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DRAFT Post-Removal Action Long Term Monitoring Report

Longshot Mine and Mill

December 17, 2012

COLVILLE NATIONAL FOREST, WASHINGTON





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USDA Forest Service
Region 6
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1.0 INTRODUCTION

Millennium Science and Engineering (MSE), a division of E W Wells Group, LLC, was contracted by the United States Department of Agriculture, Forest Service (Forest Service) to complete a Removal Action (RA) at the Longshot Mine and Mill ("the Site") in the Colville National Forest, Washington. The location is provided in Figure 1. A Site Inspection (SI) was completed in 2005 (MSE), and an Engineering Evaluation/Cost Analysis (EE/CA) in 2008 (MSE). MSE conducted pre-removal inspection and data gathering activities at the Site, including a sampling event in October 2011. The RA was completed in late October 2011. MSE will conduct three years of annual post-removal monitoring at the Site as outlined in the Post-Removal Monitoring and Operations & Maintenance Plan (MSE 2011). The first monitoring event was conducted on April 25, 2012. The second and third post-removal monitoring events are scheduled for spring of 2013 and 2014, respectively. The post-removal monitoring events consist of:

- A general visual inspection of areas disturbed during removal activities at the Site;
- Collecting surface water, sediment and benthic macroinvertebrate samples; and
- Taking representative photos of the Site with an effort to replicate the photos taken at completion of the Removal Action.

This report presents results of the first post-removal monitoring event at the Site. Post-removal monitoring photographs are provided in Attachment A. Field forms completed during monitoring activities are provided in Attachment B. Laboratory results of samples collected during the monitoring activities are provided in Attachment C.

1.1 Purpose and Objectives

The purpose of the RA was to abate, prevent, minimize, stabilize, mitigate or eliminate the release or threat of a release to the environment. The specific, overall objectives of the Longshot Mine RA were to: (1) eliminate direct contact with high concentrations of metals in the mine waste for all receptors; (2) reduce or eliminate the migration of contaminants to the environment; and (3) mitigate physical hazards at the Site. The primary objectives of post-RA sampling and monitoring are to compare post-RA mine waste area and aquatic habitat conditions to pre-RA conditions. This will be accomplished by:

- Assessing surface water samples collected from four locations for comparison with data collected during the pre-RA monitoring event. Sampling locations, presented on Figure 2, include: AD1 (Adit discharge), ET3 (Immediately below the lower tailings impoundment and a reservoir), BG1 (Ephemeral [background] stream east from the Site), and ET4 (End of the ephemeral stream prior to discharge to Mill Creek).
- Assessing sediment samples collected from each of the four surface water sampling locations for comparison with data collection during the pre-removal monitoring event;
- Assessing one coeval benthic sample collected at ET4 to evaluate potential impacts to the stream habitat, benthic macro-invertebrate community, and fish species. Benthic samples were not obtained from this location during the pre-RA monitoring event, because the location was dry; and
- Inspect the Site for re-vegetation success, evidence of erosion, slumps, or other damage as well as bat gate integrity.

1.2 Site Description

The Longshot Mine and Mill is an inactive lead-zinc mine located on the Colville National Forest, about 11 miles northeast of the town of Colville, Washington (Figure 1). The Site is in the South Fork Mill Creek (SFMC) drainage, which is a tributary to Mill Creek and the Colville River. The Site is accessed via Forest Service Spur Road 150 by turning off County Road 4954 and traveling north for about 1 mile. Spur Road 150 leads to a turnaround at the mill and lower adit (Figure 1). A detailed site characterization can found in the SI (MSE 2005). Pre-removal site features include:

- Remnants of a concrete mill foundation and other wooden structures;
- Two open adits, including one with discharge (Lower Adit near the mill);
- One open stope (Gloryhole) in the Upper Adit;
- One reservoir;
- One settling pond;
- A collapsed coarse (unprocessed) ore bin;
- Six waste rock piles; and
- Three tailings impoundments.

2.0 POST-REMOVAL MONITORING

This sampling event was conducted on April 25, 2012. The pre-RA sampling event was conducted during very low-stream flow conditions on October 19, 2011. Location ET-4 was dry, and MSE personnel elected to perform the post-RA monitoring events during high-stream flow conditions that would permit sampling at ET-4. This proved successful, but comparisons between low- and high-stream flow conditions can be problematic, because two competing mechanism, flushing and dilution, occur.

2.1 General Site Inspection

- The upper and lower bat gates were inspected for vandalism and structural integrity.
- Disturbed areas of the Site that were reclaimed during the RA were inspected to evaluate re-vegetation success. These include the repository, the Spur Road, WR-1 through WR-6, and the access road.
- Photographs taken during the general site inspection are provided in Attachment A.
    - There were no signs of erosion or damage on reclaimed areas or roads. All receptors remain protected from direct contact with elevated metal concentrations.
    - The bat gate and bat culvert were intact with no evidence of vandalism.
    - Emergent re-vegetation had started, but was not yet significant. Seeding and fertilizing occurred in early November 2011 with limited possibility of sprouting, and the sampling event occurred prior to significant sprouting at the Site elevation.

2.2 Sample Collection and Analysis

Surface water, sediment, and benthic samples were collected for comparison with pre-RA samples collected during the pre-RA monitoring event in 2011 (MSE). A summary of the samples collected, laboratory analyses, and field parameters measured is provided in Table 1.

The sampling methodology and procedures are described in the Post-Removal Monitoring and Operations and Maintenance Plan (MSE 2011). The laboratory analyses for surface water and sediment samples are summarized in Tables 2 and 3. One benthic macro-invertebrate sample was taken at location ET-4, shown on Figure 2. Stakes imprinted with sample IDs were installed to identify the sample locations for future monitoring events. GPS coordinates of the sampling locations were obtained and noted in the surface water and soil collection forms presented in Attachment B. All surface water and sediment samples were

shipped to SVL Analytical Laboratory (SVL) in Kellogg, Idaho for analyses. The benthic sample was submitted for analysis to Aquatic Biology Associates, Inc. (ABA) in Corvallis, Oregon.

2.3 Surface Water

Four surface water samples were collected from approximate SI sampling locations and shown on Figure 2. Sampling locations included: AD-1 (Adit discharge), ET-3 (Immediately below the lower tailings), BG-1 (Ephemeral [background] stream east from the Site), and ET-4 (End of the ephemeral stream prior to discharge to Mill Creek).

The surface water samples were collected by submerging a laboratory supplied 500-mL plastic bottle directly into the source. Filtered samples were collected by submerging the laboratory-supplied bottles directly into the stream and using a hand pump to pump the sample through disposable tubing and through a certified-clean, disposable 0.45-micron Nalgene filter into a sample container. Four separate samples were obtained at each location:

1. A 500 ml unfiltered, unpreserved sample for total recoverable metals (Total) analyses;
2. A 500 ml filtered sample preserved with nitric acid to pH <2 for dissolved metals (Diss.) analyses;
3. A 500 ml unfiltered, unpreserved sample for major ion, total suspended solids (TSS), total dissolved solids (TDS), sulfate, and hardness (Hard) analyses, and
4. A 500 ml unfiltered, unpreserved sample for laboratory pH, Eh/ORP, Specific Conductivity (SC) measurements.

Field parameters were measured in the stream before surface water sample collection. At each sample location, the sample information and field parameters were documented on a Water Sample Collection Record (Attachment B) and the sample location was photographed. The analyses for surface water samples are provided in Table 2.

2.4 Sediment

Sediment sampling consisted of collecting a composite grab sample co-located with the four surface water sample locations described above and shown on Figure 2. At each sampling location, the sediment sample was collected immediately following collection of the surface water sample using a disposable, clean trowel. Gravel and organic media were removed, and samples were placed in plastic bags and decanted so that the bag was filled with as much sediment as possible. The analyses for sediment samples are summarized in Table 3. The samples were documented on Sediment Sample Collection Records (Attachment B).

2.5 Benthic Macro-invertebrates

One composite macro-invertebrate sample was collected from ET-4. The composite sample consisted of subsamples from different pool habitats within the intermittent/seasonal stream reach (no riffle habitats were present). Collection of macro-invertebrate samples from specific pool habitats is usually necessitated by the potential of tailings mobilizing into the streams and settling in areas of slower moving water. At location ET-4 there is no consistent surface flow connection with the Site; there is only a limited potential for overland flood flows during extreme spring rain-on-snow events. The dominant impact would occur from any contaminated base flow originating at the Site and discharging to surface as springs near ET-4.

The macro-invertebrate samples were collected using a D-ring kick net. Sampling techniques were in accordance with the "Benthic Macro-invertebrate Biological Monitoring Protocols for Rivers and

Streams" (Plotnikoff and Wiseman 2001). The samples were preserved in the field by 99 percent isopropyl alcohol and shipped to Aquatic Biology Associates, Inc. in Corvallis, Oregon. The samples were documented on a Benthic Invertebrate Collection Record (Attachment B).

The pond is an approximately 5 meter in diameter, 20 cm deep pool impounded by the County Road and directed to discharge by a culvert. This is not a typical, free-flowing stream benthic environment, but is rather the only possible location to evaluate potential impact of the Site on SFMC. The springs which supply this location discharge from the hillside base approximately 100 meters from the pool. The pool is also subject to contamination from free-range cattle. MSE personnel believe the pool only contains surface water in a typical year from March or April through June, the spring runoff period.

3.0 SAMPLE RESULTS

Analytical results of samples collected during the monitoring event and the corresponding field parameters are presented in Tables 2 through 5 and discussed below by media type. A comprehensive discussion on results of the samples collected during the SI can be found in the SI Report (MSE 2005). The laboratory reports are provided in Attachment C.

3.1 Surface Water

Surface water analytical results are presented in Table 2 and field parameters are presented in Table 4. The laboratory analytical results are provided in Attachment C. Concentrations were compared to Washington State and EPA human health and ecological screening criteria (EPA 2009; NOAA 1999; WDOE 2010). For distal and temporal comparisons, all surface water data are also provided graphically in Chart 1.

3.1.1 Quality Assurance/Quality Control

Project Quality Assurance/Quality Control (QA/QC) consisted of collecting one duplicate sample, analyzing one field blank, and laboratory matrix spikes plus laboratory internal duplicate analyses. As indicated in Table 2 the duplicate sample analyses were within seven percent, which meets EPA requirements of less than ten percent variance. All field blank analyses were less than reporting limits with the exception of a trace amount of sulfate, which is within typical variability of ion chromatographic analyses. As shown in the SVL analytical reports in Appendix C all internal metal analyses in laboratory blanks, control standards, duplicates, and matrix spike analyses were within the respective EPA limits of < reporting limits/<20% relative difference, 80-120%/85-115%, < reporting limits, and 75-125%/70-130%. QA/QC is, therefore, excellent.

3.1.2 Individual Sample Discussion

- BG-1: During the post-RA sampling event no criteria were exceeded.
- AD-1: During the post-RA sampling event TDS slightly exceeded EPA ecological screening levels (ESLV) and EPA human health screening criteria (HHSLV) at location AD-1. Total and dissolved cadmium and zinc concentrations exceeded Washington and EPA ESLV by factors of 15 to 61 at location AD-1.
- ET-3: During the post-RA sampling event Total lead and zinc exceeded ESLV and HHSLV by factors of 159 and 2 respectively.
- ET-4: During the post-RA sampling event no analytes exceeded criteria.

3.1.3 Distal Discussion

The monitoring sample locations were specifically selected to compare up-gradient (background) water quality (BG-1) to adit discharge water quality (AD-1) which flows down-gradient through remaining waste rock then residue tailings to the location below the Site (ET-3) to the final impact measurement location (ET-4).

As is clearly indicated in Table 2 and Chart 1 during the 2012 monitoring event all surface water constituents tended to increase from BG-1 to AD-1. Between AD-1 and ET-3 Hardness/TDS, sulfate, cadmium, calcium, and zinc decreased whereas barium, lead, and magnesium increased slightly. From ET-3 to ET-4 all constituents except magnesium and possibly barium decreased in concentration to slightly greater than background concentrations. No analytes exceeded criteria at ET-4.

3.1.4 Temporal Discussion

Because the pre-RA sampling was conducted during low flow and the post-RA at high flow, defensible temporal comparisons cannot be made. At BG-1 and ET-3 low-flow concentrations appear to be slightly lower than high flow, which may indicate impact by runoff dilution. The adit sample (AD-1) tended to exhibit greater concentrations at high flow, which may indicate flushing.

3.2 Sediment

Analytical results of the sediment samples are summarized in Table 3. Laboratory results are provided in Attachment C. Concentrations were compared to Washington State and EPA human health and ecological screening criteria (EPA 2009; NOAA 1999; WDOE 2010).

3.2.1 Quality Assurance/Quality Control

Project Quality Assurance/Quality Control (QA/QC) consisted of collecting one duplicate sample at location AD-1. As illustrated in Table 3 the percent differences between samples was as high as 30% for cadmium and 27% for zinc. These values slightly exceed EPA preferred limits, but this is not uncommon for soil samples which are more variable than surface water samples.

3.2.2 Individual Sample Discussion

- BG-1: During the post-RA sampling event copper exceeded Washington sediment criteria in development, but not the current recommended level for HHSLV. No other criteria were exceeded.
- AD-1: During the post-RA sampling event cadmium exceeded most criteria for HHSLV and ESLV. Copper exceeded on ESLV; lead exceeded various HHSLVs and ESLVs. Zinc exceeded all ESLVs but no HHSLVs.
- ET-3: During the post-RA sampling event arsenic, cadmium, and lead exceeded various criteria for HHSLV and ESLV. Copper, silver, and zinc exceeded various ESLVs. This is common for soils and sediment at the portal of an abandoned mine.
- ET-4: During the post-RA sampling event arsenic exceeded two HHSLVs. No other analytes exceeded criteria.

3.2.3 Distal Discussion

The monitoring sample locations were specifically selected to compare up-gradient (background) sediment quality (BG-1) to adit discharge sediment quality (AD-1) which is possibly transported down-gradient through remaining waste rock then residue tailings to the location below the Site (ET-3). It is highly unlikely any mine derived sediment was transported as far as the final impact measurement location (ET-4), because there is no surface transport flow path.

As is clearly indicated in Table 3 during the 2012 monitoring event all sediment constituents tended to increase from BG-1 to AD-1. Between AD-1 and ET-3 arsenic, barium, lead, silver, and zinc increased whereas cadmium and copper decreased. From ET-3 to ET-4 all metal constituents except barium decreased in concentration to slightly greater than background concentrations. Only arsenic exceed any criteria at ET-4.

3.2.4 Temporal Discussion

Because the pre-RA sampling was conducted during low flow and the post-RA at high flow, defensible temporal comparisons cannot be made. The only analyte that was significantly elevated was lead at ET-3, and this may be an artifact of sample variability and nugget effect.

3.3 Benthic Macro-invertebrates

Results of the benthic macro-invertebrate sampling are summarized in Table 5. Sampling was conducted at ET-4, which is an intermittent/seasonal stream. Sampling was done in accordance to the benthic sampling protocol set forth in EPA's "Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macro-invertebrates, and Fish, Second Edition" (Barbour 1999). Adaptations to the sampling method were done in accordance to site-specific constraints and the samples were analyzed by Aquatics Biology Associates, Inc. in Corvallis, Oregon.

The total amount of benthic macro-invertebrate taxa present at ET-4 was low, with 17 taxa present, in comparison to perennial streams which typically have 40 to 70 taxa. The taxa present at ET-4 are consistent with intermittent streams which are dominated by taxa that develop quickly over a narrow seasonal window and that have short life cycles.

Because ET-4 is predominately a pool habitat and an intermittent stream, it is inappropriate to apply the Karr Benthic Index of Biological Integrity (BIBI, Karr 1998), since the BIBI is meant for riffle sample locations from perennial streams. It is also hard to quantify if the benthic macro-invertebrate community is impaired by historical mining activity.

4.0 CONCLUSIONS AND RECOMMENDATIONS

- In general, the Site volunteer and planted re-vegetation continues to reestablish and improve.
  - Emergent grasses and native plant species were observed on the reclaimed areas.
  - There was no evidence of erosion or damage on reclaimed areas, and direct contact with mine waste remains inhibited.
  - The bat gate and culvert are fully intact and did not show any signs of disturbance.
- Recreation use impact is not apparent at the site. Recreation remains limited to hiking with motorized access prevented above the old mill site.
- Sampling was conducted at the same approximate locations during 2012 as in 2011. Location ET-4 was dry during the 2011 sampling; no comparisons can be made. Future sampling will include all four locations.

- Analytical results of the post-removal surface water samples indicate the concentrations of most analytes are lower than the 2011 pre-removal concentrations at sample locations BG-1 and ET-3. Location AD-1 showed an increase in several detectable analytes, but only cadmium and zinc concentrations exceeded any criterion.
  - Total arsenic, cadmium, lead, and zinc exceed the associated water quality screening levels.
  - Dissolved cadmium and zinc exceed the associated water quality screening levels.
  - Sample location ET-4 was dry during the pre-removal sampling; therefore, no comparisons can be made between pre-removal and post-removal sampling.
- Analytical results of the post-RA sediment samples indicate the concentrations of most analytes are lower than the 2011 pre-removal concentrations at sample locations BG-1 and AD-1. A majority of detected analytes at ET-3 show increasing concentrations when compared to pre-removal sample concentrations.
  - Sample location ET4 was dry during the pre-removal sampling; therefore, no comparisons can be made between pre-removal and post-removal sampling.
  - Only arsenic slightly exceed two HHSLVs at ET-4.
- The general decrease of post-removal metal concentrations is an encouraging indication of positive impact by removal action activities.
- Circumneutral pHs indicate no acid rock drainage.
- Relatively low sulfate concentrations indicate that no acid is being generated at any location at the Site.

Two additional years of post-removal monitoring events are scheduled for spring of 2013 and 2014. During these events MSE recommends that water samples be analyzed by ICP-mass spectrometry for arsenic, cadmium, copper, lead, and zinc to provide detection limits less than criteria.

5.0 REFERENCES

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WDOE 2010b. "Model Toxics Control Act Cleanup (MTCA) Regulation." WAC Chapter 173-340-900, Table 745-1, Method A Soil Cleanup Levels for Industrial Properties.

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FIGURES

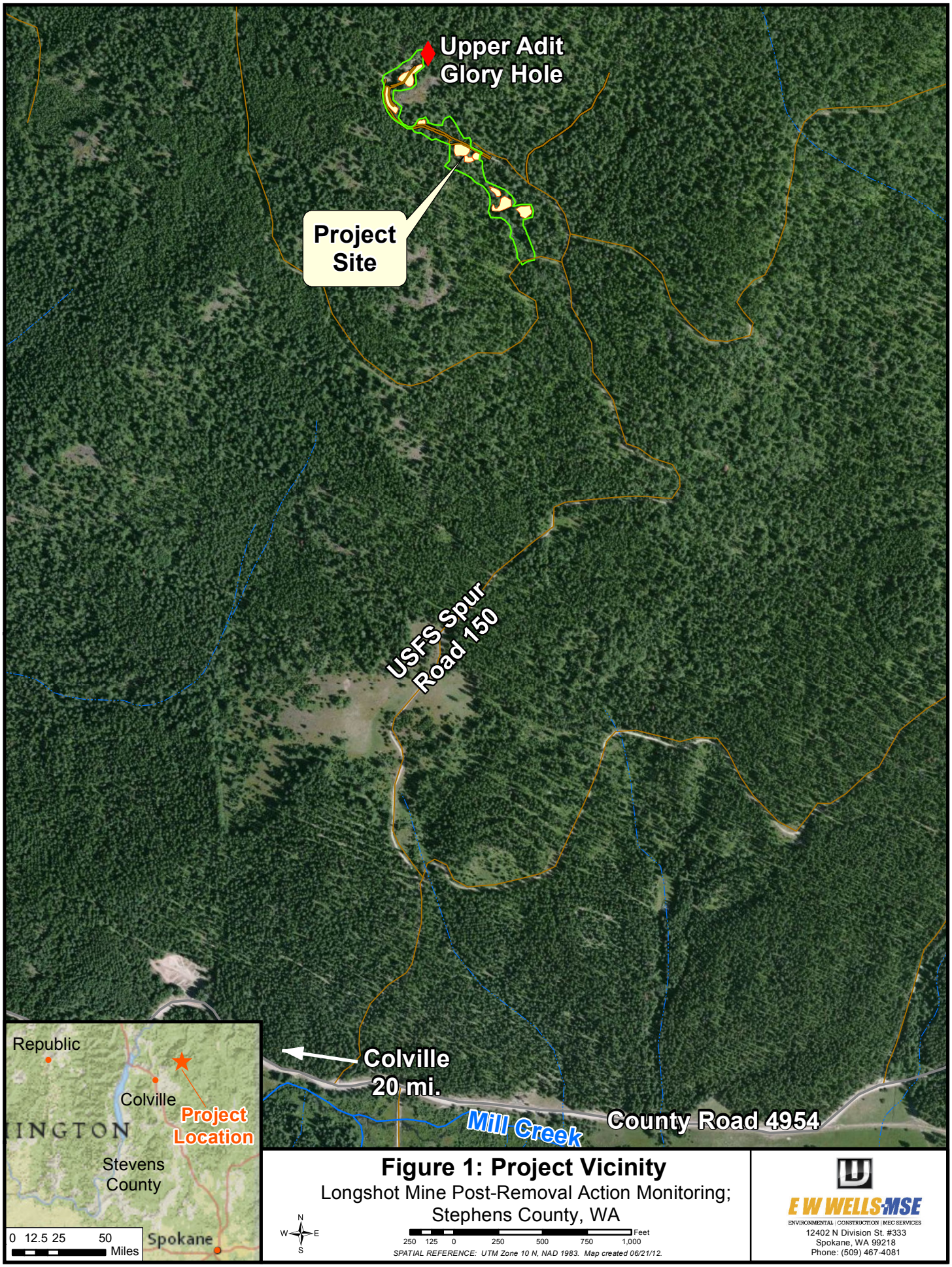


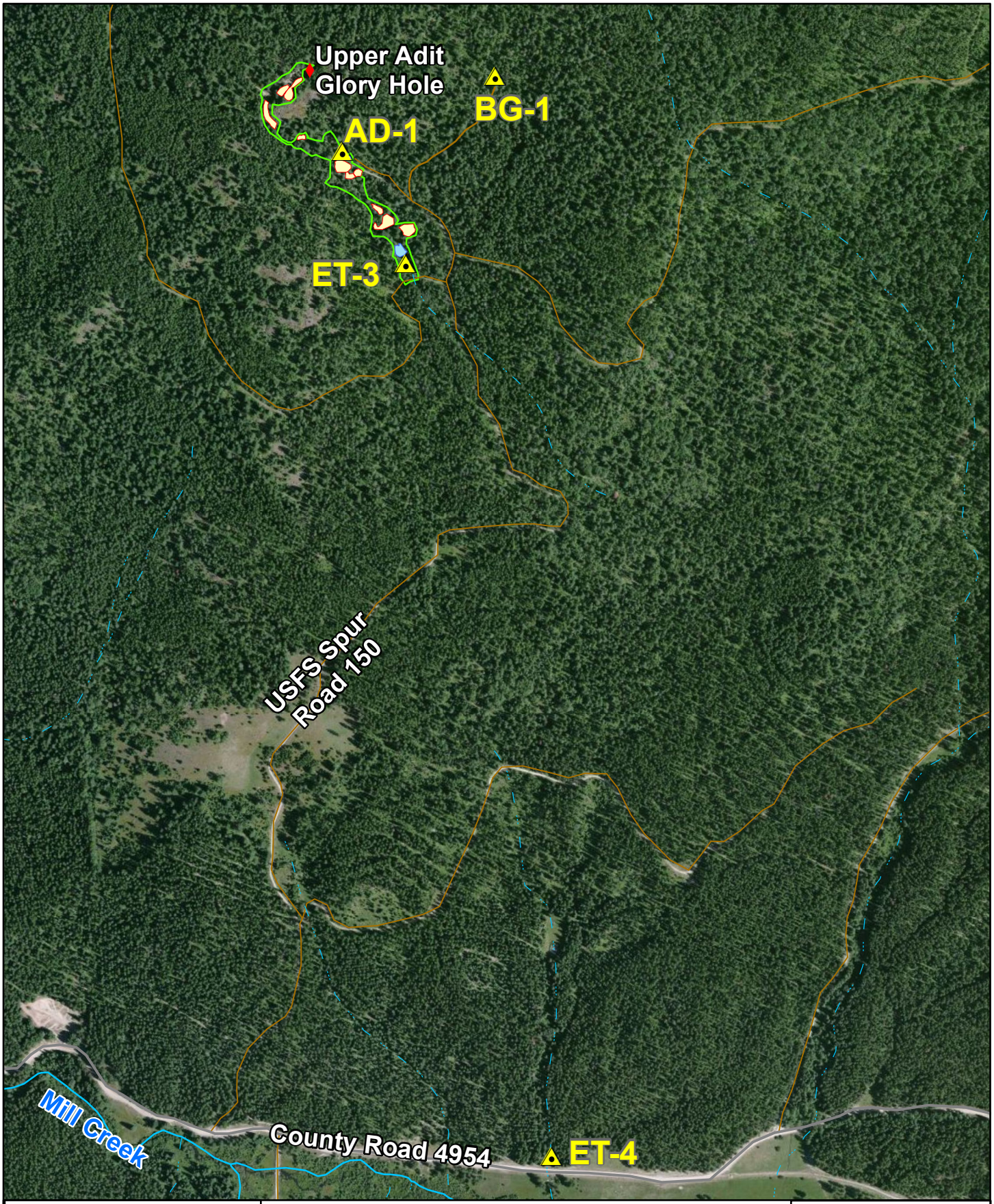
Figure 1: Project Vicinity

Longshot Mine Post-Removal Action Monitoring;
Stephens County, WA

SPATIAL REFERENCE: UTM Zone 10 N, NAD 1983. Map created 06/21/12.

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Legend

- Sample Points
- Project Limits
- Waste Area

N
W E
S

Figure 2: Sample Locations

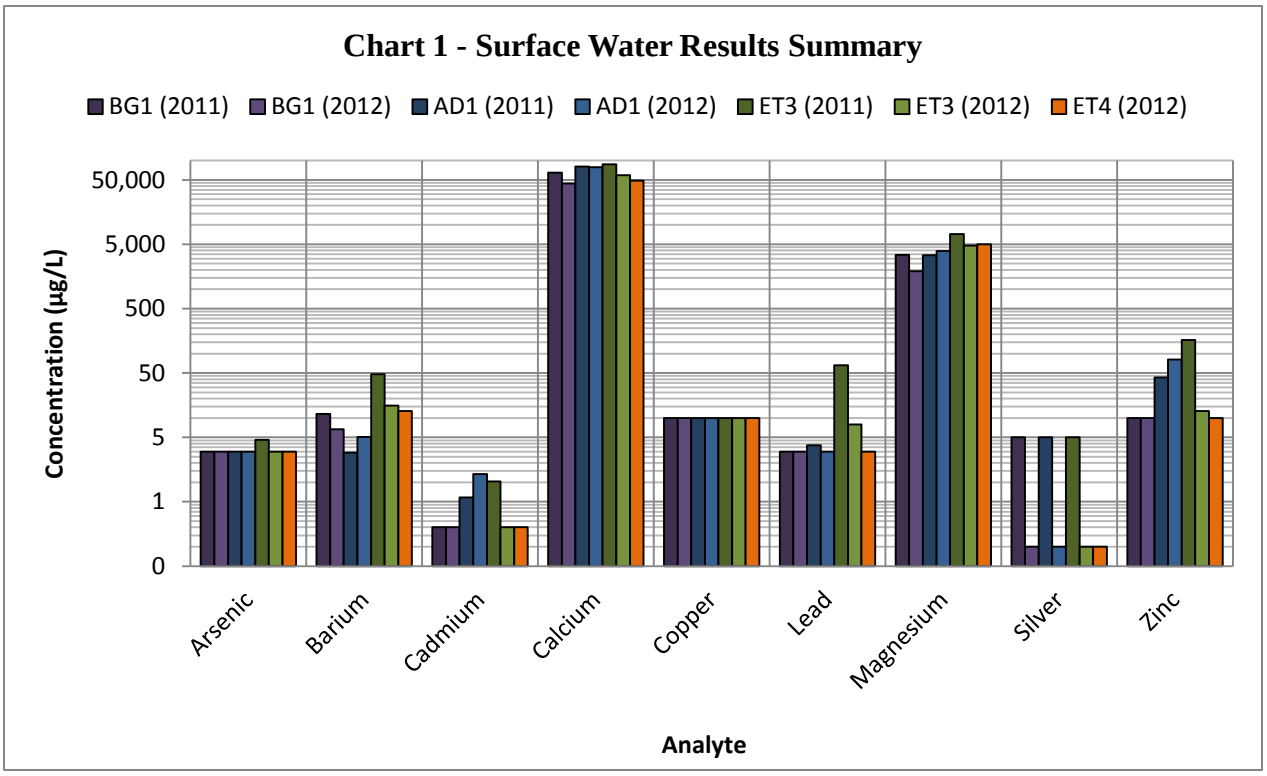
Longshot Mine Post-Removal Action;
Stephens County, WA

0.25 0.125 0 0.25 Miles

SPATIAL REFERENCE: UTM Zone 10 N, NAD 1983. Map created 02/13/12. File: Fig2_Samples.mxd Pr. No. 3149

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Chart 1 - Surface Water Results Summary
BG1 (2011)
BG1 (2012)
AD1 (2011)
AD1 (2012)
ET3 (2011)
ET3 (2012)
ET4 (2012)
Concentration (µg/L)
50,000
5,000
500
50
5
1
0
Arsenic
Barium
Cadmium
Calcium
Copper
Lead
Magnesium
Silver
Zinc
Analyte

TABLES

Table 1
Post Removal Monitoring Sampling And Analysis Summary
Longshot Mill and Mine Post-RA Monitoring

Location	Medium	Number of Samples	Analyses
(1) Adit Discharge (AD-1)	Surface Water Sediment	1 each medium	Total & Dissolved Metals: Ag, As, Ba, Cd, Pb, Zn Water only add: Sulfate, TDS, TSS, Hardness Field Parameters: pH, Temp, DO, EC, ORP/Eh
(2) Ephemeral Stream East of site (BG-1, Background)	Surface Water Sediment	1 each medium	Total & Dissolved Metals: Ag, As, Ba, Cd, Pb, Zn Water only add: Sulfate, TDS, TSS, Hardness Field Parameters: pH, Temp, DO, EC, ORP/Eh
(3) Ephemeral Stream Below Lower Tailings & Reservoir (ET-3)	Surface Water Sediment	1 each medium	Total & Dissolved Metals: Ag, As, Ba, Cd, Pb, Zn Water only add: Sulfate, TDS, TSS, Hardness Field Parameters: pH, Temp, DO, EC, ORP/Eh
(4) Ephemeral Stream Before Discharge to Mill Creek (ET-4)	Surface Water Sediment	1 each medium	Total & Dissolved Metals: Ag, As, Ba, Cd, Pb, Zn Water only add: Sulfate, TDS, TSS, Hardness Field Parameters: pH, Temp, DO, EC, ORP/Eh
(5) Ephemeral Stream Before Discharge to Mill Creek (ET-4)	Benthic Organisms	1	Taxonomy, generally to genus/species
(6) Site	Water QA/QC	1 Blank, 1 MS/MSD	Total & Dissolved Metals: Ag, As, Ba, Cd, Pb, Zn Sulfate TDS, TSS, Hardness,

Notes:
DO – Dissolved oxygen
EC – Electrical conductivity
MS/MSD – Matrix spike/matrix spike duplicate
ORP/Eh – Oxygen reduction potential
TDS – Total dissolved solids
Temp – Temperature
TSS – Total suspended solids

Table 2
Surface Water Sample Results Summary
Longshot Mill and Mine Post-RA Monitoring

Sample ID	Date Collected	pH (s.u.)	Eh/ORP (mV)	SC (µS/cm)	Analyte Concentration (mg/L)				Analyte Concentration (µg/L)															
					Hard	TDS	TSS	Sulfate	Arsenic		Barium		Cadmium		Calcium		Copper		Lead		Magnesium		Silver		Zinc	
									Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.
Pre-Removal																										
BG-1	10/19/2011	7.85	457	392	176	206	< 5.0	7.18	< 3.0	< 3.0	11.6	10.6	< 0.2	< 0.2	65000	-	< 10.0	< 10.0	< 3.0	< 3.0	3430	-	< 5.0	< 5.0	< 10.0	< 10.0
AD-1	10/19/2011	7.95	448	467	215	230	< 5.0	22.9	< 3.0	< 3.0	2.9	2.7	0.58	0.37	80700	-	< 10.0	< 10.0	3.75	< 3.0	3400	-	< 5.0	< 5.0	42.7	29.8
ET-3	10/19/2011	7.65	462	518	248	259	89.0	10.3	4.6	< 3.0	48.0	10.0	1.03	< 0.2	87600	-	< 10.0	< 10.0	65.7	< 3.0	7190	-	< 5.0	< 5.0	163	< 10.0
ET-4 (dry)	10/19/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post-Removal Sample Results (2012):																										
BG-1	4/25/2012	8.01 H3, H5	441 H3	221	118	163	< 5.0	7.54	< 3.0	< 3.0	6.7	7.5	< 0.2	< 0.2	44000	-	< 10.0	< 10.0	< 3.0	< 3.0	1900	-	< 0.1	< 0.1	< 10.0	< 10.0
AD-1	4/25/2012	8.02 H3, H5	485 H3	402	212	275	< 5.0	31.3	< 3.0	< 3.0	5.1	5.8	1.34	1.24	78600	-	< 10.0	< 10.0	< 3.0	< 3.0	3940	-	< 0.1	< 0.1	81	73.7
ET-3	4/25/2012	7.2 H3, H5	477 H3	309	167	220	< 5.0	19.4	< 3.0	< 3.0	15.5	12.9	< 0.2	< 0.2	59100	-	< 10.0	< 10.0	7.94	< 3.0	4780	-	< 0.1	< 0.1	12.8	< 10.0
ET-4	4/25/2012	7.71 H3, H5	486 H3	271	142	181	< 5.0	5.96	< 3.0	< 3.0	12.8	13.3	< 0.2	< 0.2	48500	-	< 10.0	< 10.0	< 3.0	< 3.0	4970	-	< 0.1	< 0.1	< 10.0	< 10.0
QA/QC																										
Field Blank	4/25/2012	5.48 H3, H5	455 H3	< 5.0	< 0.0	< 20.0	< 10.0	0.3	-	-	-	-	-	-	< 0.04	-	< 10.0	< 10.0	-	-	< 0.06	-	-	-	-	-
AD-1 Duplicate	4/25/2012	8.06 H3, H5	467 H3	407	220	264	< 5.0	31.2	< 3.0	< 3.0	5.3	5.6	1.37	1.26	81400	-	< 10.0	< 10.0	< 3.0	< 3.0	4000	-	< 0.1	< 0.1	87.1	78.1
Percent Difference (AD1)		0%	-4%	1%	4%	-4%	0%	0%	0%	0%	4%	-4%	2%	2%	3%	-	0%	0%	0%	0%	2%	-	0%	0%	7%	6%
Human Health Screening Criteria:																										
[1]WA Ambient Water Quality		NS	NS	NS	NS	NS	NS	NS	0.018	0.018	NS	NS	NS	NS	NS	-	1000	1000	NS	NS	NS	-	NS	NS	5000	5000
[2]WA Drinking Water		NS	NS	NS	NS	500	NS	NS	10.0	10.0	2000	2000	5.0	5.0	NS	-	1300	1300	15.0	15.0	NS	-	100	100	5000	5000
[3]EPA Chronic Ambient Water Quality		5.0-9.0	NS	NS	NS	250	NS	NS	0.018	0.018	1000	1000	NS	NS	NS	-	1300	1300	NS	NS	NS	-	NS	NS	7400	7400
Ecological Screening Criteria:																										
[4]WA Chronic Toxic Substances		6.5-8.5	NS	NS	NS	NS	NS	230	190	190	NS	NS	0.078	0.078	NS	-	0.58	0.58	0.05	0.05	NS	-	NS	NS	5.5	5.5
[5]EPA Chronic Ambient Water Quality		6.5-9.0	NS	NS	NS	250	NS	230	150	150	NS	NS	0.022	0.022	NS	-	2.34	2.34	0.05	0.05	NS	-	NS	NS	6.2	6.2

Notes:

Screening Critera Exceeded

Screening Critera Exceeded; However, pH measurements of distilled water are inaccurate and typically weakly acidic!

[1]State of Washington ambient water quality criteria for protection of human health, TSDCALC.XLS spreadsheet, WDOE website, 2010

[2]State of Washington Drinking Water Criteria (MCLs) WAC 246-290-310 (WDOE 2010)

[3]EPA recommended chronic ambient water quality criteria for human consumption of water and fish (2009)

[4]State of Washington Toxic Substances Criteria for Protection of Aquatic Life, Chronic Criterion, Table 240(3) - WAC 173-201A-240 (WDOE 2010)

[5]EPA recommended chronic ambient water quality criteria for freshwater aquatic life (EPA 2009); if none existed then used Tier II secondary chronic values (NOAA 1999)

H3 = Sample was received and analyzed past holding time

H5 = This test is specified to be performed in the field within 15 mintues of sampling; sample was received and analyzed past the regulatory holding time

s.u. = Standard units

NS = No screening criteria

mV = Millivolt

Eh = Reduction Potential

µmhos/cm = Micromhos per centimeter

Hard = Hardness as calcium carbonate ($CaCO_3$)

mg/L = Milligram per liter

TDS = Total dissolved solids

µg/L = Microgram per liter

TSS = Total suspended solids

Diss. = Dissolved

ORP = Oxygen reduction potential

SC = Specific Conductance

Table 3
Sediment Sample Results Summary
Longshot Mill and Mine Post-RA Monitoring

Sample ID	Date Collected	Analyte (mg/kg)						
		Arsenic	Barium	Cadmium	Copper	Lead	Silver	Zinc
Pre-Removal Sample Results (2011):								
BG-1	10/19/2011	< 2.5	18.3	< 0.2	31.1	3.22	< 0.5	12.7
AD-1	10/19/2011	< 2.5	12.0	13.4	22.9	59.9	< 0.5	577
ET-3	10/19/2011	8.4	89.8	2.07	7.53	80.4	1.43	287
ET-4 (dry)	10/19/2011	-	-	-	-	-	-	-
Post-Removal Sample Results (2012):								
BG-1	4/25/2012	< 2.5	14.7	< 0.2	27.5	1.93	< 0.5	10.2
AD-1	4/25/2012	< 2.5	21.5	3.23	32.2	36.9	< 0.5	154
ET-3	4/25/2012	7.8	54.8	2.09	19.0	639	4.17	378
ET-4	4/25/2012	2.5	79	0.33	16.0	9.66	< 0.5	55.6
QA/QC								
AD-1 Duplicate	4/25/2012	< 2.5	22.8	4.62	34.7	45.8	< 0.5	210
Percent Difference (AD-1)		0%	6%	30%	7%	19%	0%	27%
Human Health Screening Criteria:								
[1]WA MTCA Method A Industrial Soil Cleanup Levels		20.0	NS	2.0	NS	1000	NS	NS
[2]EPA Regional Screening Levels for Industrial Soil		1.6	190000	800	41000	800	5100	310000
[2]EPA Regional Screening Levels for Residential Soil		0.39	150000	70.0	3100	400	390	23000
Ecological Screening Criteria:								
[3]WA Development of Freshwater Sediment Quality Values - reccomended		20.0	NS	0.6	80.0	335	2.0	140
[4]WA Development of Freshwater Sediment Quality Values - in development		5.9	NS	0.6	16.0	31.0	3.9	110
[5]EPA Threshold Effects Level		5.9	NS	0.596	35.7	35.0	NS	123
[6]EPA Probable Effects Level		17.0	NS	3.53	197	91.3	NS	315

Notes:

Screening Critera Exceeded

[1]WDOE MTCA Method A Industrial Soil Cleanup Levels – Human Receptors (WDOE 2010)

[2]EPA Regional Screening Levels, Industrial Soil (EPA 2009)

[3]State of Washington Development of Freshwater Sediment Quality Values (WDOE 2004) - recommended only

[4]State of Washington Development of Freshwater Sediment Quality Values (WDOE 2004) - in development

[5]EPA Threshold Effects Level (NOAA 1999)

[6]EPA Freshwater Probable Effects Level (NOAA 1999)

mg/kg = Milligram per kilogram

Table 4
Field Parameters Summary
Longshot Mill and Mine Post-RA Monitoring

Sample ID	Field Parameters				
	Temp. (°C)	pH (pH units)	EC (µS/cm)	DO (mg/L)	Eh/ORP (mV)
Post-Removal Sample Results (2012):					
BG-1	5.34	7.37	239	11.17	12.7
AD-1	7.96	7.15	419	10.69	-6.80
ET-3	9.84	7.33	314	8.330	12.5
ET-4	5.16	7.25	328	96.10	40.6

Notes:

Low value for measured DO; possible interference.

°C = Celsius

µS/cm = Microsemen per centimeter

mg/L = Milligram per liter

mV = Millivolt

Temp. = Temperature

EC = Eletrical conductivity

DO = Dissolved oxygen

ORP = Oxygen reduction potential

Eh = Reduction potential

Table 5
Benthic Macroinvertebrate Taxa Abundance
Longshot Mill and Mine Post-RA Monitoring

Taxon	ET-4-BI	
	Abundance	**%**
Turbellaria	6.4	0.35
Nemata	41.6	2.25
Oligochaeta	108.8	5.87
Lymnaeidae	12.8	0.69
Ostracoda	16	0.86
Non-Insect Total	**185.6**	**10.02**
Limnephilidae	105.6	5.7
Trichoptera Total	**105.6**	**5.7**
Ceratopogoninae	3.2	0.17
Dolichopodidae	3.2	0.17
Mycetophilidae	3.2	0.17
Twinnia	121.6	6.56
Caloparyphus	3.2	0.17
Tipula	35.2	1.9
Diamesa	19.2	1.04
Metriocnemus	6.4	0.35
Orthocladius	1228.8	66.32
Rheocricotopus	102.4	5.53
Smittia	35.2	1.9
Diptera Total	**1561.6**	**84.28**

ATTACHMENT A

Photographs



Photograph 1 - AD-1 (lower adit discharge)



Photograph 2 - AD-1 stake (left-hand side)



Photograph 2 - BG-1 stake (upper left-hand side)



Photograph 5 - BG-1 (background)



Photograph 3 - ET-3



Photograph 6 - ET-3 stake (upper left-hand side)



Photograph 7 - ET-4



Photograph 8 - ET-4

ATTACHMENT B

Field Forms

MSE Water Sample Collection Record

SAMPLE ID: AD-1-SW + dup.

Sample Location: Longshot Mine Photo:

Description: adit

Date: 4-25-12

Field Personnel: C. Lorenz, E. Hieb

Conditions: Weather: (Sunny) Cloudy Rain

FIELD PARAMETER MEASUREMENT

Field Meter:	Field Parameters:	Observation 1	Observation 2	Observation 3
	Temperature (Celcius)	7.96		
	pH (pH units)	7.15		
	SpCond (microS/cm)	0.419		
	Dissolved O_2 (mg/L)	10.69		
	ORP (mV)	-6.8		

Method: YSI 556

Measurement START Time: Measurement END Time:

FLOW MEASUREMENT

Method: Flow Meter: Flume: Timed Volumetric:

Description: Flow with cross-sectional area, standard USGS method

Flow: ~~0.1 m/s~~ 18.4 gal/min

SAMPLE COLLECTION

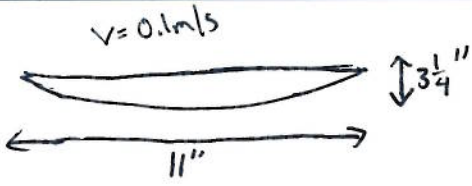
Sample Method: (Bottle) Pump Other:

Sample Collection Time: 1050 am & 1105 am

	Sample ID	# of Sample Containers	Size: 500-mL plastic bottle	Size: 250-mL plastic bottle	Size: 1000-mL glass bottle	Filtration: Filtered	Filtration: Unfiltered	Analysis: Total Metals	Analysis: Dissolved Metals	Analysis: General Chem.	Analysis	Analysis	Analysis	Preservative: HCl	Preservative: HNO_3	Preservative: NaOH	Preservative: NONE
(1050)	AD-1-SW	3	3			1	2	1	1	1					2		1
(1105)	AD-1-SW (dup)	3	3			1	2	1	1	1					2		1
(1130)	field blank (AD-1-FB)	1	1				1										1

STREAM CROSS-SECTION/COMMENTS

GPS Coords: UTM
11 U 0449052
5385672



MSE Water Sample Collection Record

SAMPLE ID: ET-3-SW

Sample Location: Longshot Mine Photo:

Description: near pond

Date: 4-25-12

Field Personnel: C. Lorenz, E. Hieb

Conditions: Weather: (Sunny) Cloudy Rain

FIELD PARAMETER MEASUREMENT

Field Meter:	Field Parameters:	Observation 1	Observation 2	Observation 3
	Temperature (Celcius)	9.84		
	pH (pH units)	7.33		
	SpCond (microS/cm)	0.314		
	Dissolved O_2 (mg/L)	8.33		
	ORP (mV)	12.5		

Method:

Measurement START Time: Measurement END Time:

FLOW MEASUREMENT

Method: Flow Meter: Flume: Timed Volumetric:

Description: flow with cross sectional area, standard USGS method

Flow: ~~0.05 m/s~~ ~~26.9 gal/min~~

SAMPLE COLLECTION

Sample Method: (Bottle) Pump Other:

Sample Collection Time: 1230pm

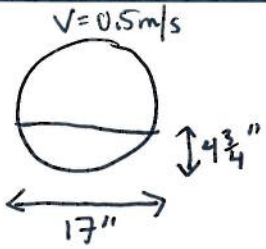
Sample ID	# of Sample Containers	Size: 500-mL plastic bottle	Size: 250-mL plastic bottle	Size: 1000-mL glass bottle	Filtration: Filtered	Filtration: Unfiltered	Analysis: Total Rec. Metals	Analysis: Dissolved Metals	Analysis: Gen. Chem.	Analysis	Analysis	Analysis	Preservative: HCl	Preservative: HNO_3	Preservative: NaOH	Preservative: NONE
ET-3-SW	3	3			1	2	1	1	1					2		1

STREAM CROSS-SECTION/COMMENTS

GPS Cards: UTM

11 U 0449159

5385470



MSE Water Sample Collection Record

SAMPLE ID: BG-1-SW

Sample Location: Longshot Mine Photo:

Description: background sample

Date: 4-25-12

Field Personnel: C. Lorenz, E. Hieb

Conditions: Weather: (Sunny) Cloudy Rain

FIELD PARAMETER MEASUREMENT

Field Meter:	Field Parameters:	Observation 1	Observation 2	Observation 3
	Temperature (Celcius)	5.34		
	pH (pH units)	7.37		
	SpCond (microS/cm)	0.239		
	Dissolved O_2 (mg/L)	11.17		
	ORP (mV)	12.7		

Method:

Measurement START Time: Measurement END Time:

FLOW MEASUREMENT

Method: Flow Meter: Flume: Timed Volumetric:

Description: Flow with cross-sectional area, standard USGS method

Flow: ~~0.05 m/s, 0.1 m/s, 0.1 m/s~~ 89.7 gal/min

SAMPLE COLLECTION

Sample Method: (Bottle) Pump Other:

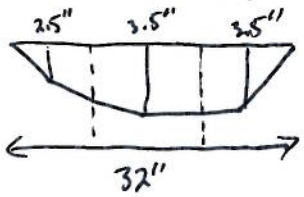
Sample Collection Time: 1200 pm

Sample ID	# of Sample Containers	Size: 500-mL plastic bottle	Size: 250-mL plastic bottle	Size: 1000-mL glass bottle	Filtration: Filtered	Filtration: Unfiltered	Analysis: Total Rec. Metals	Analysis: Dissolved metals	Analysis: Gen. Chem	Analysis	Analysis	Analysis	Preservative: HCl	Preservative: HNO_3	Preservative: NaOH	Preservative: NONE
BG-1-SW	3	3			1	2	1	1	1					2		1

STREAM CROSS-SECTION/COMMENTS

GPS Coords: UTM
11 U 0449358
5385715

V= 0.05 m/s; 0.1 m/s; 0.1 m/s



MSE Water Sample Collection Record

SAMPLE ID: ET-4-SW

Sample Location: Longshot Mine Photo:

Description: near road culvert

Date: 4-25-12

Field Personnel: C. Lorenz, E. Hieb

Conditions: Weather: (Sunny) Cloudy Rain

FIELD PARAMETER MEASUREMENT

Field Meter:	Field Parameters:	Observation 1	Observation 2	Observation 3
	Temperature (Celcius)	5.16		
	pH (pH units)	7.25		
	SpCond (microS/cm)	0.328		
	Dissolved O_2 (mg/L)	96.1		
	ORP (mV)	40.6		

Method:

Measurement START Time: Measurement END Time:

FLOW MEASUREMENT

Method: Flow Meter: Flume: Timed Volumetric:

Description: Flow with cross-sectional area, standard USGS method

Flow: ~~0.7m/s~~ 112.2 gal/min

SAMPLE COLLECTION

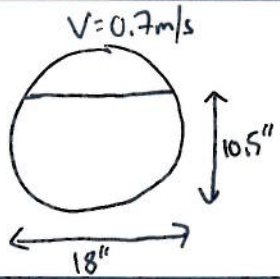
Sample Method: (Bottle) Pump Other:

Sample Collection Time: 1310

Sample ID	# of Sample Containers	Size: 500-mL plastic bottle	Size: 250-mL plastic bottle	Size: 1000-mL glass bottle	Filtration: Filtered	Filtration: Unfiltered	Analysis: Total Rec. Metals	Analysis: Dissolved metals	Analysis: Gen. Chem.	Analysis	Analysis	Analysis	Preservative: HCl	Preservative: HNO_3	Preservative: NaOH	Preservative: NONE
ET-4-SW	3	3			1	2								2		1

STREAM CROSS-SECTION/COMMENTS

GPS Coords: UTM
11 U 0449276
5383957



MSE Sediment Sample Collection Record

SAMPLE ID: AD-1-SED

Sample Location: Longshot Mine Photo:

Description: adit

Date: 4-25-12

Field Personnel: C. Lorenz, E. Hieb

Conditions: Weather: (Sunny) Cloudy Rain

METHOD

Grab: ✓ Depth: 4 inches

Composite:

Habitat	Depth	Comments

SAMPLE COLLECTION

Equipment: Trowel Push Sampler Other: .

Sample Collection Time: 1055 am & 1110

Sample ID	# Sample Containers	Size: 1 gal. bag	Size	Size	Analysis	Analysis	Analysis	Analysis	Analysis	Analysis	Analysis	Analysis	Other	Other	Other	Other
(1055) AD-1-SED	1	1														
(1110) AD-1-SED (dup)	1	1														

DESCRIPTION/COMMENTS

Coords same as SW sample

MSE Sediment Sample Collection Record

SAMPLE ID: BG-1-SED

Sample Location: Longshot Mine Photo:

Description: background

Date: 4-25-12

Field Personnel: C. Lorenz, E. Hieb

Conditions: Weather: (Sunny) Cloudy Rain

METHOD

Grab: ✓ Depth: 4in.

Composite:

Habitat	Depth	Comments

SAMPLE COLLECTION

Equipment: Trowel Push Sampler Other:

Sample Collection Time: 1210 pm

Sample ID	# Sample Containers	Size			Analysis								Other			
		1 gal. bag.														
BG-1-SED	1	1														

DESCRIPTION/COMMENTS

Same cards as SW sample

MSE Sediment Sample Collection Record

SAMPLE ID: ET-3-SED

Sample Location: Langshot Mine Photo:

Description: near pond

Date: 4-25-12

Field Personnel: C. Lorenz, E. Hieb

Conditions: Weather: (Sunny) Cloudy Rain

METHOD

Grab: ✓ Depth: 3 in.

Composite:

Habitat	Depth	Comments

SAMPLE COLLECTION

Equipment: Trowel Push Sampler Other:

Sample Collection Time: 1240 pm

Sample ID	# Sample Containers	Size (1 gal bag)	Size	Size	Analysis	Analysis	Analysis	Analysis	Analysis	Analysis	Analysis	Analysis	Other	Other	Other	Other
ET-3-SED	1	1														

DESCRIPTION/COMMENTS

Coords. same as SW sample

MSE Sediment Sample Collection Record

SAMPLE ID: ET-4-SED

Sample Location: Longshot Mine Photo:

Description: near road culvert

Date: 4-25-12

Field Personnel: C. Lorenz, E. Hieb

Conditions: Weather: (Sunny) Cloudy Rain

METHOD

Grab: ✓ Depth: 4in.

Composite:

Habitat	Depth	Comments

SAMPLE COLLECTION

Equipment: Trowel Push Sampler Other:

Sample Collection Time: 1320

Sample ID	# Sample Containers	Size			Analysis								Other			
		1gal. bag														
ET-4-SED	1	1														

DESCRIPTION/COMMENTS

Same coords. as SW sample

MSE Benthic Invertebrate Collection Record

Project: Longshot Mine and Mill
Project Number: 3149
Location: Colville, WA
Field Personnel: C. Lorenz, E. Hieb
Date: 4-25-12 1330 | Weather: sunny, 65°

SAMPLE COLLECTION

Gear Used: (D-frame) kick-net other:
How were the samples collected? (wading) (from bank) from boat
Indicate the number of jabs/kicks taken from each habitat type:
cobble ___ snags ___ vegetated banks ___ sand ___
submerged macrophytes ___ other ( ) ___

HABITAT TYPES

Indicate the percentage of each habitat type present:
cobble 15% snags 5% vegetated banks 100% sand 50% (fine)
submerged macrophytes 20% other ( ) ___

COMMENTS

Sample Location: ET-4-BI, next to road culvert

Area sampled: 15 x 15 ft

GPS Coords: UTM 11 U 0449276
5383957

Notes: • low flow
• net mesh size: 500
• preservative: 75.5 %

ATTACHMENT C

Laboratory Results

Chemical Analyses

W2D0635

FOR SVL USE ONLY
SVL JOB #

TEMP on Receipt: 5.2°C

Page 1 of 1

CHAIN OF CUSTODY RECORD

SVL Analytical, Inc. • One Government Gulch • Kellogg, ID 83837 • (208) 784-1258 • FAX: (208) 783-0891

Table 1. -- Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other_____

Report to Company:	Millennium Science &
Contact:	Chelsea Lorentz Eng.
Address:	1550 Shoreline Dr. Boise ID
Phone Number:	(208) 345-8292
FAX Number:	(208) 345-8007
E-mail:	clorentz@mse-env.com

Invoice Sent To:	Same
Contact:	
Address:	
Phone Number:	
FAX Number:	
PO#:	

Project Name: Longshot TRA Monitoring

Sampler's Signature: for CL/EH

Indicate State of sample origination: WA **USACE?** ☐ Yes ☒ No

	Sample ID (Please take care to distinguish between: 1 and I, 2 and Z, 5 and S, ø and O. Thanks!)	Collection Date (2012)	Collection Time *	Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Preservative(s): Unpreserved	HNO_3 Filtered	HNO_3 Unfiltered	HCl	H_2SO_4	NaOH	Other (Specify)	Analyses Required: TRM	Diss.	Major	Metals	Rush Instructions (Days)
1	BG-1-SW	4-25	12:00	CL	1	3	1	1	1					x	x	x		
2	AD-1-SW	4-25	11:05	CL	1	3	1	1	1					x	x	x		
3	ET-3-SW	4-25	12:30	CL	1	3	1	1	1					x	x	x		
4	ET-4-SW	4-25	13:10	CL	1	3	1	1	1					x	x	x		
5	AD-1-SW (2)	4-25	10:50	CL	1	3	1	1	1					x	x	x		
6	AD-1-FB	4-25	11:30	CL	1	1										x		
7	BG-1-Sed	4-25	12:10	CL	3	1	1										x	
8	AD-1-Sed	4-25	10:55	CL	3	1	1										x	
9	ET-3-Sed	4-25	12:40	CL	3	1	1										x	
10	ET-4-Sed	4-25	13:20	CL	3	1	1										x	

Comments:
TRM = A_g, As, Ba, Cd, Pb, Zn
Diss. = " "
Major = SO_4^{2-}, TDS, TSS, Hardness
Metals = Ag, As, Ba, Cd, Pb, Zn

CF 4/30/12
ID ON SAMPLE READS AD-1-SW
will check filter prep.

Relinquished by:	RH & mail	Date: 4-27	Time: 9:00	Received by:	
Relinquished by:		Date:	Time:	Received by:	

Date: 4/27/12 Time: 17:00

* Sample Reject: ☐ Return ☐ Dispose ☒ Store (30 Days)

CF ** AD-1-Sed (2) 4-25 11:10 3/1/1

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

* SVL RECORDED TIMES FROM SAMPLE ID'S. CF 4/30/12
~~** SVL DID NOT RECEIVE THIS SAMPLE.~~ CF 4/30/12

SAMPLE RECEIPT/CHAIN-OF -CUSTODY CHECKLIST

The following items were checked for completeness, correctness, and compliance to project specifications using the Chain-of-Custody (COC) and other supporting information.

Date of acceptance: 4/30/12 By: CR Seevy

SVL Work No: W2D0635

Item	Description	V	VC	NV	NA	Comments
1	Client or project name	✓				MGE - SPOKANE
2	Date and time of receipt at lab	✓				4/27/12 17:00
3	Received by	✓				C. FLORES
4	Temperature blank or cooler temperature	✓				Temp. 5.2 °C.
5	Were the sample(s) received on ice	✓				YES
6	Custody tape/bottle seals				✓	
7	Condition of samples upon receipt (leaking; bubbles in VOA vials	✓				GOOD
8	Sample numbers/IDs agree with COC	✓				NOTED ON COC
9	Sample date & time agree with COC	✓				SVL RECORDED TIMES FROM SAMPLE ID
10	Number of containers for each sample	✓				
11	The correct preservative for the analysis requested	✓				
12	Did an SVL employee preserve sample(s) upon receipt				✓	NO
13	Type of container for each sample / volume received	✓				
14	Analysis requested for each sample	✓				
15	Sample matrix description	✓				
16	COC properly completed & legible	✓				
17	Corrections properly made (initials & date)				✓	
18	Additional comments or records of sample condition or treatment (unlisted or missing samples at laboratory, aliquot taken, sample hold, samples subcontracted, communications between client and laboratory)	✓				SVL DID NOT RECEIVE 1 SEDIMENT SAMPLE. (CF)
19	Shipper's air bill	1			✓	CITY PARCEL

V- Verified VC- Verified Corrections Made NV-Not Verified NA- Not Applicable

Additional Comments: _____

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

MSE - Boise
1555 Shoreline Dr. #150
Boise, ID 83702

Project Name: Long Shot 2012
Work Order: **W2D0635**
Reported: 22-May-12 15:23

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Sampled By	Date Received
BG-1-SW	W2D0635-01	Surface Water	25-Apr-12 12:00	CL	27-Apr-2012
AD-1-SW	W2D0635-02	Surface Water	25-Apr-12 11:05	CL	27-Apr-2012
ET-3-SW	W2D0635-03	Surface Water	25-Apr-12 12:30	CL	27-Apr-2012
ET-4-SW	W2D0635-04	Surface Water	25-Apr-12 13:10	CL	27-Apr-2012
AD-1-SW (2)	W2D0635-05	Surface Water	25-Apr-12 10:50	CL	27-Apr-2012
AD-1-FB	W2D0635-06	Surface Water	25-Apr-12 11:30	CL	27-Apr-2012
BG-1-SED	W2D0635-07	Soil	25-Apr-12 12:10	CL	27-Apr-2012
AD-1-SED	W2D0635-08	Soil	25-Apr-12 10:55	CL	27-Apr-2012
ET-3-SED	W2D0635-09	Soil	25-Apr-12 12:40	CL	27-Apr-2012
ET-4-SED	W2D0635-10	Soil	25-Apr-12 13:20	CL	27-Apr-2012
AD-1-SED (2)	W2D0635-11	Soil	25-Apr-12 11:10	CL	27-Apr-2012

Solid samples are analyzed on an as-received, wet-weight basis, unless otherwise requested. Non-Detects are reported at the MDL.
Sample preparation is defined by the client as per their Data Quality Objectives.
This report supercedes any previous reports for this Work Order. The complete report includes pages for each sample, a full QC report, and a notes section.
The results presented in this report relate only to the samples, and meet all requirements of the NELAC Standards unless otherwise noted.

Case Narrative

05/22/2012mab: Report reissued. pH, Eh, specific conductance and TR Cu and D Cu added as requested by client.

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

MSE - Boise
1555 Shoreline Dr. #150
Boise, ID 83702

Project Name: Long Shot 2012
Work Order: **W2D0635**
Reported: 22-May-12 15:23

Client Sample ID: **BG-1-SW**
SVL Sample ID: **W2D0635-01 (Surface Water)**

Sampled: 25-Apr-12 12:00
Received: 27-Apr-12
Sampled By: CL

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	**Barium**	0.0067	mg/L	0.0020	0.0002		W218256	DT	05/07/12 12:48	
EPA 200.7	**Calcium**	44.0	mg/L	0.040	0.006		W218256	DT	05/07/12 12:48	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.002		W218256	DT	05/07/12 12:48	
EPA 200.7	**Magnesium**	1.90	mg/L	0.060	0.013		W218256	DT	05/07/12 12:48	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0010		W218256	DT	05/07/12 12:48	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003	2.5	W218224	KWH	05/14/12 11:39	
EPA 200.8	Cadmium	< 0.00020	mg/L	0.00020	0.00002	2.5	W218224	KWH	05/14/12 11:39	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000072	2.5	W218224	KWH	05/14/12 11:39	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000018	2.5	W218224	KWH	05/14/12 11:39	
SM 2340B	**Hardness (as CaCO3)**	118	mg/L	0.347	0.070		N/A		05/07/12 12:48	
SM 2340B	**Hardness(as CaCO3)**	118	mg/L	0.347	0.070		N/A		05/07/12 12:48	
Metals (Dissolved)										
EPA 200.7	**Barium**	0.0075	mg/L	0.0020	0.0004		W218264	TJK	05/10/12 16:17	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.003		W218264	TJK	05/17/12 14:17	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0019		W218264	TJK	05/10/12 16:17	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0002		W218239	KWH	05/10/12 10:04	
EPA 200.8	Cadmium	< 0.00020	mg/L	0.00020	0.000014		W218239	KWH	05/10/12 10:04	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000058		W218239	KWH	05/10/12 10:04	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.0000074		W218239	KWH	05/10/12 10:04	
Classical Chemistry Parameters										
EPA 120.1	**Specific conductance**	221	µmhos/cm	5.00			W220471	RS	05/18/12 12:40	
SM 2540 C	**Total Diss. Solids**	163	mg/L	10			W218190	JMS	05/02/12 15:39	
SM 2540 D	Total Susp. Solids	< 5.0	mg/L	5.0			W218189	JMS	05/02/12 15:39	
SM 2580B	**Eh**	441	mV	2.50			W220408	DKS	05/18/12 09:53	H3
SM 4500 H B	**pH @21.0°C**	8.01	pH Units				W220408	DKS	05/18/12 09:53	H3,H5
Anions by Ion Chromatography										
EPA 300.0	**Sulfate as SO4**	7.54	mg/L	0.30	0.05		W220028	AEW	05/15/12 13:15	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

MSE - Boise
1555 Shoreline Dr. #150
Boise, ID 83702

Project Name: Long Shot 2012
Work Order: **W2D0635**
Reported: 22-May-12 15:23

Client Sample ID: **AD-1-SW**
SVL Sample ID: **W2D0635-02 (Surface Water)**

Sampled: 25-Apr-12 11:05
Received: 27-Apr-12
Sampled By: CL

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	**Barium**	0.0051	mg/L	0.0020	0.0002		W218256	DT	05/07/12 12:54	
EPA 200.7	**Calcium**	78.6	mg/L	0.040	0.006		W218256	DT	05/07/12 12:54	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.002		W218256	DT	05/07/12 12:54	
EPA 200.7	**Magnesium**	3.94	mg/L	0.060	0.013		W218256	DT	05/07/12 12:54	
EPA 200.7	**Zinc**	0.0811	mg/L	0.0100	0.0010		W218256	DT	05/07/12 12:54	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003	2.5	W218224	KWH	05/14/12 11:44	
EPA 200.8	**Cadmium**	0.00134	mg/L	0.00020	0.00002	2.5	W218224	KWH	05/14/12 11:44	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000072	2.5	W218224	KWH	05/14/12 11:44	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000018	2.5	W218224	KWH	05/14/12 11:44	
SM 2340B	**Hardness (as CaCO3)**	212	mg/L	0.347	0.070		N/A		05/07/12 12:54	
SM 2340B	**Hardness(as CaCO3)**	212	mg/L	0.347	0.070		N/A		05/07/12 12:54	
Metals (Dissolved)										
EPA 200.7	**Barium**	0.0058	mg/L	0.0020	0.0004		W218264	TJK	05/10/12 16:35	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.003		W218264	TJK	05/17/12 14:29	
EPA 200.7	**Zinc**	0.0737	mg/L	0.0100	0.0019		W218264	TJK	05/10/12 16:35	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0002		W218239	KWH	05/10/12 09:58	
EPA 200.8	**Cadmium**	0.00124	mg/L	0.00020	0.000014		W218239	KWH	05/10/12 09:58	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000058		W218239	KWH	05/10/12 09:58	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.0000074		W218239	KWH	05/10/12 09:58	
Classical Chemistry Parameters										
EPA 120.1	**Specific conductance**	402	µmhos/cm	5.00			W220471	RS	05/18/12 12:40	
SM 2540 C	**Total Diss. Solids**	275	mg/L	10			W218190	JMS	05/02/12 15:39	
SM 2540 D	Total Susp. Solids	< 5.0	mg/L	5.0			W218189	JMS	05/02/12 15:39	
SM 2580B	**Eh**	485	mV	2.50			W220408	DKS	05/18/12 09:58	H3
SM 4500 H B	**pH @20.0°C**	8.02	pH Units				W220408	DKS	05/18/12 09:58	H3,H5
Anions by Ion Chromatography										
EPA 300.0	**Sulfate as SO4**	31.3	mg/L	0.30	0.05		W220028	AEW	05/15/12 13:25	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

MSE - Boise
1555 Shoreline Dr. #150
Boise, ID 83702

Project Name: Long Shot 2012
Work Order: **W2D0635**
Reported: 22-May-12 15:23

Client Sample ID: **ET-3-SW**
SVL Sample ID: **W2D0635-03 (Surface Water)**

Sampled: 25-Apr-12 12:30
Received: 27-Apr-12
Sampled By: CL

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	**Barium**	0.0155	mg/L	0.0020	0.0002		W218256	DT	05/07/12 13:00	
EPA 200.7	**Calcium**	59.1	mg/L	0.040	0.006		W218256	DT	05/07/12 13:00	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.002		W218256	DT	05/07/12 13:00	
EPA 200.7	**Magnesium**	4.78	mg/L	0.060	0.013		W218256	DT	05/07/12 13:00	
EPA 200.7	**Zinc**	0.0128	mg/L	0.0100	0.0010		W218256	DT	05/07/12 13:00	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003	2.5	W218224	KWH	05/14/12 11:46	
EPA 200.8	Cadmium	< 0.00020	mg/L	0.00020	0.00002	2.5	W218224	KWH	05/14/12 11:46	
EPA 200.8	**Lead**	0.00794	mg/L	0.00300	0.000072	2.5	W218224	KWH	05/14/12 11:46	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000018	2.5	W218224	KWH	05/14/12 11:46	
SM 2340B	**Hardness (as CaCO3)**	167	mg/L	0.347	0.070		N/A		05/07/12 13:00	
SM 2340B	**Hardness(as CaCO3)**	167	mg/L	0.347	0.070		N/A		05/07/12 13:00	
Metals (Dissolved)										
EPA 200.7	**Barium**	0.0129	mg/L	0.0020	0.0004		W218264	TJK	05/10/12 16:41	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.003		W218264	TJK	05/17/12 14:33	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0019		W218264	TJK	05/10/12 16:41	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0002		W218239	KWH	05/10/12 10:06	
EPA 200.8	Cadmium	< 0.00020	mg/L	0.00020	0.000014		W218239	KWH	05/10/12 10:06	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000058		W218239	KWH	05/10/12 10:06	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.0000074		W218239	KWH	05/10/12 10:06	
Classical Chemistry Parameters										
EPA 120.1	**Specific conductance**	309	µmhos/cm	5.00			W220471	RS	05/18/12 12:40	
SM 2540 C	**Total Diss. Solids**	220	mg/L	10			W218190	JMS	05/02/12 15:39	
SM 2540 D	Total Susp. Solids	< 5.0	mg/L	5.0			W218189	JMS	05/02/12 15:39	
SM 2580B	**Eh**	477	mV	2.50			W220408	DKS	05/18/12 10:04	H3
SM 4500 H B	**pH @19.0°C**	7.92	pH Units				W220408	DKS	05/18/12 10:04	H3,H5
Anions by Ion Chromatography										
EPA 300.0	**Sulfate as SO4**	19.4	mg/L	0.30	0.05		W220028	AEW	05/15/12 13:35	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.



John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

MSE - Boise
1555 Shoreline Dr. #150
Boise, ID 83702

Project Name: Long Shot 2012
Work Order: **W2D0635**
Reported: 22-May-12 15:23

Client Sample ID: **ET-4-SW**
SVL Sample ID: **W2D0635-04 (Surface Water)**

Sampled: 25-Apr-12 13:10
Received: 27-Apr-12
Sampled By: CL

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	**Barium**	0.0128	mg/L	0.0020	0.0002		W218256	DT	05/07/12 13:06	
EPA 200.7	**Calcium**	48.5	mg/L	0.040	0.006		W218256	DT	05/07/12 13:06	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.002		W218256	DT	05/07/12 13:06	
EPA 200.7	**Magnesium**	4.97	mg/L	0.060	0.013		W218256	DT	05/07/12 13:06	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0010		W218256	DT	05/07/12 13:06	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003	2.5	W218224	KWH	05/14/12 11:48	
EPA 200.8	Cadmium	< 0.00020	mg/L	0.00020	0.00002	2.5	W218224	KWH	05/14/12 11:48	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000072	2.5	W218224	KWH	05/14/12 11:48	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000018	2.5	W218224	KWH	05/14/12 11:48	
SM 2340B	**Hardness (as CaCO3)**	142	mg/L	0.347	0.070		N/A		05/07/12 13:06	
SM 2340B	**Hardness(as CaCO3)**	142	mg/L	0.347	0.070		N/A		05/07/12 13:06	
Metals (Dissolved)										
EPA 200.7	**Barium**	0.0133	mg/L	0.0020	0.0004		W218264	TJK	05/10/12 16:47	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.003		W218264	TJK	05/17/12 14:38	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0019		W218264	TJK	05/10/12 16:47	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0002		W218239	KWH	05/10/12 10:07	
EPA 200.8	Cadmium	< 0.00020	mg/L	0.00020	0.000014		W218239	KWH	05/10/12 10:07	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000058		W218239	KWH	05/10/12 10:07	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.0000074		W218239	KWH	05/10/12 10:07	
Classical Chemistry Parameters										
EPA 120.1	**Specific conductance**	271	µmhos/cm	5.00			W220471	RS	05/18/12 12:40	
SM 2540 C	**Total Diss. Solids**	181	mg/L	10			W218190	JMS	05/02/12 15:39	
SM 2540 D	Total Susp. Solids	< 5.0	mg/L	5.0			W218189	JMS	05/02/12 15:39	
SM 2580B	**Eh**	486	mV	2.50			W220408	DKS	05/18/12 10:09	H3
SM 4500 H B	**pH @19.0°C**	7.71	pH Units				W220408	DKS	05/18/12 10:09	H3,H5
Anions by Ion Chromatography										
EPA 300.0	**Sulfate as SO4**	5.96	mg/L	0.30	0.05		W220028	AEW	05/15/12 13:46	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

MSE - Boise
1555 Shoreline Dr. #150
Boise, ID 83702

Project Name: Long Shot 2012
Work Order: **W2D0635**
Reported: 22-May-12 15:23

Client Sample ID: **AD-1-SW (2)**
SVL Sample ID: **W2D0635-05 (Surface Water)**

Sampled: 25-Apr-12 10:50
Received: 27-Apr-12
Sampled By: CL

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	**Barium**	0.0053	mg/L	0.0020	0.0002		W218256	DT	05/07/12 13:11	
EPA 200.7	**Calcium**	81.4	mg/L	0.040	0.006		W218256	DT	05/07/12 13:11	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.002		W218256	DT	05/07/12 13:11	
EPA 200.7	**Magnesium**	4.00	mg/L	0.060	0.013		W218256	DT	05/07/12 13:11	
EPA 200.7	**Zinc**	0.0871	mg/L	0.0100	0.0010		W218256	DT	05/07/12 13:11	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003	2.5	W218224	KWH	05/14/12 11:50	
EPA 200.8	**Cadmium**	0.00137	mg/L	0.00020	0.00002	2.5	W218224	KWH	05/14/12 11:50	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000072	2.5	W218224	KWH	05/14/12 11:50	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000018	2.5	W218224	KWH	05/14/12 11:50	
SM 2340B	**Hardness (as CaCO3)**	220	mg/L	0.347	0.070		N/A		05/07/12 13:11	
SM 2340B	**Hardness(as CaCO3)**	220	mg/L	0.347	0.070		N/A		05/07/12 13:11	
Metals (Dissolved)										
EPA 200.7	**Barium**	0.0056	mg/L	0.0020	0.0004		W218264	TJK	05/10/12 16:52	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.003		W218264	TJK	05/17/12 14:42	
EPA 200.7	**Zinc**	0.0781	mg/L	0.0100	0.0019		W218264	TJK	05/10/12 16:52	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0002		W218239	KWH	05/10/12 10:09	
EPA 200.8	**Cadmium**	0.00126	mg/L	0.00020	0.000014		W218239	KWH	05/10/12 10:09	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000058		W218239	KWH	05/10/12 10:09	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.0000074		W218239	KWH	05/10/12 10:09	
Classical Chemistry Parameters										
EPA 120.1	**Specific conductance**	407	µmhos/cm	5.00			W220471	RS	05/18/12 12:40	
SM 2540 C	**Total Diss. Solids**	264	mg/L	10			W218190	JMS	05/02/12 15:39	
SM 2540 D	Total Susp. Solids	< 5.0	mg/L	5.0			W218189	JMS	05/02/12 15:39	
SM 2580B	**Eh**	467	mV	2.50			W220408	DKS	05/18/12 10:15	H3
SM 4500 H B	**pH @20.0°C**	8.06	pH Units				W220408	DKS	05/18/12 10:15	H3,H5
Anions by Ion Chromatography										
EPA 300.0	**Sulfate as SO4**	31.2	mg/L	0.30	0.05		W220028	AEW	05/15/12 13:56	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

MSE - Boise
1555 Shoreline Dr. #150
Boise, ID 83702

Project Name: Long Shot 2012
Work Order: **W2D0635**
Reported: 22-May-12 15:23

Client Sample ID: **AD-1-FB**
SVL Sample ID: **W2D0635-06 (Surface Water)**

Sampled: 25-Apr-12 11:30
Received: 27-Apr-12
Sampled By: CL

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	Calcium	< 0.040	mg/L	0.040	0.006		W218256	DT	05/07/12 13:17	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.002		W218256	DT	05/07/12 13:17	
EPA 200.7	Magnesium	< 0.060	mg/L	0.060	0.013		W218256	DT	05/07/12 13:17	
SM 2340B	Hardness (as CaCO3)	< 0.347	mg/L	0.347	0.070		N/A		05/07/12 13:17	
SM 2340B	Hardness(as CaCO3)	< 0.347	mg/L	0.347	0.070		N/A		05/07/12 13:17	
Classical Chemistry Parameters										
EPA 120.1	Specific conductance	< 5.00	µmhos/cm	5.00			W220471	RS	05/18/12 12:40	
SM 2540 C	Total Diss. Solids	< 20	mg/L	20			W218190	JMS	05/02/12 15:39	
SM 2540 D	Total Susp. Solids	< 10.0	mg/L	10.0			W218189	JMS	05/02/12 15:39	
SM 2580B	**Eh**	455	mV	2.50			W220408	DKS	05/18/12 10:21	H3
SM 4500 H B	**pH @19.0°C**	5.48	pH Units				W220408	DKS	05/18/12 10:21	H3,H5
Anions by Ion Chromatography										
EPA 300.0	Sulfate as SO4	< 0.30	mg/L	0.30	0.05		W220028	AEW	05/15/12 14:07	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.



John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

MSE - Boise
1555 Shoreline Dr. #150
Boise, ID 83702

Project Name: Long Shot 2012
Work Order: **W2D0635**
Reported: 22-May-12 15:23

Client Sample ID: **BG-1-SED**
SVL Sample ID: **W2D0635-07 (Soil)**

Sampled: 25-Apr-12 12:10
Received: 27-Apr-12
Sampled By: CL

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	Arsenic	< 2.5	mg/kg	2.5	0.4		W218238	DT	05/14/12 12:39	
EPA 6010B	**Barium**	14.7	mg/kg	0.200	0.017		W218238	DT	05/14/12 12:39	
EPA 6010B	Cadmium	< 0.20	mg/kg	0.20	0.04		W218238	DT	05/14/12 12:39	
EPA 6010B	**Copper**	27.5	mg/kg	1.00	0.29		W218238	DT	05/14/12 12:39	
EPA 6010B	**Lead**	1.93	mg/kg	0.75	0.35		W218238	DT	05/14/12 12:39	
EPA 6010B	Silver	< 0.50	mg/kg	0.50	0.04		W218238	DT	05/14/12 12:39	
EPA 6010B	**Zinc**	10.2	mg/kg	1.00	0.20		W218238	DT	05/14/12 12:39	
Percent Solids										
Percent Solids	**% Solids**	16.3	%	0.1			W219059	HLC	05/08/12 11:59	

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John Kern
Laboratory Director

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

MSE - Boise
1555 Shoreline Dr. #150
Boise, ID 83702

Project Name: Long Shot 2012
Work Order: **W2D0635**
Reported: 22-May-12 15:23

Client Sample ID: **AD-1-SED**
SVL Sample ID: **W2D0635-08 (Soil)**

Sampled: 25-Apr-12 10:55
Received: 27-Apr-12
Sampled By: CL

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	Arsenic	< 2.5	mg/kg	2.5	0.4		W218238	DT	05/14/12 12:45	
EPA 6010B	**Barium**	21.5	mg/kg	0.200	0.017		W218238	DT	05/14/12 12:45	
EPA 6010B	**Cadmium**	3.23	mg/kg	0.20	0.04		W218238	DT	05/14/12 12:45	
EPA 6010B	**Copper**	32.2	mg/kg	1.00	0.29		W218238	DT	05/14/12 12:45	
EPA 6010B	**Lead**	36.9	mg/kg	0.75	0.35		W218238	DT	05/14/12 12:45	
EPA 6010B	Silver	< 0.50	mg/kg	0.50	0.04		W218238	DT	05/14/12 12:45	
EPA 6010B	**Zinc**	154	mg/kg	1.00	0.20		W218238	DT	05/14/12 12:45	
Percent Solids										
Percent Solids	**% Solids**	43.6	%	0.1			W219059	HLC	05/08/12 11:59	

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MSE - Boise
1555 Shoreline Dr. #150
Boise, ID 83702

Project Name: Long Shot 2012
Work Order: **W2D0635**
Reported: 22-May-12 15:23

Client Sample ID: **ET-3-SED**
SVL Sample ID: **W2D0635-09 (Soil)**

Sampled: 25-Apr-12 12:40
Received: 27-Apr-12
Sampled By: CL

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Arsenic**	7.8	mg/kg	2.5	0.4		W218238	DT	05/14/12 12:50	
EPA 6010B	**Barium**	54.8	mg/kg	0.200	0.017		W218238	DT	05/14/12 12:50	
EPA 6010B	**Cadmium**	2.09	mg/kg	0.20	0.04		W218238	DT	05/14/12 12:50	
EPA 6010B	**Copper**	19.0	mg/kg	1.00	0.29		W218238	DT	05/14/12 12:50	
EPA 6010B	**Lead**	639	mg/kg	0.75	0.35		W218238	DT	05/14/12 12:50	
EPA 6010B	**Silver**	4.17	mg/kg	0.50	0.04		W218238	DT	05/14/12 12:50	
EPA 6010B	**Zinc**	378	mg/kg	1.00	0.20		W218238	DT	05/14/12 12:50	
Percent Solids										
Percent Solids	**% Solids**	36.6	%	0.1			W219059	HLC	05/08/12 11:59	

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Laboratory Director

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MSE - Boise
1555 Shoreline Dr. #150
Boise, ID 83702

Project Name: Long Shot 2012
Work Order: **W2D0635**
Reported: 22-May-12 15:23

Client Sample ID: **ET-4-SED**
SVL Sample ID: **W2D0635-10 (Soil)**

Sampled: 25-Apr-12 13:20
Received: 27-Apr-12
Sampled By: CL

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	**Arsenic**	2.5	mg/kg	2.5	0.4		W218238	DT	05/14/12 12:56	
EPA 6010B	**Barium**	79.0	mg/kg	0.200	0.017		W218238	DT	05/14/12 12:56	
EPA 6010B	**Cadmium**	0.33	mg/kg	0.20	0.04		W218238	DT	05/14/12 12:56	
EPA 6010B	**Copper**	16.0	mg/kg	1.00	0.29		W218238	DT	05/14/12 12:56	
EPA 6010B	**Lead**	9.66	mg/kg	0.75	0.35		W218238	DT	05/14/12 12:56	
EPA 6010B	Silver	< 0.50	mg/kg	0.50	0.04		W218238	DT	05/14/12 12:56	
EPA 6010B	**Zinc**	55.6	mg/kg	1.00	0.20		W218238	DT	05/14/12 12:56	
Percent Solids										
Percent Solids	**% Solids**	71.2	%	0.1			W219059	HLC	05/08/12 11:59	

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Laboratory Director

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MSE - Boise
1555 Shoreline Dr. #150
Boise, ID 83702

Project Name: Long Shot 2012
Work Order: **W2D0635**
Reported: 22-May-12 15:23

Client Sample ID: **AD-1-SED (2)**
SVL Sample ID: **W2D0635-11 (Soil)**

Sampled: 25-Apr-12 11:10
Received: 27-Apr-12
Sampled By: CL

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	Arsenic	< 2.5	mg/kg	2.5	0.4		W218238	DT	05/14/12 13:01	
EPA 6010B	**Barium**	22.8	mg/kg	0.200	0.017		W218238	DT	05/14/12 13:01	
EPA 6010B	**Cadmium**	4.62	mg/kg	0.20	0.04		W218238	DT	05/14/12 13:01	
EPA 6010B	**Copper**	34.7	mg/kg	1.00	0.29		W218238	DT	05/14/12 13:01	
EPA 6010B	**Lead**	45.8	mg/kg	0.75	0.35		W218238	DT	05/14/12 13:01	
EPA 6010B	Silver	< 0.50	mg/kg	0.50	0.04		W218238	DT	05/14/12 13:01	
EPA 6010B	**Zinc**	210	mg/kg	1.00	0.20		W218238	DT	05/14/12 13:01	
Percent Solids										
Percent Solids	**% Solids**	29.5	%	0.1			W219059	HLC	05/08/12 11:59	

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John Kern
Laboratory Director

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MSE - Boise
1555 Shoreline Dr. #150
Boise, ID 83702

Project Name: Long Shot 2012
Work Order: **W2D0635**
Reported: 22-May-12 15:23

Quality Control - BLANK Data

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods								
EPA 6010B	Arsenic	mg/kg	<2.5	0.4	2.5	W218238	14-May-12	
EPA 6010B	Barium	mg/kg	<0.200	0.017	0.200	W218238	14-May-12	
EPA 6010B	Cadmium	mg/kg	<0.20	0.04	0.20	W218238	14-May-12	
EPA 6010B	Copper	mg/kg	<1.00	0.16	1.00	W218238	14-May-12	
EPA 6010B	Lead	mg/kg	<0.75	0.35	0.75	W218238	14-May-12	
EPA 6010B	Silver	mg/kg	<0.50	0.04	0.50	W218238	14-May-12	
EPA 6010B	Zinc	mg/kg	<1.00	0.20	1.00	W218238	14-May-12	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)								
EPA 200.7	Barium	mg/L	<0.0020	0.0002	0.0020	W218256	07-May-12	
EPA 200.7	Calcium	mg/L	<0.040	0.006	0.040	W218256	07-May-12	
EPA 200.7	Copper	mg/L	<0.010	0.002	0.010	W218256	07-May-12	
EPA 200.7	Magnesium	mg/L	<0.060	0.013	0.060	W218256	07-May-12	
EPA 200.7	Zinc	mg/L	<0.0100	0.0010	0.0100	W218256	07-May-12	
EPA 200.8	Arsenic	mg/L	<0.0030	0.0003	0.0030	W218224	14-May-12	
EPA 200.8	Lead	mg/L	<0.00300	0.000072	0.00300	W218224	14-May-12	
EPA 200.8	Silver	mg/L	<0.000100	0.000018	0.000100	W218224	14-May-12	
EPA 200.8	Cadmium	mg/L	<0.00020	0.00002	0.00020	W218224	14-May-12	
Metals (Dissolved)								
EPA 200.7	Barium	mg/L	<0.0020	0.0004	0.0020	W218264	10-May-12	
EPA 200.7	Copper	mg/L	<0.010	0.003	0.010	W218264	17-May-12	
EPA 200.7	Zinc	mg/L	<0.0100	0.0019	0.0100	W218264	10-May-12	
EPA 200.8	Arsenic	mg/L	<0.0030	0.0002	0.0030	W218239	10-May-12	
EPA 200.8	Cadmium	mg/L	<0.00020	0.000014	0.00020	W218239	10-May-12	
EPA 200.8	Lead	mg/L	<0.00300	0.000058	0.00300	W218239	10-May-12	
EPA 200.8	Silver	mg/L	<0.000100	0.0000074	0.000100	W218239	10-May-12	
Classical Chemistry Parameters								
EPA 120.1	Specific conductance	µmhos/cm	<5.00		5.00	W220471	18-May-12	
SM 2540 C	Total Diss. Solids	mg/L	<10		10	W218190	02-May-12	
SM 2540 D	Total Susp. Solids	mg/L	<5.0		5.0	W218189	02-May-12	
Anions by Ion Chromatography								
EPA 300.0	Sulfate as SO4	mg/L	<0.30	0.05	0.30	W220028	14-May-12	

Quality Control - LABORATORY CONTROL SAMPLE Data

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods									
EPA 6010B	Arsenic	mg/kg	92.8	100	92.8	80 - 120	W218238	14-May-12	
EPA 6010B	Barium	mg/kg	90.8	100	90.8	80 - 120	W218238	14-May-12	
EPA 6010B	Cadmium	mg/kg	93.3	100	93.3	80 - 120	W218238	14-May-12	
EPA 6010B	Copper	mg/kg	92.3	100	92.3	80 - 120	W218238	14-May-12	
EPA 6010B	Lead	mg/kg	89.3	100	89.3	80 - 120	W218238	14-May-12	
EPA 6010B	Silver	mg/kg	4.53	5.00	90.7	80 - 120	W218238	14-May-12	
EPA 6010B	Zinc	mg/kg	93.1	100	93.1	80 - 120	W218238	14-May-12	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)									
EPA 200.7	Barium	mg/L	0.982	1.00	98.2	85 - 115	W218256	07-May-12	
EPA 200.7	Calcium	mg/L	18.8	20.0	93.9	85 - 115	W218256	07-May-12	
EPA 200.7	Copper	mg/L	0.996	1.00	99.6	85 - 115	W218256	07-May-12	
EPA 200.7	Magnesium	mg/L	18.2	20.0	90.8	85 - 115	W218256	07-May-12	
EPA 200.7	Zinc	mg/L	0.966	1.00	96.6	85 - 115	W218256	07-May-12	

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MSE - Boise
1555 Shoreline Dr. #150
Boise, ID 83702

Project Name: Long Shot 2012
Work Order: **W2D0635**
Reported: 22-May-12 15:23

Quality Control - LABORATORY CONTROL SAMPLE Data (Continued)

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Metals (Total Recoverable--reportable as Total per 40 CFR 136) (Continued)									
EPA 200.8	Arsenic	mg/L	0.0254	0.0250	102	85 - 115	W218224	14-May-12	
EPA 200.8	Lead	mg/L	0.0260	0.0250	104	85 - 115	W218224	14-May-12	
EPA 200.8	Silver	mg/L	0.0258	0.0250	103	85 - 115	W218224	14-May-12	
EPA 200.8	Cadmium	mg/L	0.0259	0.0250	104	85 - 115	W218224	14-May-12	
Metals (Dissolved)									
EPA 200.7	Barium	mg/L	1.04	1.00	104	85 - 115	W218264	10-May-12	
EPA 200.7	Copper	mg/L	1.02	1.00	102	85 - 115	W218264	17-May-12	
EPA 200.7	Zinc	mg/L	0.963	1.00	96.3	85 - 115	W218264	10-May-12	
EPA 200.8	Arsenic	mg/L	0.0258	0.0250	103	85 - 115	W218239	10-May-12	
EPA 200.8	Cadmium	mg/L	0.0247	0.0250	98.8	85 - 115	W218239	10-May-12	
EPA 200.8	Lead	mg/L	0.0249	0.0250	99.6	85 - 115	W218239	10-May-12	
EPA 200.8	Silver	mg/L	0.0255	0.0250	102	85 - 115	W218239	10-May-12	
Classical Chemistry Parameters									
EPA 120.1	Specific conductance	µmhos/cm	484	494	98.0	90 - 110	W220471	18-May-12	
Anions by Ion Chromatography									
EPA 300.0	Sulfate as SO4	mg/L	10.5	10.0	105	90 - 110	W220028	14-May-12	

Quality Control - DUPLICATE Data

Method	Analyte	Units	Duplicate Result	Sample Result	RPD	RPD Limit	Batch ID	Analyzed	Notes
Metals (Total Recoverable--reportable as Total per 40 CFR 136)									
EPA 200.7	Barium	mg/L	<0.0020	<0.0020	UDL	20	W218256	07-May-12	
EPA 200.7	Calcium	mg/L	<0.040	<0.040	<RL	20	W218256	07-May-12	
EPA 200.7	Copper	mg/L	<0.010	<0.010	UDL	20	W218256	07-May-12	
EPA 200.7	Magnesium	mg/L	<0.060	<0.060	UDL	20	W218256	07-May-12	
EPA 200.7	Zinc	mg/L	<0.0100	<0.0100	UDL	20	W218256	07-May-12	
EPA 200.8	Arsenic	mg/L	<0.0030	<0.0030	UDL	20	W218224	14-May-12	
EPA 200.8	Lead	mg/L	<0.00300	<0.00300	UDL	20	W218224	14-May-12	
EPA 200.8	Silver	mg/L	<0.000100	<0.000100	UDL	20	W218224	14-May-12	
EPA 200.8	Cadmium	mg/L	<0.00020	<0.00020	UDL	20	W218224	14-May-12	
Metals (Dissolved)									
EPA 200.7	Barium	mg/L	0.0075	0.0075	0.9	20	W218264	10-May-12	
EPA 200.7	Copper	mg/L	<0.010	<0.010	UDL	20	W218264	17-May-12	
EPA 200.7	Zinc	mg/L	<0.0100	<0.0100	UDL	20	W218264	10-May-12	
EPA 200.8	Arsenic	mg/L	<0.0030	<0.0030	<RL	20	W218239	10-May-12	
EPA 200.8	Cadmium	mg/L	0.00127	0.00124	2.6	20	W218239	10-May-12	
EPA 200.8	Lead	mg/L	<0.00300	<0.00300	<RL	20	W218239	10-May-12	
EPA 200.8	Silver	mg/L	<0.000100	<0.000100	UDL	20	W218239	10-May-12	
Classical Chemistry Parameters									
EPA 120.1	Specific conductance	µmhos/cm	4030	4030	0.1	20	W220471	18-May-12	
SM 2540 C	Total Diss. Solids	mg/L	206	220	6.6	10	W218190	02-May-12	
SM 2540 D	Total Susp. Solids	mg/L	<5.0	<5.0	<RL	10	W218189	02-May-12	
SM 2580B	Eh	mV	433	441	1.8	20	W220408	18-May-12	
SM 4500 H B	pH	pH Units	7.99	8.01	0.3	20	W220408	18-May-12	
Anions by Ion Chromatography									
EPA 300.0	Sulfate as SO4	mg/L	46.0	46.3	0.7	20	W220028	14-May-12	

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MSE - Boise
1555 Shoreline Dr. #150
Boise, ID 83702

Project Name: Long Shot 2012
Work Order: **W2D0635**
Reported: 22-May-12 15:23

Quality Control - MATRIX SPIKE Data

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	Arsenic	mg/kg	113	17.9	100	94.7	75 - 125	W218238	14-May-12	
EPA 6010B	Barium	mg/kg	279	174	100	105	75 - 125	W218238	14-May-12	
EPA 6010B	Cadmium	mg/kg	94.6	0.36	100	94.2	75 - 125	W218238	14-May-12	
EPA 6010B	Copper	mg/kg	134	32.9	100	101	75 - 125	W218238	14-May-12	
EPA 6010B	Lead	mg/kg	151	63.8	100	87.5	75 - 125	W218238	14-May-12	
EPA 6010B	Silver	mg/kg	5.22	0.52	5.00	94.2	75 - 125	W218238	14-May-12	
EPA 6010B	Zinc	mg/kg	199	104	100	95.3	75 - 125	W218238	14-May-12	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	Barium	mg/L	1.00	<0.0020	1.00	100	70 - 130	W218256	07-May-12	
EPA 200.7	Calcium	mg/L	19.7	<0.040	20.0	98.3	70 - 130	W218256	07-May-12	
EPA 200.7	Copper	mg/L	1.03	<0.010	1.00	103	70 - 130	W218256	07-May-12	
EPA 200.7	Magnesium	mg/L	19.1	<0.060	20.0	95.7	70 - 130	W218256	07-May-12	
EPA 200.7	Zinc	mg/L	1.00	<0.0100	1.00	100	70 - 130	W218256	07-May-12	
EPA 200.8	Arsenic	mg/L	0.0268	<0.0030	0.0250	107	70 - 130	W218224	14-May-12	
EPA 200.8	Lead	mg/L	0.0249	<0.00300	0.0250	99.0	70 - 130	W218224	14-May-12	
EPA 200.8	Silver	mg/L	0.0261	<0.000100	0.0250	104	70 - 130	W218224	14-May-12	
EPA 200.8	Cadmium	mg/L	0.0260	<0.00020	0.0250	104	70 - 130	W218224	14-May-12	
Metals (Dissolved)										
EPA 200.7	Barium	mg/L	1.09	0.0075	1.00	108	70 - 130	W218264	10-May-12	
EPA 200.7	Copper	mg/L	1.01	<0.010	1.00	101	70 - 130	W218264	17-May-12	
EPA 200.7	Zinc	mg/L	1.03	<0.0100	1.00	103	70 - 130	W218264	10-May-12	
EPA 200.8	Arsenic	mg/L	0.0293	<0.0030	0.0250	115	70 - 130	W218239	10-May-12	
EPA 200.8	Cadmium	mg/L	0.0258	0.00124	0.0250	98.3	70 - 130	W218239	10-May-12	
EPA 200.8	Lead	mg/L	0.0231	<0.00300	0.0250	92.0	70 - 130	W218239	10-May-12	
EPA 200.8	Silver	mg/L	0.0251	<0.000100	0.0250	100	70 - 130	W218239	10-May-12	
Anions by Ion Chromatography										
EPA 300.0	Sulfate as SO4	mg/L	53.7	46.3	10.0	R > 4S	90 - 110	W220028	14-May-12	D2,M3
EPA 300.0	Sulfate as SO4	mg/L	26.9	15.4	10.0	114	90 - 110	W220028	15-May-12	M1

Quality Control - MATRIX SPIKE DUPLICATE Data

Method	Analyte	Units	MSD Result	Spike Result	Spike Level	RPD	RPD Limit	Batch ID	Analyzed	Notes
Metals (Total) by EPA 6000/7000 Methods										
EPA 6010B	Arsenic	mg/kg	110	113	100	2.8	20	W218238	14-May-12	
EPA 6010B	Barium	mg/kg	268	279	100	4.0	20	W218238	14-May-12	
EPA 6010B	Cadmium	mg/kg	92.5	94.6	100	2.3	20	W218238	14-May-12	
EPA 6010B	Copper	mg/kg	130	134	100	2.7	20	W218238	14-May-12	
EPA 6010B	Lead	mg/kg	147	151	100	3.0	20	W218238	14-May-12	
EPA 6010B	Silver	mg/kg	5.08	5.22	5.00	2.9	20	W218238	14-May-12	
EPA 6010B	Zinc	mg/kg	193	199	100	3.4	20	W218238	14-May-12	

One Government Gulch - PO Box 929 Kellogg ID 83837-0929 (208) 784-1258 Fax (208) 783-0891

MSE - Boise
1555 Shoreline Dr. #150
Boise, ID 83702

Project Name: Long Shot 2012
Work Order: **W2D0635**
Reported: 22-May-12 15:23

Notes and Definitions

D2	Sample required dilution due to high concentration of target analyte.
H3	Sample was received and analyzed past holding time.
H5	This test is specified to be performed in the field within 15 minutes of sampling; sample was received and analyzed past the regulatory holding time.
M1	Matrix spike recovery was high, but the LCS recovery was acceptable.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to spike level. The LCS was acceptable.
LCS	Laboratory Control Sample (Blank Spike)
RPD	Relative Percent Difference
UDL	A result is less than the detection limit
R > 4S	% recovery not applicable, sample concentration more than four times greater than spike level
<RL	A result is less than the reporting limit
MRL	Method Reporting Limit
MDL	Method Detection Limit
N/A	Not Applicable

Benthic Analyses

Client contact	Chelsea Lorenz, clorenz@mse-env.com
Project location	Longshot Mine and Mill, eastern Washington
Project objectives	Determine if a macroinvertebrate community is present and developed in a seasonal stream draining from the mine.
Laboratory	
Aquatic Biology Associates, Inc. (ABA)	3490 NW Deer Run Street, Corvallis, OR 97330
http://www.aquaticbio.com/	
Robert Wisseman	general taxonomy, bobwisseman@mac.com
James DiGiulio	Chironomidae taxonomy, digiulio@peak.org
Jon Lee	mite taxonomy, jlee@humboldt1.com
Sampling protocol	
Sampling gear	D-frame net
Mesh size	500 micron
Square area sampled	qualitative jabs and sweeps
Habitat sampled	seasonal pool about 15' long and wide
Laboratory protocol	
Mesh size	500 micron
Subsampling target count	500 organism minimum
Subsampling device	Caton tray
Sorting efficacy	95+%
Standard taxonomic effort	Pacific Northwest level 2 (unpublished)
Chironomidae (midges)	genus/species group
Oligochaeta (segmented worms)	class Oligochaeta
Acari (mites)	subclass Acari
Taxa abundances	converted to a full sample basis
Data analysis	
Standard taxonomic effort (STE)	Version 2 ABA
Taxa traits (e.g. feeding group, etc.)	Version 2 ABA (see "Traits" tab in this output for documentation)

Programmed in R by Adam and Robert Wisseman
Version 2 of ABA STE and taxa traits is a draft version still under development.
Abundances converted to a standard full sample (if subsampled) basis.

Date run:
Wed May 30 21:56:30 2012
Analysis program in developmental phase.

Abundances converted to a standard full sample (if subsampled).

Site	ET-4-BI	
Date	2012-04-25	Comments
Subsample count	579	
Subsample correction factor to full sample	3.2	
Area correction factor to square meter	1	
SUMMARY METRICS		
Total taxa richness	17	Perennial streams typically have 40-70 taxa.
Total abundance	1852.8	
EPT taxa richness	1	Very low.
EPT abundance	105.6	
DOMINANCE AND DIVERSITY		
% Dominant taxa	66.32	
% Top 3 taxa	78.76	High dominance by a few taxa, midges, black flies and worms.
Shannon-Weaver Diversity (loge)	1.38	
Shannon-Weaver Diversity (log2)	1.99	
TOLERANT AND INTOLERANT TAXA		
% Total tolerant taxa	3.28	Surprisingly low.
Total tolerant taxa richness	5	
Total tolerant taxa abundance	60.8	
% Highly tolerant taxa	0	
Highly tolerant taxa richness	0	
Highly tolerant taxa abundance	0	
% Moderately tolerant taxa	3.28	
Moderately tolerant taxa richness	5	
Moderately tolerant taxa abundance	60.8	
% Total intolerant taxa	7.6	Moderate.
Total intolerant taxa richness	2	
Total intolerant taxa abundance	140.8	
% Highly intolerant taxa	1.04	
Highly intolerant taxa richness	1	
Highly intolerant taxa abundance	19.2	
% Moderately Intolerant taxa	6.56	
Moderately intolerant taxa richness	1	
Moderately intolerant taxa abundance	121.6	
VOLTINISM (length of life cycle)		
% Semivoltine (> 1 year life cycle)	1.9	
% Univoltine (1 year life cycle)	14.51	
% Multivoltine (< 1 year life cycle)	83.42	High dominance by taxa with short generation times.
Semivoltine taxa abundance	35.2	
Univoltine taxa abundance	268.8	
Multivoltine taxa abundance	1545.6	
Semivoltine taxa richness	1	
Univoltine taxa richness	6	
Multivoltine taxa richness	9	
GROWTH AND DEVELOPMENT		
% Fast seasonal life cycle	82.04	High dominance by taxa that develop over a narrow seasonal window.
% Slow seasonal life cycle	17.79	
% Nonseasonal life cycle	0	
OCCURRENCE IN DRIFT		
% Rare in drift	24.7	
% Common in drift	0	
% Abundant in drift	75.13	
SIZE AT MATURITY		
% Small size at maturity	81.52	High dominance by small taxa.
% Medium size at maturity	16.41	
% Large size at maturity	1.9	
Small size at maturity abundance	1510.4	
Medium size at maturity abundance	304	
Large size at maturity abundance	35.2	
Small size at maturity taxa richness	6	
Medium size at maturity taxa richness	9	
Large size at maturity taxa richness	1	
RHEOPHILY AND HABITAT AFFINITY		
% Depositional only	0.17	
% Depositional and erosional	99.65	
% Erosional	0	
THERMAL PREFERENCE		
% Cold stenothermal and cool eurythermal	7.6	
% Cool/warm eurythermal	91.54	
% Warm eurythermal	0.69	
NON-INSECT AND INSECT ORDERS		

% Non-insect invertebrates	10.02	
% Ephemeroptera (mayflies)	0	
% Odonata (damsel- and dragonflies)	0	
% Plecoptera (stoneflies)	0	
% Hemiptera (true bugs)	0	
% Megaloptera (alderflies and hellgramites)	0	
% Trichoptera (caddisflies)	5.7	
% Lepidoptera (moths)	0	
% Coleoptera (beetles)	0	
% Diptera (total)(true flies)	84.28	High dominance by true flies and midges.
% Chironomidae (true flies- midges	75.13	
Non-insect taxa richness	5	
Ephemeroptera taxa richness	0	
Odonata taxa richness	0	
Plecoptera taxa richness	0	
Hemiptera taxa richness	0	
Megaloptera taxa richness	0	
Trichoptera taxa richness	1	
Lepidoptera taxa richness	0	
Coleoptera taxa richness	0	
Diptera (total) taxa richness	11	
Chironomidae taxa richness	5	
Non-insect abundance	185.6	
Ephemeroptera abundance	0	
Odonata abundance	0	
Plecoptera abundance	0	
Hemiptera abundance	0	
Megaloptera abundance	0	
Trichoptera abundance	105.6	
Lepidoptera abundance	0	
Coleoptera abundance	0	
Diptera (total) abundance	1561.6	
Chironomidae abundance	1392	
INDICATOR TAXA		
Mollusca (snails and bivalves) taxa richness	1	
Crustacea taxa richness	1	
Baetidae (mayfly) taxa richness	0	
Ephemerellidae (mayfly) taxa richness	0	
Heptageniidae (mayfly) taxa richness	0	
Nemouridae (stonefly) taxa richness	0	
Rhyacophilidae (caddisfly) taxa richness	0	
Hydropsychidae (caddisfly) taxa richness	0	
Elmidae (riffle beetle) taxa richness	0	
Oligochaeta (segmented worms) abundance	108.8	
Mollusca abundance	12.8	
Crustacea abundance	16	
Acari (mites) abundance	0	
Baetidae abundance	0	
Baetis tricaudatus (mayfly) abundance	0	
Ephemerellidae abundance	0	
Heptageniidae abundance	0	
Nemouridae abundance	0	
Rhyacophililidae abundance	0	
Hydropsychidae taxa abundance	0	
Elmidae abundance	0	
Simuliidae abundance	121.6	
Tanytarsini midge abundance	0	
% Oligochaeta (segmented worms)	5.87	
% Mollusca	0.69	
% Crustacea	0.86	
% Acari	0	
% Baetidae	0	
% Baetis tricaudatus	0	
% Ephemerellidae	0	
% Heptageniidae	0	
% Nemouridae	0	
% Rhyacophilidae	0	
% Hydropsychidae	0	
% Elmidae	0	
% Simuliidae	6.56	
% Tanytarsini	0	
FEEDING GROUPS		

Predator taxa richness	4	
Parasite taxa richness	0	
Collector-gatherer taxa richness	8	
Collector-filterer taxa richness	1	
Collector (total) taxa richness	9	
Piercer herbivore taxa richness	0	
Macrophyte herbivore taxa richness	0	
Shredder taxa richness	2	
Scraper taxa richness	1	
Omnivore taxa richness	0	
Unknown taxa richness	1	
Predator abundance	54.4	
Parasite abundance	0	
Collector-gatherer abundance	1520	
Collector-filterer abundance	121.6	
Collector (total) abundance	1641.6	
Piercer herbivore abundance	0	
Macrophyte herbivore abundance	0	
Shredder abundance	140.8	
Scraper abundance	12.8	
Omnivore abundance	0	
Unknown abundance	3.2	
% Predator	2.94	
% Parasite	0	
% Collector-gatherer	82.04	
% Collector-filterer	6.56	
% Collector (total)	88.6	High dominance by collectors.
% Piercer herbivore	0	
% Macrophyte herbivore	0	
% Shredder	7.6	
% Scraper	0.69	
% Omnivore	0	
% Unknown	0.17	
HABIT		
Skater taxa richness	0	
Planktonic taxa richness	0	
Diver taxa richness	0	
Swimmer taxa richness	1	
Clinger taxa richness	3	
Sprawler taxa richness	6	
Climber taxa richness	1	
Burrower taxa richness	5	
Unknowns taxa richness	1	
Skater abundance	0	
Planktonic abundance	0	
Diver abundance	0	
Swimmer abundance	16	
Clinger abundance	140.8	
Sprawler abundance	1360	
Climber abundance	105.6	
Burrower abundance	227.2	
Unknowns abundance	3.2	
% Skater	0	
% Planktonic	0	
% Diver	0	
% Swimmer	0.86	
% Clinger	7.6	
% Sprawler	73.4	
% Climber	5.7	
% Burrower	12.26	
% Unknown	0.17	

Abundances converted to a standard full sample (if subsampled) and one square meter basis.

							Site	ET-4-BI	
							Date	2012-04-25	
Taxon	Stage	Insect?	Origin	Higher classification	Order	Family	Common name	Abundance	
Turbellaria	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	6.4	Lotic taxa.
Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	41.6	Lotic & lentic taxa.
Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	108.8	Lotic & lentic taxa.
Lymnaeidae	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	12.8	Lotic & lentic taxa.
Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	16	Lotic & lentic taxa.
Limnephilidae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Limnephilidae	caddisflies	105.6	Lotic & lentic taxa.
Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	3.2	Lotic & lentic taxa.
Dolichopodidae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Dolichopodidae	long-legged flies	3.2	Terrestrial & semi-aquatic taxa.
Mycetophilidae	L	insect	Terrestrial	Arthropoda: Insecta	Diptera	Mycetophilidae	fungus gnats	3.2	Terrestrial & semi-aquatic taxa.
Twinnia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	121.6	Lotic taxa.
Caloparyphus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Stratiomyidae	soldier flies	3.2	Lotic taxa.
Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	35.2	Lotic & lentic taxa.
Diamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	19.2	Lotic taxa.
Metriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	6.4	Lotic & lentic taxa.
Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	1228.8	Lotic taxa.
Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	102.4	Lotic taxa.
Smittia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	35.2	Terrestrial & semi-aquatic taxa.

Abundances converted to a standard full sample (if subsampled) and one square meter basis.

							Site	ET-4-BI
							Date	2012-04-25
Taxon	Stage	Insect?	Origin	Higher classification	Order	Family	Common name	% abundance
Turbellaria	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	0.35
Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	2.25
Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	5.87
Lymnaeidae	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	0.69
Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	0.86
Limnephilidae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Limnephilidae	caddisflies	5.7
Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	0.17
Dolichopodidae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Dolichopodidae	long-legged flies	0.17
Mycetophilidae	L	insect	Terrestrial	Arthropoda: Insecta	Diptera	Mycetophilidae	fungus gnats	0.17
Twinnia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	6.56
Caloparyphus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Stratiomyidae	soldier flies	0.17
Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	1.9
Diamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	1.04
Metriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0.35
Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	66.32
Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	5.53
Smittia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	1.9

Site	Date	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
ET-4-BI	2012-04-25	Mycetophilidae	L	insect	Terrestrial	Arthropoda: Insecta	Diptera	Mycetophilidae	fungus gnats	3.2
ET-4-BI	2012-04-25	Turbellaria	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	6.4
ET-4-BI	2012-04-25	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	41.6
ET-4-BI	2012-04-25	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	108.8
ET-4-BI	2012-04-25	Lymnaeidae	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	12.8
ET-4-BI	2012-04-25	Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	16
ET-4-BI	2012-04-25	Limnephilidae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Limnephilidae	caddisflies	105.6
ET-4-BI	2012-04-25	Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	3.2
ET-4-BI	2012-04-25	Dolichopodidae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Dolichopodidae	long-legged flies	3.2
ET-4-BI	2012-04-25	Twinnia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	121.6
ET-4-BI	2012-04-25	Caloparyphus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Stratiomyidae	soldier flies	3.2
ET-4-BI	2012-04-25	Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	35.2
ET-4-BI	2012-04-25	Diamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	19.2
ET-4-BI	2012-04-25	Metriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	6.4
ET-4-BI	2012-04-25	Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	1228.8
ET-4-BI	2012-04-25	Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	102.4
ET-4-BI	2012-04-25	Smittia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	35.2

Taxon	Stage	Insect.	Origin	Higher.classification	Order	Family	Common.name	Range	Feeding.Group	CA.feedin	Habit	Tolerance	CTI.tolera	PSSB.tol	CA.tolera	HDG.tole	PSSB.Ion	Voltinism	Developm	Occurren	Size.at.m	Rheophil	Thermal.p	a	b
Turbellaria	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	0	PR	PR	CL	0.0	0	0	4	0	0	2	2	1	2	2	2	0.0082	2.168
Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	0	PR	PR	BU	0.0	0	0	6	0	0	2	2	1	2	2	2	0.0758	0.74
Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	0	CG	CG	BU	0.0	0	0	5	0	0	2	2	1	2	2	2	0.0758	0.74
Lymnaeidae	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lymnaeidae	snails	0	SC	SC	CL	MT	0	0	6	0	0	3	2	1	2	2	3	0.0208	3.03
Ostracoda	U	non-insect	Aquatic	Crustacea: Ostracoda	x	x	seed shrimp	0	CG	CG	SW	0.0	0	0	6	0	0	3	2	1	1	2	2	0.00675	2.27
Limnephilidae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Limnephilidae	caddisflies	0	SH	SH	CM	0.0	0	0	4	0	0	2	2	1	2	2	2	0.004	2.933
Dolichopodidae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Dolichopodidae	long-legged flies	0	PR	PR	SP	MT	0	0	4	0	0	2	2	1	2	1	2	0.0054	2.546
Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	0	PR	PR	SP	0.0	0	0	6	0	0	2	1	1	2	2	2	0.0025	2.469
Mycetophilidae	L	insect	Terrestrial	Arthropoda: Insecta	Diptera	Mycetophilidae	fungus gnats	0	UN	UN	UN	0.0	0	0	11	0	0	0	0	0	0	0	0	0.0029	2.681
Twinnia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	0	CF	CF	CL	MI	0	0	6	0	0	3	1	1	1	2	1	0.002	3.011
Caloparyphus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Stratiomyidae	soldier flies	0	CG	CG	SP	MT	0	0	7	0	0	3	1	1	2	2	2	0.005	2.591
Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	0	SH	SH	BU	0.0	0	0	4	0	0	1	2	1	3	2	2	0.0029	2.681
Diamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Diamesinae	midges	0	CG	CG	SP	HI	0	0	2	0	0	3	1	3	2	2	1	0.0018	2.617
Metriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	BU	MT	0	0	5	0	0	3	1	3	1	2	2	0.0018	2.617
Orthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	0.0	0	0	6	0	0	3	1	3	1	2	2	0.0018	2.617
Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	0.0	0	0	6	0	0	3	1	3	1	2	2	0.0018	2.617
Smittia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	BU	MT	0	0	6	0	0	3	1	3	1	2	2	0.0018	2.617

Explanation of metrics	All abundances and biomass converted to a full sample and 1 square meter basis.
Subsample count (raw)	Total count of subsample prior to correction factors being applied for subsampling and conversion to a 1 square meter basis.
Subsample correction factor to full sample	Multiplier to convert subsample abundances to a full sample basis, e.g. if 1/2 the sample was sorted, then the subsample correction is X2.
Area correction factor to square meter	Converts abundances of full sample to a 1 square meter basis, e.g. if 8 square feet was sampled, then the conversion to 1 square meter is X1.345
SUMMARY METRICS	
Total taxa richness	Total count of unique taxa in sample.
Total abundance	Total abundance in sample converted to a full sample and 1 square meter basis.
Total biomass (mg)	Total biomass in full sample adjusted to a 1 square meter basis as calculated by length/mass regressions.
EPT taxa richness	Taxa richness in the insect orders Ephemeroptera+Plecoptera+Trichoptera, or mayflies+stoneflies+caddisflies.
EPT abundance	
EPT biomass (mg)	
DOMINANCE AND DIVERSITY	Metrics that examine how dominated the community is by a single or few taxa.
% Dominant taxa	The % contribution of the most numerous taxon.
Biomass dominant taxa (mg)	
% Top 3 taxa	The % contribution of the 3 most numerous taxa.
Biomass top 3 taxa (mg)	
Shannon-Weaver Diversity (loge)	Information theory index that examines how evenly abundance is allocated among the taxa present in the community.
Shannon-Weaver Diversity (log2)	
TOLERANT AND INTOLERANT TAXA	Based on habitat association and best professional judgement (Wisseman unpublished). Water temperature and dissolved oxygen are the dominant environmental factors.
% Total tolerant taxa	Sum of the moderately and highly tolerant taxa. Taxa found frequently in habitats with warm water temperature and low dissolved oxygen. Eurythermal.
Total tolerant taxa richness	
Total tolerant taxa abundance	
Total tolerant taxa biomass (mg)	
% Highly tolerant taxa	Taxa highly tolerant of warm water and very low dissolved oxygen. Found often in stagnant and highly eutrophic habitat.
Highly tolerant taxa richness	
Highly tolerant taxa abundance	
Highly tolerant taxa biomass (mg)	
% Moderately tolerant taxa	Taxa moderately tolerant of warm water and low dissolved oxygen.
Moderately tolerant taxa richness	
Moderately tolerant taxa abundance	
Moderately tolerant taxa biomass (mg)	
% Total intolerant taxa	Sum of moderately intolerant and highly intolerant taxa. Cool and cold water biota found in habitats with high dissolved oxygen.
Total intolerant taxa richness	
Total intolerant taxa abundance	
Total intolerant taxa biomass (mg)	
% Highly intolerant taxa	Taxa generally found in habitats with year-round cold water temperatures and very high dissolved oxygen. Indicative of bull trout zone. Cold water biota, cold stenotherms.
Highly intolerant taxa richness	
Highly intolerant taxa abundance	
Highly intolerant taxa biomass (mg)	
% Moderately intolerant taxa	Taxa generally found in cool water habitats, cold to cool water eurythermal. Indicative of general salmonid zone.
Moderately intolerant taxa richness	
Moderately intolerant taxa abundance	
Moderately intolerant taxa biomass (mg)	
VOLTINISM (length of life cycle)	Modified from Poff et al. 2006
% Semivoltine (> 1 year life cycle)	Taxa where a significant proportion of individuals require more than one year to complete their life cycle.
% Univoltine (1 year life cycle)	Taxa where most individuals exhibit a one year life cycle.
% Multivoltine (< 1 year life cycle)	Taxa where a significant proportion of the population has more than one generation a year.
Semivoltine taxa abundance	
Univoltine taxa abundance	
Multivoltine taxa abundance	
Semivoltine taxa richness	
Univoltine taxa richness	
Multivoltine taxa richness	
Semivioltine taxa biomass (mg)	
Univoltine taxa biomass (mg)	
Multivoltine taxa biomass (mg)	
GROWTH AND DEVELOPMENT	Modified from Poff et al. 2006
% Fast seasonal life cycle	Taxa that grow and mature over a few months or a single season.
% Slow seasonal life cycle	Taxa where growth and maturation extends over several seasons.
% Nonseasonal life cycle	Taxa that exhibit asynchronous seasonal development, with multiple life stages present during most of the year.
OCCURRENCE IN DRIFT	Modified from Poff et al. 2006
% Rare in drift	Found rarely in stream drift. Drift occurs during catastrophic events (e.g. floods).
% Common in drift	Found commonly in stream drift.
% Abundant in drift	Dominant in stream drift, behavioral drifters.
SIZE AT MATURITY	Modified from Poff et al. 2006
% Small size at maturity	<9 mm long at maturity
% Medium size at maturity	9-16 mm long at maturity
% Large size at maturity	> 16 mm long at maturity
Small size at maturity abundance	
Medium size at maturity abundance	
Large size at maturity abundance	
Small size at maturity taxa richness	
Medium size at maturity taxa richness	
Large size at maturity taxa richness	
Small size at maturity taxa biomass (mg)	
Medium size at maturity taxa biomass (mg)	
Large size at maturity taxa biomass (mg)	
RHEOPHILY AND HABITAT AFFINITY	Modified from Poff et al. 2006
% Depositional only	Occurs primarily in lentic habitats, stream pools and alcoves, or low gradient slowly flowing streams.
% Depositional and erosional	Stream taxa found in both pools and riffles, though usually in protected pockets in riffles.
% Erosional	Stream taxa associated with moderate to fast water current.
THERMAL PREFERENCE	Modified from Poff et al. 2006
% Cold stenothermal and cool eurythermal	
% Cool/warm eurythermal	
% Warm eurythermal	
NON-INSECT AND INSECT ORDERS	
% Non-insect invertebrates	Hydroids, vermiform taxa, mollusks, crustaceans and mites.
% Ephemeroptera (mayflies)	
% Odonata (damsel- and dragonflies)	
% Plecoptera (stoneflies)	
% Hemiptera (true bugs)	
% Megaloptera (alderflies & hellgramites)	
% Trichoptera (caddisflies)	
% Lepidoptera (moths)	
% Coleoptera (beetles)	
% Diptera (total)(true flies)	Inclusive of the Chironomidae.
% Chironomidae (true flies-midges)	Dominant and ubiquitous aquatic dipteran family.
Non-insect taxa richness	
Ephemeroptera taxa richness	
Odonata taxa richness	
Plecoptera taxa richness	
Hemiptera taxa richness	
Megaloptera taxa richness	
Trichoptera taxa richness	
Lepidoptera taxa richness	
Coleoptera taxa richness	
Diptera (total) taxa richness	
Chironomidae taxa richness	
Non-insect abundance	
Ephemeroptera abundance	
Odonata abundance	
Plecoptera abundance	
Hemiptera abundance	
Megaloptera abundance	
Trichoptera abundance	
Lepidoptera abundance	
Coleoptera abundance	
Diptera (total) abundance	

Chironomidae abundance	
Non-insect biomass (mg)	
Ephemeroptera biomass (mg)	
Odonata biomass (mg)	
Plecoptera biomass (mg)	
Hemiptera biomass (mg)	
Megaloptera biomass (mg)	
Trichoptera biomass (mg)	
Lepidoptera biomass (mg)	
Coleoptera biomass (mg)	
Diptera (total) biomass (mg)	
Chironomidae biomass (mg)	
INDICATOR TAXA	
Mollusca (snails and bivalves) taxa richness	
Crustacea taxa richness	Benthic taxa include Ostracoda, Amphipoda, Isopoda, Decapoda, and the Chydoridae (Cladocera), but not water column associated microcrustaceans (e.g. Daphnidae and Copepoda)
Baetidae (mayfly) taxa richness	Common, ubiquitous and diverse family of minnow-like mayflies.
Ephemerellidae (mayfly) taxa richness	Common, ubiquitous and diverse family of mayflies with most taxa associated with cool-cold montane rivers. Many taxa intolerant.
Heptageniidae (mayfly) taxa richness	Common, ubiquitous and diverse family of mayflies. Rheophilic, scraper mayflies found over a broad longitudinal range in montane and foothill rivers and streams.
Nemouridae (stonefly) taxa richness	Common, ubiquitous, and diverse family of stoneflies. Broadly distributed along river systems with peak diversity in small, forested streams.
Rhyacophilidae (caddisfly) taxa richness	Common, ubiquitous and very diverse family of caddisflies. Primarily predators. Broadly distributed along river systems with peak diversity in small to mid-size, cool/cold montane streams.
Hydropsychidae (caddisfly) taxa richness	Common, ubiquitous, and diverse family of net spinning caddisflies.
Elmidae (riffle beetle) taxa richness	Common, ubiquitous, and diverse family of aquatic beetles.
Oligochaeta (segmented worms) abundance	
Mollusca abundance	
Crustacea abundance	
Acari (mites) abundance	
Baetidae abundance	
Baetis tricaudatus (mayfly) abundance	
Ephemerellidae abundance	
Heptageniidae abundance	
Nemouridae abundance	
Rhyacophilidae abundance	
Hydropsychidae taxa abundance	
Elmidae abundance	
Simuliidae (blackfly) abundance	
Tanytarsini (midge) abundance	
% Oligochaeta (segmented worms)	
% Mollusca	
% Crustacea	
% Acari	
% Baetidae	
% Baetis tricaudatus	
% Ephemerellidae	
% Heptageniidae	
% Nemouridae	
% Rhyacophilidae	
% Hydropsychidae	
% Elmidae	
% Simuliidae	
% Tanytarsini	
Oligochaeta biomass (mg)	
Mollusca biomass (mg)	
Crustacea biomass (mg)	
Acari biomass (mg)	
Baetidae biomass (mg)	
Baetis tricaudatus biomass (mg)	
Ephemerellidae biomass (mg)	
Heptageniidae biomass (mg)	
Nemouridae biomass (mg)	
Rhyacophilidae biomass (mg)	
Hydropsychidae biomass (mg)	
Elmidae biomass (mg)	
Simuliidae biomass (mg)	
Tanytarsini biomass (mg)	
FEEDING GROUPS	Functional feeding groups based on the mechanism by which taxa feed. Modified from Merritt et al. 2008.
Predator taxa richness	Taxa that are primarily predators, consuming living animal tissue by engulfing prey or piercing prey tissues and sucking fluids. Excluding parasites.
Parasite taxa richness	External parasites of invertebrates (e.g. Acari or mites), or internal parasites (e.g. Nemata or roundworms).
Collector-gatherer taxa richness	Utilize mouthparts and other structures to "gather" fine particulate organic matter (FPOM) that is mostly detritus but may include algae, bacteria, small animals, etc.
Collector-filterer taxa richness	Utilize nets, mothparts or other structures to capture and consume FPOM suspended in the water column. FPOM may include algae, bacteria, small animals, etc.
Collector (total) taxa richness	Sum of the collector-gatherer and collector-filterer.
Piercer herbivore taxa richness	Also called Macrophyte piercers. Pierce living tissue of aquatic macrophytes and suck fluids, e.g. some Hydroptilidae.
Macrophyte herbivore taxa richness	Chewers and miners of living macrophytes. Considered a subclass of shredders in Merritt et al. 2008.
Shredder taxa richness	Consume (chew) coarse particulate organic matter (CPOM) such as decaying leaves and wood.
Scraper taxa richness	"Scrape" periphyton (attached algae) and associated material from hard surfaces.
Omnivore taxa richness	Taxa exhibiting multiple feeding mechanisms (above), with no one mechanism clearly dominant.
Unknown taxa richness	No information available on how and what taxon feeds on.
Predator abundance	
Parasite abundance	
Collector-gatherer abundance	
Collector-filterer abundance	
Collector (total) abundance	
Piercer herbivore abundance	
Macrophyte herbivore abundance	
Shredder abundance	
Scraper abundance	
Omnivore abundance	
Unknown abundance	
% Predator	
% Parasite	
% Collector-gatherer	
% Collector-filterer	
% Collector (total)	
% Piercer herbivore	
% Macrophyte herbivore	
% Shredder	
% Scraper	
% Omnivore	
% Unknown	
Predator biomass (mg)	
Parasite biomass (mg)	
Collector-gatherer biomass (mg)	
Collector-filterer biomass (mg)	
Collector (total) biomass (mg)	
Piercer herbivore biomass (mg)	
Macrophyte herbivore biomass (mg)	
Shredder biomass (mg)	
Scraper biomass (mg)	
Omnivore biomass (mg)	
Unknown biomass (mg)	
HABIT	Mode of existence.
Skater taxa richness	Adapted for "skating" on the wayter surface. Generally excluded from benthic data sets.
Planktonic taxa richness	Inhabit the water column in lentic water or slow moving streams. Generally excluded from benthic data sets.
Diver taxa richness	Swim in the water column and along the benthos, but return to the water surface to obtain oxygen. Gnerally excluded from benthic data sets.
Swimmer taxa richness	Exhibit fishlike swimming in lotic or lentic waters, but return to the benthos between bursts of swimming. Included in benthic data sets.
Clinger taxa richness	Taxa that have behavioral (e.g. net spinners) or morphological adaptations (e.g. claws) to attach to hard substrates in faster water current.
Sprawler taxa richness	Found on the surface of fine sediments or floating leaves of macrophytes.
Climber taxa richness	Found on leaves and stems of aquatic macrophytes or submerged branches and roots.
Burrower taxa richness	Burrow into fine sediments or tunnel into plant stems, leaves or roots (miners)

Unknowns taxa richness	Not able to classify as above.
Skater abundance	
Planktonic abundance	
Diver abundance	
Swimmer abundance	
Clinger abundance	
Sprawler abundance	
Climber abundance	
Burrower abundance	
Unknowns abundance	
% Skater	
% Planktonic	
% Diver	
% Swimmer	
% Clinger	
% Sprawler	
% Climber	
% Burrower	
% Unknown	
Skater biomass (mg)	
Planktonic biomass (mg)	
Diver biomass (mg)	
Swimmer biomass (mg)	
Clinger biomass (mg)	
Sprawler biomass (mg)	
Climber biomass (mg)	
Burrower biomass (mg)	
Unknowns biomass (mg)	
STATE OF CALIFORNIA DESIGNATIONS	Traits coding according to CAMLnet January 27, 2003. List of California macroinvertebrate taxa and standard taxonomic effort.
CA % Sensitive EPT	Ephemeroptera, Plecoptera and Trichoptera with California Tolerance Value (CTV) of 0-2 on a 0-10 scaling.
CA % Intolerant individuals	All invertebrates with a CTV of 0-2 on a 0-10 scaling.
CA % Tolerant individuals	All invertebrates with a CTV of 8-10 on a 0-10 scaling.
CA weighted tolerance value	Calculates the Hilsenhoff Biotic Index using the California Toilerance Values (CTV)
CA % Predators	Primary designation of predator as classed by CA.
CA % Gatherers	Primary designation of gatherer as classed by collector-gatherer by CA.
CA % Filterers	Primary designation of fileter as classed by collector-filterer by CA.
CA % Scrapers	Primary designation of scraper as classed by CA.
CA % Shredders	Primary designation of shredder as classed by CA.

Site	Date	Taxon	Stage	Abundance	Subsample.correction.factor
ET-4-BI	04/25/2012 00:00:00	Turbellaria	U	2	3.2
ET-4-BI	04/25/2012 00:00:00	Nemata	U	13	3.2
ET-4-BI	04/25/2012 00:00:00	Oligochaeta	U	34	3.2
ET-4-BI	04/25/2012 00:00:00	Lymnaeidae	U	4	3.2
ET-4-BI	04/25/2012 00:00:00	Ostracoda	U	5	3.2
ET-4-BI	04/25/2012 00:00:00	Limnephilidae	L	33	3.2
ET-4-BI	04/25/2012 00:00:00	Dolichopodidae	L	1	3.2
ET-4-BI	04/25/2012 00:00:00	Ceratopogoninae	L	1	3.2
ET-4-BI	04/25/2012 00:00:00	Mycetophilidae	L	1	3.2
ET-4-BI	04/25/2012 00:00:00	Twinnia	L	38	3.2
ET-4-BI	04/25/2012 00:00:00	Caloparyphus	L	1	3.2
ET-4-BI	04/25/2012 00:00:00	Tipula	L	11	3.2
ET-4-BI	04/25/2012 00:00:00	Diamesa	L	6	3.2
ET-4-BI	04/25/2012 00:00:00	Metriocnemus	L	2	3.2
ET-4-BI	04/25/2012 00:00:00	Orthocladius	L	384	3.2
ET-4-BI	04/25/2012 00:00:00	Rheocricotopus	L	32	3.2
ET-4-BI	04/25/2012 00:00:00	Smittia	L	11	3.2