW
COC: RDM-0912-008

Work Order: S1209439
Collection Date: 9/11/2012 3:23:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	1 J	1		ng/L	10/06/2012 1516 CS	EPA 1631
Total Metals						
Mercury	7 J	1		ng/L	10/07/2012 1529 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209439001

Project: Red Devil Mine
Lab ID: S1209439-012
Client Sample ID: 0912RD06SW
COC: RDM-0912-008

Work Order: S1209439
Collection Date: 9/11/2012 11:57:00 AM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	12 J	1		ng/L	10/06/2012 1523 CS	EPA 1631
Total Metals						
Mercury	46 J	1		ng/L	10/07/2012 1537 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209439001

Work Order: S1209439
Project: Red Devil Mine
Collection Date: 9/12/2012 10:58:00 AM
Lab ID: S1209439-013
Date Received: 9/25/2012 11:45:00 AM
Client Sample ID: 0912EB02DI
Sampler:
COC: RDM-0912-008
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	ND VJ	1		ng/L	10/06/2012 1531 CS	EPA 1631
Total Metals						
Mercury	ND VJ	1		ng/L	10/07/2012 1545 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209439001

Work Order: S1209439
Project: Red Devil Mine
Collection Date: 9/12/2012 11:52:00 AM
Lab ID: S1209439-014
Date Received: 9/25/2012 11:45:00 AM
Client Sample ID: 0912AB03DI
Sampler:
COC: RDM-0912-008
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	ND UJ	1		ng/L	10/06/2012 1539 CS	EPA 1631
Total Metals						
Mercury	ND UJ	1		ng/L	10/07/2012 1552 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209439001

Work Order: S1209439
Collection Date: 9/11/2012 11:50:00 AM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Project: Red Devil Mine
Lab ID: S1209439-015
Client Sample ID: 0912MW09GW
COC: RDM-0912-008

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	11 J	1		ng/L	10/06/2012 1547 CS	EPA 1631
Total Metals						
Mercury	172 J	1		ng/L	10/11/2012 1431 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209439
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209439001

Dissolved Mercury by EPA 245.1 - Water

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	09/27/12 9:29	Mercury	ND	0.001					

Sample ID	RunNo: 87934	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/04/12 9:30	Mercury	ND	0.001					

Sample ID	RunNo: 88228	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/12/12 9:21	Mercury	ND	0.001					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	09/27/12 9:28	Mercury	0.002	0.001	0.002		99.3	85 - 115	

Sample ID	RunNo: 87934	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/04/12 9:29	Mercury	0.002	0.001	0.002		98.5	85 - 115	

Sample ID	RunNo: 88228	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/12/12 9:19	Mercury	0.002	0.001	0.002		98.7	85 - 115	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87934	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209439-003B	10/04/12 9:36	Mercury	0.00275	0.000001	0.00244	0.000246	102	70 - 130	B

Sample ID	RunNo: 88228	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1210209-004C	10/12/12 11:12	Mercury	0.003	0.001	0.00244	ND	103	70 - 130	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87934	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209439-003B	10/04/12 9:38	Mercury	0.00274	0.000001	0.00275	0.360	102	20	B

Sample ID	RunNo: 88228	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1210209-004C	10/12/12 11:14	Mercury	0.003	0.001	0.003	0.0199	103	20	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87934	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209439-003B	10/04/12 9:34	Mercury	0.000248	0.000001	0.000246	0.853		20	B

Sample ID	RunNo: 88228	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1210209-004C	10/12/12 11:10	Mercury	ND	0.001	ND			20	

11/16/12

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

Inter-Mountain Labs
Your Environmental Monitoring Partner
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209439
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209439001

Dissolved Mercury by EPA 1631

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87989	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/05/12 11:43	Mercury	ND	0.000001					

Sample ID	RunNo: 87992	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/06/12 11:46	Mercury	ND	0.000001					

Sample ID	RunNo: 88004	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/07/12 11:46	Mercury	ND	0.000001					

Sample ID	RunNo: 88201	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/11/12 11:21	Mercury	ND	0.000001					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87989	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/05/12 11:36	Mercury	0.000005	0.000001	5E-06		104	77 - 123	

Sample ID	RunNo: 87992	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/06/12 11:38	Mercury	0.000005	0.000001	5E-06		107	77 - 123	

Sample ID	RunNo: 88004	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/07/12 11:38	Mercury	0.000005	0.000001	5E-06		90.0	77 - 123	

Sample ID	RunNo: 88201	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/11/12 11:13	Mercury	0.000006	0.000001	5E-06		110	77 - 123	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87989	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209437-006B	10/05/12 14:04	Mercury	0.000013	0.000001	0.00001	0.000003	103	71 - 125	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87989	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209437-006B	10/05/12 14:11	Mercury	0.000014	0.000001	0.000013	0.752	104	24	

11/16/12

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209439
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209439001

Total Mercury by EPA 245.1 - Water

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	09/27/12 9:29	Mercury	ND	0.001					

Sample ID	RunNo: 87934	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/04/12 9:30	Mercury	ND	0.001					

Sample ID	RunNo: 88228	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/12/12 9:21	Mercury	ND	0.001					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	09/27/12 9:28	Mercury	0.002	0.001	0.002		99.3	85 - 115	

Sample ID	RunNo: 87934	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/04/12 9:29	Mercury	0.002	0.001	0.002		98.5	85 - 115	

Sample ID	RunNo: 88228	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/12/12 9:19	Mercury	0.002	0.001	0.002		98.7	85 - 115	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209429-001D	09/27/12 12:57	Mercury	0.00248	0.00001	0.00244	0.00003	100	70 - 130	

Sample ID	RunNo: 87934	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209439-003A	10/04/12 14:33	Mercury	0.00266	0.000001	0.00244	0.000150	103	70 - 130	B

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209429-001D	09/27/12 12:59	Mercury	0.00253	0.00001	0.00248	2.22	103	20	

Sample ID	RunNo: 87934	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209439-003A	10/04/12 14:35	Mercury	0.00264	0.000001	0.00266	0.699	102	20	B

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-001D	09/27/12 12:55	Mercury	0.00003	0.00001	0.00003	3.09		20	

Sample ID	RunNo: 87934	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209439-003A	10/04/12 14:31	Mercury	0.000143	0.000001	0.000150	4.55		20	B

11/16/12

Qualifiers:

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- J Analyte detected below quantitation limits
- L Analyzed by a contract laboratory
- ND Not Detected at the Reporting Limit
- O Outside the Range of Dilutions
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

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ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209439
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209439001

Total Mercury by EPA 1631

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87992	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/06/12 11:46	Mercury	ND	0.000001					

Sample ID	RunNo: 88004	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/07/12 11:46	Mercury	ND	0.000001					

Sample ID	RunNo: 88201	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/11/12 11:21	Mercury	ND	0.000001					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87992	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/06/12 11:38	Mercury	0.000005	0.000001	5E-06		107	77 - 123	

Sample ID	RunNo: 88004	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/07/12 11:38	Mercury	0.000005	0.000001	5E-06		90.0	77 - 123	

Sample ID	RunNo: 88201	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/11/12 11:13	Mercury	0.000006	0.000001	5E-06		110	77 - 123	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87992	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209437-006A	10/06/12 17:09	Mercury	0.000068	0.000001	0.00005	0.000010	116	71 - 125	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87992	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209437-006A	10/06/12 17:17	Mercury	0.000068	0.000001	0.000068	0.293	116	24	

11/16/12

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

CHAIN OF CUSTODY RECORD

Red Devil Mine Project
Contact Name: Bill Richards
Contact Phone: 206-624-9537

No: RDM-0912-008
Cooler #: 8

Ecology and Environment, Inc

S1209439

Lab: Inter-Mountain Laboratories, Inc.
Lab Phone: 800-828-1097

Lab #	Location	Analyses	Collected	Sample Time	Numb Cont	Container	Preservative	MS/MSD
001	0912MW04GW	Total Low Level Mercury	9/10/2012	14:41	1	250 mL Clear Glass	HCl	
	0912MW04GW	Dissolved Low Level Mercury	9/10/2012	14:41	1	250 mL Clear Glass	HCl	
002	0912MW10GW	Total Low Level Mercury	9/10/2012	12:15	1	250 mL Clear Glass	HCl	
	0912MW10GW	Dissolved Low Level Mercury	9/10/2012	12:15	1	250 mL Clear Glass	HCl	
003	0912MW14GW	Total Low Level Mercury	9/10/2012	18:03	1	250 mL Clear Glass	HCl	
	0912MW14GW	Dissolved Low Level Mercury	9/10/2012	18:03	1	250 mL Clear Glass	HCl	
004	0912MW16GW	Total Low Level Mercury	9/8/2012	15:35	1	250 mL Clear Glass	HCl	
	0912MW16GW	Dissolved Low Level Mercury	9/8/2012	15:35	1	250 mL Clear Glass	HCl	
005	0912MW24GW	Total Low Level Mercury	9/9/2012	14:50	1	250 mL Clear Glass	HCl	
	0912MW24GW	Dissolved Low Level Mercury	9/9/2012	14:50	1	250 mL Clear Glass	HCl	
006	0912MW28GW	Total Low Level Mercury	9/10/2012	16:20	1	250 mL Clear Glass	HCl	

Special Instructions:

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Layton	9-25-12	11:45						

8.8°C

CHAIN OF CUSTODY RECORD

Red Devil Mine Project
Contact Name: Bill Richards
Contact Phone: 206-624-9537

No: RDM-0912-008

Cooler #: 8
Lab: Inter-Mountain Laboratories, Inc
Lab Phone: 800-828-1097

Ecology and Environment, Inc

S1209439

Lab #	Location	Analyses	Collected	Sample Time	Numb Cont	Container	Preservative	MS/MSD
006	0912MW28GW	Dissolved Low Level Mercury	9/10/2012	16:20	1	250 mL Clear Glass	HCl	
007	0912MW32GW	Total Low Level Mercury	9/8/2012	16:18	1	250 mL Clear Glass	HCl	
	0912MW32GW	Dissolved Low Level Mercury	9/8/2012	16:18	1	250 mL Clear Glass	HCl	
008	0912AB01DI	Total Low Level Mercury	9/8/2012	16:47	1	250 mL Clear Glass	HCl	
	0912AB01DI	Dissolved Low Level Mercury	9/8/2012	16:47	1	250 mL Clear Glass	HCl	
009	0912AB02DI	Total Low Level Mercury	9/12/2012	13:08	1	250 mL Clear Glass	HCl	
	0912AB02DI	Dissolved Low Level Mercury	9/12/2012	13:08	1	250 mL Clear Glass	HCl	
010	0912RI01DI	Total Low Level Mercury	9/16/2012	11:00	1	250 mL Clear Glass	HCl	
bll	0912RD05SW	Total Low Level Mercury	9/11/2012	15:23	1	250 mL Clear Glass	HCl	
RB 011	0912RD05SW	Dissolved Low Level Mercury	9/11/2012	15:23	1	250 mL Clear Glass	HCl	
012	0912RD06SW	Total Low Level Mercury	9/11/2012	11:57	1	250 mL Clear Glass	HCl	

Special Instructions:

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time

8.8°C

CHAIN OF CUSTODY RECORD

Red Devil Mine Project

Contact Name: Bill Richards

Contact Phone: 206-624-9537

No: RDM-0912-008

Cooler #: 8

Lab: Inter-Mountain Laboratories, Inc.

Lab Phone: 800-626-1097

Ecology and Environment, Inc

S12.09439

Lab #	Location	Analyses	Collected	Sample Time	Numb Cont	Container	Preservative	MS/MSD
012	0912RD06SW	Dissolved Low Level Mercury	9/11/2012	11:57	1	250 mL Clear Glass	HCl	
013	0912EB02DI	Total Low Level Mercury	9/12/2012	10:58	1	250 mL Clear Glass	HCl	
	0912EB02DI	Dissolved Low Level Mercury	9/12/2012	10:58	1	250 mL Clear Glass	HCl	
014	0912AB03DI	Total Low Level Mercury	9/12/2012	11:52	1	250 mL Clear Glass	HCl	
	0912AB03DI	Dissolved Low Level Mercury	9/12/2012	11:52	1	250 mL Clear Glass	HCl	
015	0912MW09GW	Total Low Level Mercury	9/11/2012	11:50	1	250 mL Clear Glass	HCl	
	0912MW09GW	Dissolved Low Level Mercury	9/11/2012	11:50	1	250 mL Clear Glass	HCl	

Special Instructions:

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time

DATA REVIEW MEMORANDUM

DATE: November 15, 2012

TO: Bill Richards, Project Manager, E & E, Seattle, WA

FROM: Mindy Song, E & E, Long Beach, CA 11/16/12

SUBJ: Data Review: Red Devil Mine

REFERENCE:

Project ID	Lab Work Order	Lab
EE-1096-0070	S1209440	Inter-Mountain Labs

I. SAMPLE IDENTIFICATION

For the sampling activities at Red Devil Mine, Ecology and Environment, Inc. (E & E) collected the samples listed on Table 1. Project-specific matrix spike/matrix spike duplicates (MS/MSD) were designated in the field, laboratory also identified batch MS/MSD's as batch QC for additional analytical testing. All samples were sent to Inter-Mountain Labs in Sheridan, WY for analysis. All tables are included at the end of this memorandum.

Data were reviewed for field and laboratory precision, accuracy, and completeness in accordance with procedures and quality control (QC) limits, the current laboratory Quality Assurance Manual (QAM) and current standard operating procedures (SOPs). Laboratory data qualifiers for compound identification and quantitation were accepted. Any additional data review qualifiers added are noted below and listed on the tables at the end of this memorandum. Definitions of all data qualifiers are given in the report.

Table 1 Sample Listing

Work Order	Matrix	Sample ID	Lab ID	Sample Date	MS/MSD	ID Corrections
S1209440	Water	0912MW06GW	S1209440-001	09/09/2012		
S1209440	Water	0912MW21GW	S1209440-002	09/08/2012		
S1209440	Water	0912MW27GW	S1209440-003	09/09/2012		
S1209440	Water	0912EB01D1	S1209440-004	09/09/2012		
S1209440	Water	0912RD04SW	S1209440-005	09/11/2012		
S1209440	Water	0912RD08SW	S1209440-006	09/11/2012		
S1209440	Water	0912RD09SW	S1209440-007	09/11/2012	X	
S1209440	Water	0912RD10SW	S1209440-008	09/12/2012		
S1209440	Water	0912RD12SW	S1209440-009	09/11/2012		
S1209440	Water	0912RD21SW	S1209440-010	09/11/2012		

Work Orders, Tests and Number of Samples included in this DVM

Work Orders	Matrix	Test Method	Method Name	Number of Samples	Sample Type
S1209440	Water	EPA 245.1/1631	Dissolved Mercury	10	
S1209440	Water	EPA 245.1/1631	Total Mercury	10	

II. SAMPLE PROCEDURES

All samples were collected as specified in the work plan and documented on the chain-of-custody (COC) and in field notebooks. Samples were analyzed as specified on the COC. Samples were packaged, shipped and received as specified in the work plan. All samples must be received cold (4 ±2) °C and in good condition as documented on the Cooler Receipt Form.

REVIEW RESULTS:

All sample procedures were followed and the sample coolers were received at 8.8 °C. No problems with the condition of the sample upon receipt are documented. Since the samples were received at temperature outside of range (>6 °C), the detected results were qualified as estimated (J) and the non-detected results were qualified as estimated (UJ).

III. LABORATORY DATA

1.0 HOLDING TIMES

Holding times are established and monitored to ensure analytical results accurately represent analyte concentrations in a sample at the time of collection. Exceeding the holding time for a sample generally results in a loss of the analyte due to a variety of mechanisms, such as deposition on the sample container walls or precipitation.

REVIEW RESULTS:

All samples were analyzed within the project and method specified holding times for all analytes. No data were qualified.

2.0 BLANKS

Laboratory and field blank samples are analyzed and evaluated to determine the existence and magnitude of possible contamination during the sampling and analysis process. As noted in Table 2, analyte concentrations in the blanks are generally below the practical quantitation limit (PQL). If the analyte is present in the sample at similar trace levels, then the analyte is likely a common background contaminant from some phase of the sampling, extraction, or analytical procedure and associated low level sample concentrations are not considered to be site related. If the analyte concentration is above the PQL, then there is a potential contamination problem and sample results may be biased high or the data unusable.

REVIEW RESULTS:

All blanks were performed at the required frequency. No analytes were detected in the method blanks at reporting limit levels. Trace amount (1 ng/L) of dissolved mercury was detected in the equipment blank (0912EB01DI) and the detected dissolved mercury result in sample 0912RD10SW was qualified as non-detect (U) since the sample concentration was less than 5X the blank concentration..

3.0 SURROGATE SPIKE RECOVERY

Laboratory performance for individual samples analyzed for organic compounds is established by means of surrogate spiking activities. Samples are spiked with surrogate compounds prior to preparation and analysis. Unusually low or high surrogate recovery values may indicate some deficiency in the analytical system or that some matrix effects exist, resulting in low or high sample results for target compounds. Sample surrogate recoveries outside QC limits (if applicable) are presented in Table 3.

REVIEW RESULTS:

Not applicable for these analyses.

4.0 MATRIX SPIKE AND MATRIX SPIKE DUPLICATE ANALYSIS

The matrix spike and matrix spike duplicate (MS/MSD) analyses are intended to provide information about the affects that the sample matrix exerts on the

digestion/extraction and measurement methodology. MS recovery values that do not meet laboratory QC criteria may indicate that sample analyte results are being attenuated in the analysis procedure. These results are presented in Table 4 (if applicable). The potential sample bias may be estimated by noting the degree to which the MS concentration was elevated or lowered in the spike analysis. However, this bias should serve only as approximations; sample-specific problems may be the cause of the discrepancy, particularly in soil samples. Recoveries of a post-digestion spike or a laboratory control sample (LCS) are used to verify that the analytical methodology is acceptable and that MS recoveries are due to matrix effects. An MSD analysis is performed to evaluate the precision of the sample results. Precision is measured as the relative percent difference (RPD) between analytical results for duplicate samples. The laboratory's failure to produce similar results for MSD samples may indicate that the samples were non-homogeneous (particularly in soil samples), or that method defects may exist in the laboratory's techniques.

REVIEW RESULTS:

The MS/MSD sample analyses were performed on samples 0912MW14GW (EPA 245.1) and 0912MW27GW (EPA 1631) at the required frequency. MS/MSD recoveries were within the control limits generated by the laboratory.

5.0 LABORATORY CONTROL SAMPLE ANALYSIS

The LCS is analyzed to monitor the efficiency of the digestion/extraction procedure and analytical instrument operation. The ability of the laboratory to successfully analyze an LCS demonstrates that there are no analytical problems related to the digestion/sample preparation procedures and/or instrument operations. The LCS results outside QC limits are presented in Table 5 (if applicable). Sporadic and marginal QC failures for multiple component methods do not indicate an analytical concern. If recoveries are high and the compounds are not detected in the samples, then no data qualification is required. All recoveries should be above 10% or the non-detect results flagged "UR" as rejected.

REVIEW RESULTS:

All LCS analyses were within control limits and performed at the required frequency.

IV. COMPOUND IDENTIFICATION AND QUANTITATION

Compound identities are assigned by comparing sample compound retention times to retention times from known (standard) compounds and identification of an acceptable mass spectrum. Compounds detected below the PQL in samples should be considered estimated and are qualified "J." The samples with compounds above the linear range were all re-analyzed at a higher dilution factor.

REVIEW RESULTS:

All compound identification and quantitation criteria were achieved.

V. FIELD DUPLICATE SAMPLE RESULTS

Field duplicate samples were collected and analyzed as an indication of overall precision for both field and laboratory. Field duplicate results are summarized in Table 7 (if applicable). The results are expected to have more variability than laboratory duplicates, which measure only laboratory precision. It is expected also that soil field duplicates will exhibit greater variance than water field duplicates due to the difficulties associated with collecting identical field samples. The QC criteria used to assess field duplicate samples for this project was limits of 70% RPD for soils and 40% RPD for waters, or twice the general laboratory duplicate criteria. If both compounds were below the laboratory PQL or one of the compounds was present as a non-detect, then the compounds are generally not qualified due to field duplicate precision. There are no guidelines regarding data qualification based on poor field duplicate precision. Professional judgment was used to determine whether or not to qualify results.

REVIEW RESULTS:

Field duplicates analyses were performed on this SDG. The RPD ratings are listed on Table 7 as "Good" if the RPD is less than field duplicate QC criteria of 40% and as "Poor" if the RPD exceeded the field duplicate QC criteria. The detected total mercury result in 0912RD06SW and 0912RD21SW were qualified as estimated (J).

All the results show good precision in the sample pair as noted on table 7. Qualifiers were only added to the field duplicate sample pair results as noted.

6.0 OVERALL ASSESSMENT OF DATA

All data were reviewed and considered usable with qualification as noted in this report.

Table 2 - List of Positive Results for Blank Samples

Method	Sample ID	Sample Type	Analyte	Result	Qual	Anal Type	Units	PQL
EPA 1631	0912EB01DI		dissolved mercury	1			ng/L	

Table 2A - List of Samples Qualified for Method Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
EPA 1631	0912RD10SW	Diss Hg	1	3	U	

Table 2B - List of Samples Qualified for Field Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
None.						

Table 3 - List of Samples with Surrogates outside Control Limits

Method	Sample ID	Sample Type	Analyte	Rec.	Low Limit	High Limit	Dil Fac	Sample Qual.
None.								

Table 4 - List MS/MSD Recoveries and RPDs outside Control Limits

Method	Sample ID	Sample Type	Analyte	Orig. Result	Spike Amount	Rec.	Dil Fac.	Low Limit	High Limit	Sample Qual	Reportable
None.											

Sample ID	Analyte	Method	RPD	RPD Limit	No. of Affected Samples	Samp Qual
None.						

Table 5 - List LCS Recoveries outside Control Limits

Method	Sample ID	Analyte	Rec.	Low Limit	High Limit	No. of Affected Samples	Samp Qual
None.							

Table 6 –Samples that were Re-analyzed

Sample ID	Lab ID	Method	Sample Type	Action
None.				

Table 7 – Summary of Field Duplicate Results:

Method	Analyte	Units	0912RD06SW	0912RD21SW	RPD	Rating	Sample Qualifier
EPA 1631	Dissolved Mercury	ng/L	12	13	8	Good	
EPA 1631	Total Mercury	ng/L	46	143	103	Poor	J

Method	Analyte	Units	0912MW27GW	0912MW57GW	RPD	Rating	Sample Qualifier
EPA 1631	Dissolved Mercury	ng/L	60	58	3	Good	
EPA 1631	Total Mercury	ng/L	112	144	25	Good	

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209440001

Project: Red Devil Mine
Lab ID: S1209440-001
Client Sample ID: 0912MW06GW
COC: RDM-0912-010

Work Order: S1209440
Collection Date: 9/9/2012 12:40:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	ND UJ	1		ng/L	10/06/2012 1638 CS	EPA 1631
Total Metals						
Mercury	ND UJ	1		ng/L	10/07/2012 1638 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209440001

Project: Red Devil Mine
Lab ID: S1209440-002
Client Sample ID: 0912MW21GW
COC: RDM-0912-010

Work Order: S1209440
Collection Date: 9/8/2012 6:00:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	131 J	1		ng/L	09/27/2012 000 CS	EPA 245.1
Total Metals						
Mercury	139 J	1		ng/L	09/27/2012 000 CS	EPA 245.1

11/16/12

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209440001

Work Order: S1209440
Project: Red Devil Mine
Collection Date: 9/9/2012 1:34:00 PM
Lab ID: S1209440-003
Date Received: 9/25/2012 11:45:00 AM
Client Sample ID: 0912MW27GW
Sampler:
COC: RDM-0912-010
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	60 J	1		ng/L	10/06/2012 1414 CS	EPA 1631
Total Metals						
Mercury	112 J	1		ng/L	10/07/2012 1506 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209440001

Project: Red Devil Mine
Lab ID: S1209440-004
Client Sample ID: 0912EB01DI
COC: RDM-0912-010

Work Order: S1209440
Collection Date: 9/9/2012 1:50:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	1 J	1		ng/L	10/07/2012 1217 CS	EPA 1631
Total Metals						
Mercury	ND U.J	1		ng/L	10/07/2012 1646 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209440001

Project: Red Devil Mine
Lab ID: S1209440-005
Client Sample ID: 0912RD04SW
COC: RDM-0912-010

Work Order: S1209440
Collection Date: 9/11/2012 5:26:00 PM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	8 J	1		ng/L	10/07/2012 1224 CS	EPA 1631
Total Metals						
Mercury	11 J	1		ng/L	10/07/2012 1654 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209440001

Work Order: S1209440
Project: Red Devil Mine
Collection Date: 9/11/2012 11:11:00 AM
Lab ID: S1209440-006
Date Received: 9/25/2012 11:45:00 AM
Client Sample ID: 0912RD08SW
Sampler:
COC: RDM-0912-010
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	13 J	1		ng/L	10/07/2012 1315 CS	EPA 1631
Total Metals						
Mercury	120 J	1		ng/L	10/07/2012 1409 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits

RL - Reporting Limit

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209440001

Work Order: S1209440
Project: Red Devil Mine
Collection Date: 9/11/2012 1:12:00 PM
Lab ID: S1209440-007
Date Received: 9/25/2012 11:45:00 AM
Client Sample ID: 0912RD09SW
Sampler:
COC: RDM-0912-010
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	10 J	1		ng/L	10/07/2012 1154 CS	EPA 1631
Total Metals						
Mercury	97 J	1		ng/L	10/07/2012 1346 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level
C	Calculated Value
H	Holding times for preparation or analysis exceeded
L	Analyzed by a contract laboratory
ND	Not Detected at the Reporting Limit
S	Spike Recovery outside accepted recovery limits
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
M	Value exceeds Monthly Ave or MCL
O	Outside the Range of Dilutions

Reviewed by: _____
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209440001

Project: Red Devil Mine
Lab ID: S1209440-008
Client Sample ID: 0912RD10SW
COC: RDM-0912-010

Work Order: S1209440
Collection Date: 9/12/2012 11:52:00 AM
Date Received: 9/25/2012 11:45:00 AM
Sampler:
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	3 UJ	1		ng/L	10/07/2012 1323 CS	EPA 1631
Total Metals						
Mercury	4 J	1		ng/L	10/07/2012 1417 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209440001

Work Order: S1209440
Project: Red Devil Mine
Collection Date: 9/11/2012 4:27:00 PM
Lab ID: S1209440-009
Date Received: 9/25/2012 11:45:00 AM
Client Sample ID: 0912RD12SW
Sampler:
COC: RDM-0912-010
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	12 J	1		ng/L	10/07/2012 1331 CS	EPA 1631
Total Metals						
Mercury	53 J	1		ng/L	10/07/2012 1425 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Sample Analysis Report

CLIENT: Ecology & Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, WA 98104

Date Reported: 10/9/2012
Report ID: S1209440001

Work Order: S1209440
Project: Red Devil Mine
Collection Date: 9/11/2012 7:00:00 AM
Lab ID: S1209440-010
Date Received: 9/25/2012 11:45:00 AM
Client Sample ID: 0912RD21SW
Sampler:
COC: RDM-0912-010
Matrix: Water

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Dissolved Metals						
Mercury	13 J	1		ng/L	10/07/2012 1339 CS	EPA 1631
Total Metals						
Mercury	143 J	1		ng/L	10/07/2012 1451 CS	EPA 1631

11/16/12

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
C	Calculated Value	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	M	Value exceeds Monthly Ave or MCL
ND	Not Detected at the Reporting Limit	O	Outside the Range of Dilutions
S	Spike Recovery outside accepted recovery limits		

Reviewed by:
Lacey Ketron, Water Lab Supervisor

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209440
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209440001

Dissolved Mercury by EPA 245.1 - Water

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	09/27/12 9:29	Mercury	ND	0.001					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	09/27/12 9:28	Mercury	0.002	0.001	0.002		99.3	85 - 115	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209393-001C	09/27/12 9:35	Mercury	0.002	0.001	0.00244	ND	86.1	70 - 130	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209393-001C	09/27/12 9:37	Mercury	0.002	0.001	0.002	9.09	93.9	20	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209393-001C	09/27/12 9:33	Mercury	ND	0.001	ND			20	

11/16/12

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209440
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209440001

Dissolved Mercury by EPA 1631

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87992	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/06/12 11:46	Mercury	ND	0.000001					

Sample ID	RunNo: 88004	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/07/12 11:46	Mercury	ND	0.000001					

Sample ID	RunNo: 88201	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/11/12 11:21	Mercury	ND	0.000001					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87992	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/06/12 11:38	Mercury	0.000005	0.000001	5E-06		107	77 - 123	

Sample ID	RunNo: 88004	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/07/12 11:38	Mercury	0.000005	0.000001	5E-06		90.0	77 - 123	

Sample ID	RunNo: 88201	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/11/12 11:13	Mercury	0.000006	0.000001	5E-06		110	77 - 123	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87992	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209440-003B	10/06/12 14:22	Mercury	0.000067	0.000001	0.00001	0.000060	71.0	71 - 125	

Sample ID	RunNo: 88004	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209440-007B	10/07/12 12:01	Mercury	0.000019	0.000001	0.00001	0.000010	93.9	71 - 125	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87992	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209440-003B	10/06/12 14:45	Mercury	0.000066	0.000001	0.000067	2.38	55.0	24	S

Sample ID	RunNo: 88004	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209440-007B	10/07/12 12:09	Mercury	0.000018	0.000001	0.000019	3.70	86.9	24	

11/16/12

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209440
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209440001

Total Mercury by EPA 245.1 - Water

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	09/27/12 9:29	Mercury	ND	0.001					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	09/27/12 9:28	Mercury	0.002	0.001	0.002		99.3	85 - 115	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209429-001D	09/27/12 12:57	Mercury	0.00248	0.00001	0.00244	0.00003	100	70 - 130	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209429-001D	09/27/12 12:59	Mercury	0.00253	0.00001	0.00248	2.22	103	20	

Sample Type **DUP** Units: mg/L

Sample ID	RunNo: 87669	Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
S1209429-001D	09/27/12 12:55	Mercury	0.00003	0.00001	0.00003	3.09		20	

11/16/12

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

ANALYTICAL QC SUMMARY REPORT

CLIENT: Ecology & Environment, Inc.
Work Order: S1209440
Project: Red Devil Mine

Date: 10/9/2012
Report ID: S1209440001

Total Mercury by EPA 1631

Sample Type **MBLK** Units: mg/L

Sample ID	RunNo: 87992	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/06/12 11:46	Mercury	ND	0.000001					

Sample ID	RunNo: 88004	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/07/12 11:46	Mercury	ND	0.000001					

Sample ID	RunNo: 88201	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LRB	10/11/12 11:21	Mercury	ND	0.000001					

Sample Type **LCS** Units: mg/L

Sample ID	RunNo: 87992	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/06/12 11:38	Mercury	0.000005	0.000001	5E-06		107	77 - 123	

Sample ID	RunNo: 88004	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/07/12 11:38	Mercury	0.000005	0.000001	5E-06		90.0	77 - 123	

Sample ID	RunNo: 88201	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
LCS	10/11/12 11:13	Mercury	0.000006	0.000001	5E-06		110	77 - 123	

Sample Type **MS** Units: mg/L

Sample ID	RunNo: 87992	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209437-006A	10/06/12 17:09	Mercury	0.000068	0.000001	0.00005	0.000010	116	71 - 125	

Sample ID	RunNo: 88004	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209440-007A	10/07/12 13:54	Mercury	0.000125	0.000001	0.00001	0.000097	282	71 - 125	S

Sample ID	RunNo: 88004	Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
S1209440-003A	10/07/12 15:14	Mercury	0.000120	0.000001	0.00001	0.000112	80.0	71 - 125	

Sample Type **MSD** Units: mg/L

Sample ID	RunNo: 87992	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209437-006A	10/06/12 17:17	Mercury	0.000068	0.000001	0.000068	0.293	116	24	

Sample ID	RunNo: 88004	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209440-007A	10/07/12 14:02	Mercury	0.000099	0.000001	0.000125	20.6	25.0	24	S

Sample ID	RunNo: 88004	Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
S1209440-003A	10/07/12 15:21	Mercury	0.000126	0.000001	0.000120	5.00	140	24	S

11/16/12

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
L	Analyzed by a contract laboratory	ND	Not Detected at the Reporting Limit
O	Outside the Range of Dilutions	R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits		

CHAIN OF CUSTODY RECORD

Red Devil Mine Project
Contact Name: Bill Richards
Contact Phone: 206-624-9537

No: RDM-0912-010

Cooler #: 10
Lab: Inter-Mountain Laboratories, Inc.
Lab Phone: 800-828-1097

Ecology and Environment, Inc

S12E9440

Lab #	Location	Analyses	Collected	Sample Time	Numb Cont	Container	Preservative	MS/MSD
001	0912MW06GW	Total Low Level Mercury	9/9/2012	12:40	1	250 mL Clear Glass	HCl	
	0912MW06GW	Dissolved Low Level Mercury	9/9/2012	12:40	1	250 mL Clear Glass	HCl	
002	0912MW21GW	Total Low Level Mercury	9/8/2012	18:00	1	250 mL Clear Glass	HCl	
	0912MW21GW	Dissolved Low Level Mercury	9/8/2012	18:00	1	250 mL Clear Glass	HCl	
003	0912MW27GW	Total Low Level Mercury	9/9/2012	13:34	3	250 mL Clear Glass	HCl	Y
	0912MW27GW	Dissolved Low Level Mercury	9/9/2012	13:34	3	250 mL Clear Glass	HCl	Y
004	0912EB01DI	Total Low Level Mercury	9/9/2012	13:50	1	250 mL Clear Glass	HCl	
	0912EB01DI	Dissolved Low Level Mercury	9/9/2012	13:50	1	250 mL Clear Glass	HCl	
005	0912RD04SW	Total Low Level Mercury	9/11/2012	17:26	1	250 mL Clear Glass	HCl	
	0912RD04SW	Dissolved Low Level Mercury	9/11/2012	17:26	1	250 mL Clear Glass	HCl	
006	0912RD08SW	Total Low Level Mercury	9/11/2012	11:11	1	250 mL Clear Glass	HCl	

Special Instructions:

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
				9-25-12	11:45						

8.8°C

CHAIN OF CUSTODY RECORD

No: RDM-0912-010

Red Devil Mine Project

Cooler #: 10

Ecology and Environment, Inc

Contact Name: Bill Richards

Lab: Inter-Mountain Laboratories, Inc

Contact Phone: 206-624-9537

Lab Phone: 800-828-1097

Lab #	Location	Analyses	Collected	Sample Time	Numb Cont	Container	Preservative	MS/MSD
006	0912RD08SW	Dissolved Low Level Mercury	9/11/2012	11:11	1	250 mL Clear Glass	HCl	
007	0912RD09SW	Total Low Level Mercury	9/11/2012	13:12	3	250 mL Clear Glass	HCl	Y
	0912RD09SW	Dissolved Low Level Mercury	9/11/2012	13:12	3	250 mL Clear Glass	HCl	Y
008	0912RD10SW	Total Low Level Mercury	9/12/2012	11:52	1	250 mL Clear Glass	HCl	
	0912RD10SW	Dissolved Low Level Mercury	9/12/2012	11:52	1	250 mL Clear Glass	HCl	
009	0912RD12SW	Total Low Level Mercury	9/11/2012	16:27	1	250 mL Clear Glass	HCl	
	0912RD12SW	Dissolved Low Level Mercury	9/11/2012	16:27	1	250 mL Clear Glass	HCl	
010	0912RD21SW	Total Low Level Mercury	9/11/2012	07:00	1	250 mL Clear Glass	HCl	
	0912RD21SW	Dissolved Low Level Mercury	9/11/2012	07:00	1	250 mL Clear Glass	HCl	

Special Instructions:

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
			Layde	9-25-12	11:45						

8.8°C

DATA REVIEW MEMORANDUM

DATE: October 29, 2012

TO: Bill Richards, Project Manager, E & E, Seattle

FROM: Bryan Kroon, Chemist, E & E, Buffalo

SUBJ: Data Review: Red Devil Mine

REFERENCE:

ProjectID	Lab Work Order
Red Devil Mine	O1206012
Red Devil Mine	O1206013
Red Devil Mine	S1206022
Red Devil Mine	S1206026
Red Devil Mine	S1206027
Red Devil Mine	S1206029
Red Devil Mine	S1206030
Red Devil Mine	S1206031
Red Devil Mine	S1206032
Red Devil Mine	S1206033
Red Devil Mine	S1206035

I. SAMPLE IDENTIFICATION

For the sampling activities at Red Devil Mine, Ecology and Environment, Inc. (E & E) collected the samples listed on Table 1. Project-specific matrix spike/matrix spike duplicates (MS/MSD) were designated in the field, laboratory also identified batch MS/MSD's as batch QC for additional analytical testing. Trip blanks were provided with each shipment for this sampling event. All samples were sent to Brooks Rand Laboratory and Inter-Mountain in Sheridan, WY for analysis. All tables are included at the end of this memorandum.

Data were reviewed for field and laboratory precision, accuracy, and completeness in accordance with procedures and quality control (QC) limits, the current laboratory Quality Assurance Manual (QAM) and current standard operating procedures (SOPs). Laboratory data qualifiers for compound identification and quantitation were accepted. Any additional data review qualifiers added are noted below and listed on the tables at the end of this memorandum. Definitions of all data qualifiers are given in the report.

Table 1 Sample Listing

Work Order	Matrix	Sample ID	Lab ID	Sample Date	Lab QC	MS/ MSD	ID Corrections
O1206012	Water	0512EB02DI	O1206012-001	5/30/2012			None
O1206013	Water	0512EB02DI	O1206013-001	5/30/2012			None
O1206013	Water	0512MW19GW	O1206013-002	5/29/2012			None
O1206013	Water	0512MW52GW	O1206013-003	5/29/2012			None
O1206013	Water	trip blank	O1206013-004	5/29/2012			None
S1206022	Water	0512RD08SW	1224007-01	5/27/2012			None
S1206022	Water	0512RD04SW	1224007-02	5/27/2012			None
S1206022	Water	0512RD05SW	1224007-03	5/27/2012			None
S1206022	Water	0512RD06SW	1224007-04	5/27/2012			None
S1206022	Water	0512RD09SW	1224007-05	5/27/2012			None
S1206022	Water	0512RD10SW	1224007-06	5/27/2012			None
S1206022	Water	0512RD12SW	1224007-07	5/27/2012			None
S1206022	Water	0512RD20SW	1224007-08	5/27/2012			None
S1206026	Water	0512MW19GW	S1206026-002	5/29/2012			None
S1206027	Water	0512EB02DI	S1206027-001	5/30/2012			None
S1206027	Water	0512MW14GW	S1206027-002	5/30/2012			None
S1206027	Water	0512MW15GW	S1206027-003	5/30/2012			None
S1206027	Water	0512MW29GW	S1206027-004	5/30/2012			None
S1206029	Water	0512RD05SW	S1206029-001	5/27/2012			None
S1206029	Water	0512RD09SW	S1206029-002	5/27/2012			None
S1206029	Water	0512RD12SW	S1206029-003	5/27/2012			None
S1206029	Water	0512AB01DI	S1206029-004	5/27/2012			None
S1206029	Water	0512MW25GW	S1206029-005	5/27/2012			None
S1206029	Water	0512MW50GW	S1206029-006	5/27/2012			None

Work Order	Matrix	Sample ID	Lab ID	Sample Date	Lab QC	MS/ MSD	ID Corrections
S1206030	Water	0512MW08GW	S1206030-001	5/29/2012			None
S1206030	Water	0512MW12GW	S1206030-002	5/28/2012			None
S1206030	Water	0512MW17GW	S1206030-004	5/28/2012			None
S1206030	Water	0512MW24GW	S1206030-005	5/29/2012			None
S1206030	Water	0512MW51GW	S1206030-006	5/28/2012			None
S1206031	Water	0512AB02DI	S1206031-001	5/28/2012			None
S1206031	Water	0512MW01GW	S1206031-002	5/29/2012			None
S1206031	Water	0512MW04GW	S1206031-003	5/29/2012			None
S1206031	Water	0512MW28GW	S1206031-004	5/29/2012			None
S1206031	Water	0512MW32GW	S1206031-005	5/29/2012			None
S1206031	Water	0512MW33GW	S1206031-006	5/29/2012			None
S1206031	Water	0512AB03DI	S1206031-007	5/29/2012			None
S1206032	Water	0512RD04SW	S1206032-001	5/27/2012			None
S1206032	Water	0512RD06SW	S1206032-002	5/27/2012			None
S1206032	Water	0512RD20SW	S1206032-003	5/27/2012			None
S1206032	Water	0512MW27GW	S1206032-004	5/27/2012			None
S1206033	Water	0512EB01DI	S1206033-001	5/27/2012			None
S1206033	Water	0512ER01DI	S1206033-002	5/28/2012			None
S1206033	Water	0512MW06GW	S1206033-003	5/29/2012			None
S1206033	Water	0512MW10GW	S1206033-004	5/28/2012			None
S1206033	Water	0512MW13GW	S1206033-005	5/28/2012			None
S1206033	Water	0512MW16GW	S1206033-006	5/28/2012			None
S1206035	Water	0512RD08SW	S1206035-001	5/27/2012			None
S1206035	Water	0512RD10SW	S1206035-003	5/27/2012			None
S1206035	Water	0512MW20GW	S1206035-004	5/28/2012			None
S1206035	Water	0512MW21GW	S1206035-005	5/28/2012			None

Work Orders, Tests and Number of Samples included in this DVM

Work Orders	Matrix	Test Method	Method Name	Number of Samples	Sample Type
O1206012	Water	AK 102/103	AK102DRO/103RRO	1	SAMP
O1206013	Water	AK 102/103	AK102DRO/103RRO	2	SAMP
O1206013	Water	AK101	AK101 GRO/BTEX - Water	4	SAMP
S1206022	Water	Calc	Total Arsenic and Arsenic Speciation by HG-CT-AAS	8	SAMP
S1206022	Water	EPA 1630	Total Mercury and Mercury Speciation by CVAFS	8	SAMP

Work Orders	Matrix	Test Method	Method Name	Number of Samples	Sample Type
S1206022	Water	EPA 1632	Total Arsenic and Arsenic Speciation by HG-CT-AAS	8	SAMP
S1206026	Water	6010C	Total(3020) Metals by ICP - 6010C	1	SAMP
S1206026	Water	6020A	Total (3020) Metals by ICPMS - 6020A	1	SAMP
S1206026	Water	EPA 1631	Dissolved Mercury by EPA 1631	1	SAMP
S1206026	Water	EPA 1631	Total Mercury by EPA 1631	1	SAMP
S1206026	Water	EPA 300.0	Anions by ION Chromatography	1	SAMP
S1206026	Water	EPA 353.2	Nitrogen, Nitrate-Nitrite (as N)	1	SAMP
S1206026	Water	SM 2320B	Alkalinity	1	SAMP
S1206026	Water	SM 2540	Solids By SM 2540	1	SAMP
S1206027	Water	6010C	Dissolved Metals by ICP (6010C)	2	SAMP
S1206027	Water	6010C	Total(3020) Metals by ICP - 6010C	4	SAMP
S1206027	Water	6020A	Dissolved Metals by ICPMS (6020A)	2	SAMP
S1206027	Water	6020A	Total (3020) Metals by ICPMS - 6020A	4	SAMP
S1206027	Water	EPA 1631	Dissolved Mercury by EPA 1631	2	SAMP
S1206027	Water	EPA 1631	Total Mercury by EPA 1631	2	SAMP
S1206027	Water	EPA 245.1	Dissolved Mercury by EPA 245.1 - Water	2	SAMP
S1206027	Water	EPA 245.1	Total Mercury by EPA 245.1 - Water	2	SAMP
S1206027	Water	EPA 300.0	Anions by ION Chromatography	4	SAMP
S1206027	Water	EPA 353.2	Nitrogen, Nitrate-Nitrite (as N)	4	SAMP
S1206027	Water	SM 2320B	Alkalinity	4	SAMP
S1206027	Water	SM 2540	Solids By SM 2540	4	SAMP
S1206029	Water	6010C	Dissolved Metals by ICP (6010C)	3	SAMP
S1206029	Water	6010C	Total(3020) Metals by ICP - 6010C	5	SAMP
S1206029	Water	6020A	Dissolved Metals by ICPMS (6020A)	3	SAMP
S1206029	Water	6020A	Total (3020) Metals by ICPMS - 6020A	5	SAMP
S1206029	Water	EPA 1631	Dissolved Mercury by EPA 1631	3	SAMP
S1206029	Water	EPA 1631	Total Mercury by EPA 1631	4	SAMP
S1206029	Water	EPA 245.1	Dissolved Mercury by EPA 245.1 - Water	2	SAMP
S1206029	Water	EPA 245.1	Total Mercury by EPA 245.1 - Water	2	SAMP
S1206029	Water	EPA 300.0	Anions by ION Chromatography	5	SAMP
S1206029	Water	EPA 353.2	Nitrogen, Nitrate-Nitrite (as N)	5	SAMP
S1206029	Water	SM 2320B	Alkalinity	5	SAMP
S1206029	Water	SM 2540	Solids By SM 2540	5	SAMP
S1206029	Water	SM 5310B	Total Organic Carbon	3	SAMP
S1206030	Water	6010C	Total(3020) Metals by ICP - 6010C	5	SAMP
S1206030	Water	6020A	Total (3020) Metals by ICPMS - 6020A	5	SAMP
S1206030	Water	EPA 1631	Dissolved Mercury by EPA 1631	5	SAMP
S1206030	Water	EPA 1631	Total Mercury by EPA 1631	5	SAMP
S1206030	Water	EPA 300.0	Anions by ION Chromatography	5	SAMP
S1206030	Water	EPA 353.2	Nitrogen, Nitrate-Nitrite (as N)	5	SAMP

Work Orders	Matrix	Test Method	Method Name	Number of Samples	Sample Type
S1206030	Water	SM 2320B	Alkalinity	5	SAMP
S1206030	Water	SM 2540	Solids By SM 2540	5	SAMP
S1206031	Water	6010C	Dissolved Metals by ICP (6010C)	3	SAMP
S1206031	Water	6010C	Total(3020) Metals by ICP - 6010C	5	SAMP
S1206031	Water	6020A	Dissolved Metals by ICPMS (6020A)	3	SAMP
S1206031	Water	6020A	Total (3020) Metals by ICPMS - 6020A	5	SAMP
S1206031	Water	EPA 1631	Dissolved Mercury by EPA 1631	5	SAMP
S1206031	Water	EPA 1631	Total Mercury by EPA 1631	7	SAMP
S1206031	Water	EPA 300.0	Anions by ION Chromatography	5	SAMP
S1206031	Water	EPA 353.2	Nitrogen, Nitrate-Nitrite (as N)	5	SAMP
S1206031	Water	SM 2320B	Alkalinity	5	SAMP
S1206031	Water	SM 2540	Solids By SM 2540	5	SAMP
S1206032	Water	6010C	Dissolved Metals by ICP (6010C)	3	SAMP
S1206032	Water	6010C	Total(3020) Metals by ICP - 6010C	4	SAMP
S1206032	Water	6020A	Dissolved Metals by ICPMS (6020A)	3	SAMP
S1206032	Water	6020A	Total (3020) Metals by ICPMS - 6020A	4	SAMP
S1206032	Water	EPA 1631	Dissolved Mercury by EPA 1631	3	SAMP
S1206032	Water	EPA 1631	Total Mercury by EPA 1631	3	SAMP
S1206032	Water	EPA 245.1	Dissolved Mercury by EPA 245.1 - Water	1	SAMP
S1206032	Water	EPA 245.1	Total Mercury by EPA 245.1 - Water	1	SAMP
S1206032	Water	EPA 300.0	Anions by ION Chromatography	4	SAMP
S1206032	Water	EPA 353.2	Nitrogen, Nitrate-Nitrite (as N)	4	SAMP
S1206032	Water	SM 2320B	Alkalinity	4	SAMP
S1206032	Water	SM 2540	Solids By SM 2540	4	SAMP
S1206032	Water	SM 5310B	Total Organic Carbon	3	SAMP
S1206033	Water	6010C	Dissolved Metals by ICP (6010C)	2	SAMP
S1206033	Water	6010C	Total(3020) Metals by ICP - 6010C	6	SAMP
S1206033	Water	6020A	Dissolved Metals by ICPMS (6020A)	2	SAMP
S1206033	Water	6020A	Total (3020) Metals by ICPMS - 6020A	6	SAMP
S1206033	Water	EPA 1631	Dissolved Mercury by EPA 1631	5	SAMP
S1206033	Water	EPA 1631	Total Mercury by EPA 1631	6	SAMP
S1206033	Water	EPA 300.0	Anions by ION Chromatography	4	SAMP
S1206033	Water	EPA 353.2	Nitrogen, Nitrate-Nitrite (as N)	4	SAMP
S1206033	Water	SM 2320B	Alkalinity	4	SAMP
S1206033	Water	SM 2540	Solids By SM 2540	4	SAMP
S1206035	Water	6010C	Dissolved Metals by ICP (6010C)	2	SAMP
S1206035	Water	6010C	Total(3020) Metals by ICP - 6010C	4	SAMP
S1206035	Water	6020A	Dissolved Metals by ICPMS (6020A)	2	SAMP
S1206035	Water	6020A	Total (3020) Metals by ICPMS - 6020A	4	SAMP
S1206035	Water	EPA 1631	Dissolved Mercury by EPA 1631	2	SAMP
S1206035	Water	EPA 1631	Total Mercury by EPA 1631	2	SAMP

Work Orders	Matrix	Test Method	Method Name	Number of Samples	Sample Type
S1206035	Water	EPA 245.1	Dissolved Mercury by EPA 245.1 - Water	2	SAMP
S1206035	Water	EPA 245.1	Total Mercury by EPA 245.1 - Water	2	SAMP
S1206035	Water	EPA 300.0	Anions by ION Chromatography	4	SAMP
S1206035	Water	EPA 353.2	Nitrogen, Nitrate-Nitrite (as N)	4	SAMP
S1206035	Water	SM 2320B	Alkalinity	4	SAMP
S1206035	Water	SM 2540	Solids By SM 2540	4	SAMP
S1206035	Water	SM 5310B	Total Organic Carbon	2	SAMP

II. SAMPLE PROCEDURES

All samples were collected as specified in the work plan and documented on the chain-of-custody (COC) and in field notebooks. Samples were analyzed as specified on the COC. Samples were packaged, shipped and received as specified in the work plan. All samples must be received cold (4 ±2) ^{o}C and in good condition as documented on the Cooler Receipt Form.

REVIEW RESULTS:

All sample procedures were followed and the sample coolers were received at the appropriate temperatures. No problems with the condition of the sample upon receipt are documented.

Rinsate blanks were not required for this sampling as dedicated sampling equipment was used for each monitoring well. Trip blanks were submitted daily to be associated with these samples.

III. LABORATORY DATA

1.0 HOLDING TIMES

Holding times are established and monitored to ensure analytical results accurately represent analyte concentrations in a sample at the time of collection. Exceeding the holding time for a sample generally results in a loss of the analyte due to a variety of mechanisms, such as deposition on the sample container walls or precipitation.

REVIEW RESULTS:

All samples were analyzed within the project and method specified holding times for all analytes except as noted in the case narratives for the short hold time tests, as it was not possible to have them delivered within the holding time due to the location of the sampling points. This was taken into account during the initial sample planning phase and it was agreed that the data would be qualified as estimated with a “J” flag. Samples were analyzed with in the long term hold times before any of the analytical data was rejected. Data should be considered usable for project purposes.

2.0 BLANKS

Laboratory and field blank samples are analyzed and evaluated to determine the existence and magnitude of possible contamination during the sampling and analysis process. As noted in Table 2, analyte concentrations in the blanks are generally below the practical quantitation limit (PQL). If the analyte is present in the sample at similar trace levels, then the analyte is likely a common background contaminant from some phase of the sampling, extraction, or analytical procedure and associated low level sample concentrations are not considered to be site related. If the analyte concentration is above the PQL, then there is a potential contamination problem and sample results may be biased high or the data unusable.

REVIEW RESULTS:

All blanks were performed at the required frequency. Several analytes were detected in the method blanks as noted on Table 2. Samples are qualified as noted on Table 2A.

3.0 SURROGATE SPIKE RECOVERY

Laboratory performance for individual samples analyzed for organic compounds is established by means of surrogate spiking activities. Samples are spiked with surrogate compounds prior to preparation and analysis. Unusually low or high surrogate recovery values may indicate some deficiency in the analytical system or that some matrix effects exist, resulting in low or high sample results for target compounds. Sample surrogate recoveries outside QC limits (if applicable) are presented in Table 3.

REVIEW RESULTS:

Surrogate recoveries were acceptable in all applicable samples.

4.0 MATRIX SPIKE AND MATRIX SPIKE DUPLICATE ANALYSIS

The matrix spike and matrix spike duplicate (MS/MSD) analyses are intended to provide information about the effects that the sample matrix exerts on the digestion/extraction and measurement methodology. MS recovery values that do not meet laboratory QC criteria may indicate that sample analyte results are being attenuated

in the analysis procedure. These results are presented in Table 4 (if applicable). The potential sample bias may be estimated by noting the degree to which the MS concentration was elevated or lowered in the spike analysis. However, this bias should serve only as approximations; sample-specific problems may be the cause of the discrepancy, particularly in soil samples. Recoveries of a post-digestion spike or a laboratory control sample (LCS) are used to verify that the analytical methodology is acceptable and that MS recoveries are due to matrix effects. An MSD analysis is performed to evaluate the precision of the sample results. Precision is measured as the relative percent difference (RPD) between analytical results for duplicate samples. The laboratory's failure to produce similar results for MSD samples may indicate that the samples were non-homogeneous (particularly in soil samples), or that method defects may exist in the laboratory's techniques.

REVIEW RESULTS:

The MS/MSD sample analyses were performed at the required frequency. MS/MSD recoveries were non-compliant for several analytes, results are qualified as noted on Table 4. Qualifiers were only added to the parent sample as noted due to matrix effects for organic analytes, and were added to all samples in the analytical batch for inorganic analytes.

5.0 LABORATORY CONTROL SAMPLE ANALYSIS

The LCS is analyzed to monitor the efficiency of the digestion/extraction procedure and analytical instrument operation. The ability of the laboratory to successfully analyze an LCS demonstrates that there are no analytical problems related to the digestion/sample preparation procedures and/or instrument operations. The LCS results outside QC limits are presented in Table 5 (if applicable). Sporadic and marginal QC failures for multiple component methods do not indicate an analytical concern. If recoveries are high and the compounds are not detected in the samples, then no data qualification is required. All recoveries should be above 10% or the non-detect results flagged “UR” as rejected.

REVIEW RESULTS:

All LCS analyses were within control limits and performed at the required frequency.

IV. COMPOUND IDENTIFICATION AND QUANTITATION

Compound identities are assigned by comparing sample compound retention times to retention times from known (standard) compounds and identification of an acceptable mass spectrum. Compounds detected below the PQL in samples should be considered estimated and are qualified "J." The samples with compounds above the linear range were all re-analyzed at a higher dilution factor.

REVIEW RESULTS:

All compound identification and quantitation criteria were achieved.

ClientSampID	TestNo	R_DilFac
S1206022-001	EPA 1632	20
S1206022-001	EPA 1632	400
S1206022-003	EPA 1632	400
S1206022-004	EPA 1632	400
S1206022-005	EPA 1632	20
S1206022-005	EPA 1632	400
S1206022-006	EPA 1632	20
S1206022-006	EPA 1632	400
S1206022-007	EPA 1632	10
S1206022-008	EPA 1632	20
S1206022-008	EPA 1632	400
S1206022-009	EPA 1632	20
S1206022-009	EPA 1632	400

V. FIELD DUPLICATE SAMPLE RESULTS

Field duplicate samples were collected and analyzed as an indication of overall precision for both field and laboratory. Field duplicate results are summarized in Table 7 (if applicable). The results are expected to have more variability than laboratory duplicates, which measure only laboratory precision. It is expected also that soil field duplicates will exhibit greater variance than water field duplicates due to the difficulties associated with collecting identical field samples. The QC criteria used to assess field

duplicate samples for this project was limits of 70% RPD for soils and 40% RPD for waters, or twice the general laboratory duplicate criteria. If both compounds were below the laboratory PQL or one of the compounds was present as a non-detect, then the compounds are generally not qualified due to field duplicate precision. There are no guidelines regarding data qualification based on poor field duplicate precision. Professional judgment was used to determine whether or not to qualify results.

REVIEW RESULTS:

The RPD ratings are listed on Table 7 as “Good” if the RPD is less than field duplicate QC criteria of 40% and as “Poor” if the RPD exceeded the field duplicate QC criteria.

No field duplicate pairs were noted in this data set.

Table 2 - List of Positive Results for Blank Samples

Method	Sample ID	Samp Type	Analyte	Result	Qual	Anal Type	Units	PQL
EPA 1630	B121025-BLK1	MB	MeHg	0.012		A	ng/L	0.049
EPA 1630	B121025-BLK2	MB	MeHg	0.011		A	ng/L	0.049
EPA 1630	B121025-BLK3	MB	MeHg	0.009		A	ng/L	0.049
EPA 1630	B121025-BLK4	MB	MeHg	0.008		A	ng/L	0.049
EPA 1632	B121077-BLK1	MB	As(Inorg)	0.179		A	ug/L	0.500
EPA 1632	B121077-BLK2	MB	As(Inorg)	0.137		A	ug/L	0.500
EPA 1632	B121077-BLK3	MB	As(Inorg)	0.141		A	ug/L	0.500
EPA 1632	B121079-BLK1	MB	As(III)	0.039		A	ug/L	0.500
SM 2540	DI	MB	Total Suspended Solids	52		A	mg/L	5
SW 6010C	ICB MBLK	MB	Magnesium	0.07		A	mg/L	0.02

Table 2A - List of Samples Qualified for Method Blank Contamination

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
SM 2540	0512MW15GW	Total Suspended Solids	52	5	U	5
SM 2540	0512MW12GW	Total Suspended Solids	52	ND	U	5
SM 2540	0512MW08GW	Total Suspended Solids	52	ND	U	5
SM 2540	0512MW17GW	Total Suspended Solids	52	ND	U	5
SM 2540	0512MW24GW	Total Suspended Solids	52	ND	U	5
SM 2540	0512MW51GW	Total Suspended Solids	52	17	U	5
SM 2540	0512MW19GW	Total Suspended Solids	52	17	U	5
SM 2540	0512MW14GW	Total Suspended	52	171	U	5

Method	Sample ID	Analyte	Blank Result	Sample Result	Sample Qual	PQL
		Solids				
SM 2540	0512RD05SW	Total Suspended Solids	52	8	U	5
SM 2540	0512RD09SW	Total Suspended Solids	52	16	U	5
SM 2540	0512MW12GW	Total Suspended Solids	52	14	U	5
SM 2540	0512MW01GW	Total Suspended Solids	52	47	U	5
SM 2540	0512MW04GW	Total Suspended Solids	52	9	U	5
SM 2540	0512MW28GW	Total Suspended Solids	52	30	U	5
SM 2540	0512MW33GW	Total Suspended Solids	52	8	U	5

Table 2B - List of Samples Qualified for Field Blank Contamination

None

Table 3 - List of Samples with Surrogates outside Control Limits

None

Table 4 - List MS/MSD Recoveries and RPDs outside Control Limits

Method	Sample ID	Sample Type	Analyte	Orig. Result	Spike Amount	Rec.	Dil Fac.	Low Limit
EPA 1632	0512RD08SW	MS	As (III)	1.651	5.000	51	1	65
SW6020A	0512MW14GW	MSD	Manganese	10.4	1.1	149	1	75
SW6020A	0512MW12GW	MS	Manganese	1.21	0.2	71.8	1	75
SW6020A	0512MW12GW	MS	Zinc	0.26	0.2	131	1	75
SW6020A	0512MW12GW	MS	Manganese	1.21	0.2	65.5	1	75
SW6020A	0512MW27GW	MS	Manganese	1.55	0.2	-78.7	1	75

Sample ID	Analyte	Method	RPD	RPD Limit	No. of Affected Samples	Sam Qua

Sample ID	Analyte	Method	RPD	RPD Limit	No. of Affected Samples	Sam Qua
0512MW29GW	Mercury	EPA 1631	25	20	1	J

Table 5 - List LCS Recoveries outside Control Limits

None

Table 6 –Samples that were Reanalyzed

None

Table 7 – Summary of Field Duplicate Results

None

6.0 OVERALL ASSESSMENT OF DATA

All data were reviewed and considered usable with qualification as noted in this report.