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Black Butte OU1 Data Summary Report – Addendum 1

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Abbreviations and Acronyms

°C	degrees Celsius
ACM Collector	Aerochem Metric Precipitation Collector
Ag	silver
Al	aluminum
As	arsenic
AVS	acid volatile sulfide
Ba	barium
BBM	Black Butte Mine Superfund Site
BERA	Baseline Ecological Risk Assessment
bgs	below ground surface
Ca	calcium
Cd	cadmium
cfs	cubic feet per second
CFW	Coastal Fork Willamette
CGL	Cottage Grove Lake
CL	clay
CLP	Contract Laboratory Program
cm	centimeter
Co	cobalt
cond	conductivity
COPC	contaminants of potential concern
cr	chromium
CRQL	contract required quantitation limit
CSM	conceptual site model
CU	copper
DC1	Dennis Creek surface water monitoring station
DMA	Demonstration of Methods Applicability
DO	dissolved oxygen
DOC	dissolved organic carbon
DQI	data quality indicators
DQO	data quality objectives
DS	dried and sieved
DTW	depth to water
EDD	electronic data deliverable
EQL	Estimated Quantitation Limit
FC1	Furnace Creek surface water monitoring station
FPXRF	field portable X-ray diffraction
°F	degrees Fahrenheit
Fe	iron
Ft	feet
g	gram
GD1	Garoutte Creek downstream surface water monitoring station
GPS	Global Positioning System

GSS	General Site Soils
GU1	Garoutte Creek upstream surface water monitoring station
Hg	mercury
HgS	mercury sulfide
ICP-MS	inductively coupled plasma – mass spectroscopy
ICP-AES	inductively coupled plasma –atomic emission spectroscopy
IDW	Investigation derived waste
IS	incremental samples
ITRC	Interstate Technology and Regulatory Council
kg	kilogram
kg/yr	kilograms per year
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
L/kg	liters per kilogram
L/min	liters per minute
MDN	Mercury Deposition Network
MEL	Manchester Environmental Laboratory
Mg	magnesium
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mg/yr	milligrams per year
Mn	Manganese
µm	micrometer
µs/cm	microsiemen per centimeter
min	minute
ML	silt
mL/min	milliliters per minute
mm	millimeter
MRL	minimum reporting level
MRLC	Multi-Resolution Land Characteristics
MS	matrix spike
MSD	matrix spike duplicates
msl	Mean sea level
mV	millivolt
n value	The Gauckler-Manning coefficient
NA	not applicable
Na	sodium
NADP	National Atmospheric Deposition Program
NFG	National Function Guidelines
ng/L	nanograms per liter
Ni	nickel
NO_2	Nitrite
NO_3	Nitrate
NTUs	nephelometric turbidity units
ORP	Oxidation-Reduction Potential
OU1	Operable unit 1
OU2	Operable unit 2

OU3	Operable unit 3
PAL	Project Action Limit
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
Pb	lead
pH	potential Hydrogen
PQLG	Project Quantitation Limit Goal
QAPP	Quality Assurance Project Plan
QC	Quality control
RSD	Relative standard deviation
RPD	relative percent difference
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
S	sieved
S4VEM	Stage 4 level
S4VM	Stage 4 level
Sb	antimony
sec	second
Site	Black Butte Mine Superfund Site
SPAF	Sample Plan Alteration Form
SRM	standard reference material
SU	standard unit
SUVA	specific ultraviolet absorbance
Swoffer gauge	Swoffer open stream velocity meter
sync	synchronize
Tl	thallium
TAL	target analyte list
TDS	total dissolved solids
temp	temperature
TMM	Tailing and Mine Materials
TOC	Total Organic Carbon
TSS	total suspended solids
Turb	turbidity
UDC1	upstream Dennis Creek sediment sample
US	unsieved
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geologic Survey
UV	ultraviolet
V	vanadium
veg	vegetation
Watershed	Watershed Sciences, Inc.
w/	with
WH1	Weyerhauser drainage surface water monitoring station
YSI	Yellow Springs Instrument Company
Zn	zinc

Section 1

Introduction

CDM Smith, under the Parametrix AES Contract (Contract No. 68-S7-03-04) completes this addendum to the *Black Butte OU1 Data Summary Report* [OU1 Data Summary Report] (CDM Smith 2014), under Task Order 052 by the U.S. Environmental Protection Agency (USEPA). A portion of the comprehensive Task Order involves performing a remedial investigation (RI) for Operable Unit 1 (OU1) of the Black Butte Mine Superfund Site (site) in Lane County, Oregon. The OU1 study area encompasses the former new and old furnace mine site areas, including mine portals, distributed tailings and the receiving surface water streams immediately adjacent to the former mining activity.

Three phases of investigation were conducted in accordance with Task Order 052 of CDM Smith's comprehensive *Work Plan for a Remedial Investigation/Feasibility Study (RI/FS) at the Black Butte Mine Superfund Site* (CDM Smith 2012a). This addendum to the OU1 Data Summary Report is based on the scope of work presented in the *Technical Memorandum on Phase 1 Implementation of the Work Plan* (CDM Smith 2012b); *Technical Memorandum on Phase 1a Implementation of the Work Plan* (CDM Smith 2013a)*; Technical Memorandum on Phase 2 Implementation of the Work Plan* (CDM Smith 2013b), and on the recommendations for additional data collection presented in the OU1 Data Summary Report. The primary objectives of Phase 1, 1a, and 2 activities are to:

1) Characterize the concentrations of mercury and other metals within various potential sources identified at OU1 and

2) Quantify the load of metals discharging into Garoutte Creek, a tributary to the Coastal Fork of the Willamette River.

1.1 Purpose

The OU1 Data Summary Report described Phase 1, 1a, and 2 investigation activities and presented an evaluation of available data. The OU1 Data Summary Report included data collected from initiation of field activities in August 2012 through completion of the storm surface water sampling event in November 2013. This addendum report augments the OU1 Data Summary Report and describes investigation activities that were completed between February 2014 and July 2014. Analytical laboratory data for samples that were collected during the OU1 Data Summary Report reporting period (August 2012 through November 2013) but not available at the time the OU1 Data Summary Report was prepared is also included in the addendum report. The addendum report includes the following data:

- Total organic carbon (TOC) and sulfate results from the October 2013 background sediment sampling
- Surface water and atmospheric deposition analytical results from the November 2013 storm event #2
- Groundwater analytical and field water quality data from the November 2013 monitoring event
- Surface water and atmospheric deposition analytical results from the February 2013 storm event #3

- Demonstration of Methods Applicability (DMA) Study field and analytical data collected in February 2014
- Automated surface water, groundwater, and climate instrumentation monitoring data through May 2014
- Field groundwater level and quality monitoring results from the May 2014 monitoring event

These data will be used along with the data presented in the OU1 Data Summary Report to assess the validity of the preliminary conceptual site model (CSM) presented in the optimization review for the OU1 area, to recommend modifications to the CSM where applicable, and to identify potential data gaps that should be addressed in future RI sampling activities.

1.2 Report Organization

This addendum is organized into the following sections:

- **Section 1 -Introduction**. Describes the purpose and data presented in the addendum.
- **Section 2 - Study Area Investigations.** Describes the fieldwork completed during the study area investigations and presents field and analytical data.
- **Section 3 – References.** Lists the references that were cited in the addendum report.

The appendices to the addendum include the following:

- **Appendix A –** Field Forms
- **Appendix B –** Demonstration of Methods Applicability Study
- **Appendix C –** Data Validation and Usability Narrative

The table and figure numbers for tables and figures presented in this addendum retain the same number or numbering sequence as in the OU1 Data Summary Report. For example, a hydrograph which is updated with new data presented in the addendum will have the same figure name as in the OU1 Data Summary Report. A table, such as the November 2013 Surface Water Data, will have a new table number that follows the numbering sequence of the previous March 2013 Surface Water Data table (e.g. Table 4.3-2 to Table 4.3-3).

Section 2

Study Area Investigations

This section describes the OU1 study area investigation activities completed between February 2014 and May 2014 and presents available analytical data from those activities, as well as analytical results from investigation activities completed in October and November 2013 but not available at the time the OU1 Data Summary Report was submitted. Details on investigation methodology are presented in the OU1 Data Summary Report. An updated summary and schedule for the field work completed during OU1 study area investigations is shown in **Table 2.1-1**. **Table 2.1-2** presents a cumulative summary of the data collected at OU1.

2.1 Field Investigations

2.1.1 Stream Discharge Measurements

Direct discharge or cross-sectional stream velocity measurements were collected at GU1, GD1, DC1, and FC1 to estimate stream discharge at the time of each measurement. A Swoffer open stream velocity meter (Swoffer gauge) was used to measure the stream velocity and depth over an established cross-sectional traverse at GU1, GD1, and DC1 in the general vicinity of the staff gauge. The stream discharge at FC1 was determined by direct measurement at a small waterfall located 20 feet upstream of the FC1 staff gauge. Direct stream discharge measurements at FC1 were also attempted using a v-notch weir during the February 2014 storm event #3; however, due to high flow conditions, accurate measurements using the weir were not obtained. Cross-sectional stream velocity or direct stream discharge measurements were made at GU1, GD1, DC1, and FC1 during the February 2014 storm event #3 and at GD1 during the July 2014 field instrumentation download event, dates of which are listed in **Table 2.1-1**.

The stream discharge and corresponding staff gauge level were used to update the rating curve for each stream. Continuous water level data collected using pressure transducers and data loggers installed in stilling pipes at GU1, GD1, DC1, and FC1 was converted to stream discharge using the rating curve. Cumulative graphs of stream discharge and precipitation over time for the GU1, GD1, FC1, and DC1 are presented in **Figures 3.3-5, 3.3-6, 3.3-11,** and **3.3-13**, respectively.

2.1.2 Atmospheric Deposition and Climate Monitoring (November 2013 and February 2014)

Collection of the atmospheric deposition data for the November 2013 storm event #2 was described in the OU1 Data Summary Report; however, the analytical results are presented in this addendum in **Table 4.4-2**.

Precipitation samples were collected during the February 2014 storm event #3 following the same methods used during storm events #1 and #2. Precipitation samples were collected for low-level mercury and methyl mercury analysis using an Aerochem Metric Precipitation Collector (ACM Collector) and precipitation samples were collected for analysis of the Contract Laboratory Program (CLP) defined Target Analyte List (TAL) metals and common ions using a pole-mounted precipitation collector. The samplers were deployed at the beginning of the storm event on February 13, 2014 and retrieved upon the completion of the storm event surface water sample collection on February 16,

2014. The precipitation sample analytical results for the February 2014 storm event #3 are presented in **Table 4.4-3**.

The BBM weather station consists of a Davis Vantage Pro2 Weather Station mounted on a steel pole cemented into the ground. Weather station sensors include a tipping rain bucket, wind vane, anemometer, thermometer, and barometer. Data was recorded at 15-minute intervals during storm events #1, #2, and #3 and at 1-hour intervals for non-storm event periods. Weather station data was downloaded at the end of the February 2014 storm event #2, during the March 2014 surface water and groundwater sensor download event, and during the May 2014 groundwater monitoring event. A graph of precipitation data recorded at the BBM weather station is presented in **Figure 3.3-5.**

2.1.3 Surface Water Sampling

Surface water sampling events reported under this addendum include data collected during the November 2013 storm event #2 and February 2014 storm event #3 and non-storm event surface water data collected during the May 2014 groundwater monitoring event.

2.1.3.1 Storm Event Surface Water Sampling (November 2013 and February 2014)

Previous storm event surface water sampling events, described in the OU1 Data Summary Report include:

- March 2013 storm event #1 – a late winter storm event of moderate rainfall amounts.
- November 2013 storm event #2 – an early winter first-flush storm event of moderate rainfall and short duration.

The February 2014 storm event #3 was a mid-winter storm event of significantly higher precipitation amounts and higher stream levels than storm event #1 and #2.

Storm Event #2 Surface Water Sampling (November 2013)

Sampling details for the November 2013 storm event #2 were described in the OU1 Data summary report but the analytical laboratory results are presented in this addendum in **Table 4.2-3.**

Storm Event #3 Surface Water Sampling (February 2014)

On February 13, 2013 a field sampling team mobilized to the site, setting up surface water sampling stations, collected baseline surface water samples, and deployed precipitation samplers at the BBM weather station. Set up included downloading data from the BBM weather station, downloading data from the Troll 9500 sensors at GD1, GU1, DC1 and the AquaTroll 200 sensor at FC1, performing calibration checks on the sensors, and installing a temporary rain gauge near the DC1 station. Swoffer gauge measurements were also collected at GU1, GD1, and DC1. The following describes the conditions and sequencing of the collection of the five surface water samples during the February 2014 storm event. Storm event details during sample collection were recorded on the storm event field forms, copies of which are included in **Appendix A**. **Figures 2.2-11** through **2.2-14** show the hydrograph data for FC1, DC1, GU1, and GD1 with the five sample collection periods indicated.

On the evening of February 13, 2014, baseline surface water samples were collected at stations GD1, GU1, FC1, and DC1. There was no observed or recorded rain for an approximate 12-hour period preceding the collection of the baseline surface water samples. Surface water samples were collected using the same equipment and methods used during the March 2013 storm event #1 and November 2013 storm event #2 surface water sampling. One 2-person team worked from the upper Garoutte

staging area to collect samples at GU1 and FC1 and one 2-person team worked from the lower Garoutte staging area to collect samples at GD1 and DC1. During the baseline sampling round and all subsequent sampling round, samples were collected at GD1 and GU1 in parallel, followed by sample collection at DC1 and FC1. At FC1, the baseline sample was collected directly from the waterfall located 20 feet upstream of the FC1 staff gauge. A field duplicate was collected at DC1 during the baseline sampling round.

In the late evening of February 13, 2014, rain began to fall and moderate to heavy rainfall continued through the night and following day. The first rising limb surface water sample was collected during mid to late morning after more than 1.43 inches of precipitation had collected in the temporary rain gauge and the GD1, GU1, and DC1 stations had observed stage increases equal to or greater than the established triggers for sampling. At FC1, the sample was collected from the pool formed directly upstream of the v-notch weir, which was located 20 feet downstream of the FC1 staff gauge. A matrix spike/matrix spike duplicate (MS/MSD) was collected at GD1 and a field duplicate was collected at DC1 during this sampling round.

Light to moderate rain continued throughout the day of February 14, 2014. By early evening, after an additional 0.8 inches of rain had collected in the temporary rain gauge and stream levels had stopped increasing or began to decrease at GU1, GD1, DC1, and FC1, a decision was made to collect the peak flow sample. At FC1, the sample was collected from the pool formed directly upstream of the v-notch weir. An MS/MSD was collected at DC1 and a field duplicate was collected at GD1 during this sampling round.

Rainfall decreased to light or intermittent rain by the early morning of February 15, 2014 and the GD1, GU1, DC1, and FC1 stations had observed stage decreases equal to or greater than the established triggers for sampling, therefore, the first falling limb surface water sample was collected on the morning of February 15, 2014. At FC1, the sample was collected from the pool formed directly upstream of the v-notch weir. An additional surface water sample was collected from the culvert where an unnamed stream emanating from the slope west of the Weyerhaeuser Road crosses under the Weyerhaeuser Road. This new surface water sampling location is designated WH1. A field blank sample was collected at the DC1 station during this sampling round.

With the exception of one short intense rainfall event on the afternoon of February 15, 2014, rainfall was light and intermittent and stream levels declining through the morning of February 16, 2014. The second falling limb surface water sample was collected on late morning of February 16, 2014. Due to stream erosion and sedimentation of the pool formed by the FC1 v-notch weir, the FC1 surface water sample was collected from a pool approximately eight feet downstream of the weir location during this sampling round. An MS/MSD sample was collected at GD1 and field blanks were collected at the GD1 and DC1 stations during this sampling round.

Upon completion of the surface water sampling, the BBM weather station and the water level/quality data from the Troll 9500 sensors at GD1, GU1, DC1 and the AquaTroll 200 at FC1 were downloaded to retrieve data recorded during the storm event. Each station data logger's memory was cleared and the units were programmed to continue recording parameters.

The analytical laboratory data for the surface water samples collected during the February 2014 storm event #3 are presented in **Table 4.2-4.**

2.1.3.2 Non-storm Event Surface Water Sampling (May 2014)

Surface water samples were collected at GU1, GD1, DC1, FC1, upper Furnace Creek at the (b) (6) residence potable water supply (sample site designated (b) (6) Potable Supply), and from water discharging from an one of the open adits at the BBM (sampling site designated ADIT). The surface water samples were collected concurrently with the May 2014 groundwater sampling event. Single grab samples were collected at each location following the same sampling methods used during the storm event surface water sampling, which are described in the OU1 Data Summary Report. A field duplicate sample was collected at DC1 and an MS/MSD was collected at GU1 during this sampling event. Sampling details and field measured parameters were recorded on a *Surface Water Sampling Record* field sheet, copies of which have been included in **Appendix A**. Analytical laboratory results for the surface water samples collected during the May 2014 event were not available at the time of this addendum and will be included and evaluated in the Remedial Investigation Report for OU1.

2.1.4 Stream Sediment Sampling (October 2013)

Collection of the background sediment samples between October 8, 2013 and October 10, 2013 was described and available data presented in the OU1 Data Summary Report; however, the TOC and sulfate results were not available at the time the report was submitted. The TOC and sulfate results for the background sediment samples are presented in this addendum in **Table 4.3-1.**

2.1.5 Groundwater Monitoring (November 2013 and May 2014)

Groundwater monitoring details for the November 2013 groundwater monitoring event were described in the OU1 Data Summary Report but the groundwater analytical results were not available at the time the report was submitted. The groundwater analytical results and field groundwater quality results are presented in this addendum in **Tables 4.5-3** and **4.5-4**, respectively.

Field sampling details and available results for the May 2014 groundwater sampling event are described in the following section.

2.1.5.1 Groundwater Elevation Monitoring

Groundwater elevation monitoring included manual groundwater level measurements at all site monitoring wells and continuous groundwater level elevation measurements at selected wells using pressure transducer/data loggers.

Manual groundwater elevation measurements were completed on between May 5, 2014 for all wells except MW2 and MW4, which were measured on May 8, 2014. The manual groundwater elevation measurements from the May 2014 event, along with groundwater elevations from previous events, are included in **Table 3.5-1**. Manual groundwater level measurements were also completed during a site visit on July 15, 2014 and the measurements are included in **Table 3.5-1**.

Troll 700 pressure transducer/data loggers recorded groundwater levels and temperature at MW2, MW3, MW8, and MW12 at 15-minute intervals. The groundwater level and temperature data was downloaded from each data logger during the April 2014 surface water and groundwater sensor download event, the May 2014 groundwater monitoring event, and the July 2014 surface water and groundwater sensor download events. Graphs of groundwater elevation and temperature over time for MW2, MW3, MW8, and MW12 are presented in **Figures 3.5-2** through **3.5-5**. To evaluate hydraulic gradients between the groundwater in the alluvial aquifer and Garoutte Creek and Dennis Creek, graphs of stream stage versus groundwater elevation have been prepared for the paired groundwater

monitoring wells and surface water stilling wells at MW12/GU1, MW2/GD1, and MW3/DC1. These graphs are presented in **Figures 3.5-6** through **Figures 3.5-8**.

2.1.5.2 Groundwater Sampling

Groundwater sampling at monitoring wells MW2, MW3, MW4, MW5, MW6, MW7, MW8, MW9, MW10, MW11, MW12, and MW13 was conducted from May 5, 2014 through May 8, 2014. On May 5, 2014, monitoring well MW1 was purged dry and no groundwater sample was collected. Reduced sample volumes were recovered for laboratory analysis at monitoring wells MW8, MW10, and MW11 due to slow recharge of groundwater to the well during sampling. Each well was sampled using a peristaltic pump and low-flow sampling methods, details of which are described in the OU1 Data Summary Report. Sample collection details and field measured parameters were recorded on a *Low-Flow Groundwater Sampling Record* field sheet, copies of which have been included in **Appendix A**. Stabilized groundwater field water quality parameters (temperature, conductivity, dissolved oxygen, oxidation reduction potential, and turbidity) for the May 2014 groundwater sampling event are presented in **Table 4.5-5**. Analytical laboratory results for the groundwater samples collected during the May 2014 event were not available at the time of this addendum and will be included and evaluated in the Remedial Investigation Report for OU1.

Quality assurance/ quality control sampling during the May 2014 groundwater sampling event included collection of one field duplicate at MW5 and one field blank on a sampling tubing train.

2.1.5.3 Investigation Derived Waste

Investigation derived waste (IDW) included purge water from low-flow sampling of groundwater monitoring wells, decontamination water, and sampling expendables. Purge water was collected in buckets during groundwater sampling. Purge and decontamination water was poured on the ground within the IDW disposal area. Sampling expendables, such as nitrile gloves, were contained within a garbage bag and disposed in a municipal trash receptacle.

2.1.6 Demonstration of Method Applicability Study (February 2014)

Field data collection for the DMA study was conducted on February 11 and 12, 2014. Data collection consisted of mapping soil and mine waste along a series of transects at BBM and collection of discrete and incremental soil samples at locations along the transects and at mine dumps. Additional details on the data collection and analyses of the DMA study are described in **Appendix B** of this addendum.

2.2 Deviations from the QAPPs

The following deviations from the *Final Black Butte Mine Phase 1 Remedial Investigation – Surface Water Storm Sampling and Sediment Sampling Quality Assurance Project Plan* [BBM QAPP 1] (CDM Smith 2012c), the *Final Quality Assurance Project Plan for Black Butte Mine Phase 1 Remedial Investigation – Soil, Groundwater Investigation and Summer Quarter Baseline Surface Water Sampling* [BBM QAPP 2)] (CDM Smith 2013b), and the *Final Quality Assurance Project plan for Black Butte Mine Phase 2 Remedial Investigation – Demonstration of Methods Applicability* [BBM QAPP 3] (CDM Smith 2013d), and all associated Sample Plan Alteration Forms (SPAFs) are noted for completion of the work described in this addendum:

- A Troll 700 pressure transducer was used to record water level at the GD1 stilling well due to ongoing problems with the Troll 9500 multi-parameter probe dedicated to the GD1 stilling well. The water level data collected using the Troll 700 was used to track stage height and

temperature during periods when the Troll 9500 was not operating correctly. The Troll 700 was positioned on the outside of the stilling well.

- During the April 2014 site visit it was observed that the stilling pipe and Troll 9500 probe at GU1 had been damaged by floating debris. The sensor was replaced with a Troll 700 sensor and data collection subsequent to April 2014 was limited to water level and temperature. In July 2014 the Troll 700 at GU1 was replaced with the AquaTroll 200 sensor from the FC1 stilling pipe.
- Due to frequent sedimentation of the stilling pipe at DC1, the Troll 9500 probe dedicated to the DC1 was removed from the stilling well and repositioned on the outside of the stilling well. The Troll 9500 probe was repositioned to the outside of the stilling well in February 2014, prior to storm event #3.
- During the February 2014 storm event #3, a total of five surface sampling rounds were completed instead of the six sampling rounds specified in BBM QAPP 1. Only five sampling rounds were completed because the second rising limb sample was missed due to the timing of the storm event.

2.3 QA/QC Summary

During the Phase 1 field work, QA/QC samples were collected to evaluate accuracy, precision and representativeness in the field processes. Field duplicates for samples were collected at a frequency of 10 percent of the total samples by medium and analyses. Equipment rinsates, which consist of the final rinse water (deionized water) after contact with a cleaned sampling tool, were not required for any of the sampling events discussed in this addendum. Field duplicate results are summarized in **Tables 2.4-7** through **2.4-10**. A summary of the data validation and usability findings for each field event is provided in **Appendix C**.

All field measurement equipment were checked with standards and/or calibrated daily prior to use. An equipment calibration log or other documentation was kept for each piece of equipment requiring calibration.

Analytical laboratory data were validated to the Stage 4 level. The QAPPs, the analytical methods, and EPA's *Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review* (EPA 2010) were used for data evaluation and validation.

The sediment analyses for Total Organic Carbon (TOC) and sulfate that were performed by Manchester Environmental Laboratories (MEL) in EPA Laboratory, were reported on a wet-weight basis. All other analytical results were reported on a dry-weight basis. Reporting analytical results on a wet-weight basis yields lower values than reporting on a dry-weight basis, with the difference being directly proportional to the percent solids of the samples.

2.3.1 Field QA/QC

Quality control activities were performed in the field in accordance with BBM QAPP 1, BBM QAPP 2, and BBM QAPP 3. These activities included:

- Checking of standards with and calibration of instruments used for field measurements including YSI-556 meters, turbidity meters, and a field portable X-ray diffraction (FPXRF) instrument.

- Collection of field duplicates
- Collection of field blanks

2.3.2 Analytical Data QA/QC

Data generated by the CLP laboratories was validated by an EPA Region 10 chemist to the Stage 4 level (S4VM). Data generated by MEL, was verified with all steps of Stage 4 validation by supervisory chemists at MEL. Subcontract laboratory data was validated to S4VM by a CDM Smith chemist. The results of the data validation and verification are discussed in **Appendix C**.

2.3.2.1 Duplicates

One field duplicate was collected for the October 2013 Background sediment samples and one field duplicate was collected for the November 2013 groundwater samples. A total of six field duplicates (three per storm event) were collected for the November 2013 Storm Event #2 and February 2014 Storm Event #3 surface waters. Four field duplicates were collected for the analyses of the grab sediment samples for the February 2014 DMA soil samples. Eight field duplicates were collected for the June 2013 Monitoring Well Installation soils. One field duplicate for the surface water samples and a field duplicate for the groundwater samples were collected for the August 2013 Groundwater and Surface Water samples. And, one field duplicate was collected for the grab sediment samples for the October 2013 Background sediment samples. These rates of collection met the QAPP-required rate of one field duplicate per 10 field samples. The results of the field duplicate analyses are presented in **Tables 2.4-7** through **2.4-10** and discussed in more detail in **Appendix C**.

2.3.3 Data Completeness

All analyses of all samples submitted were performed successfully with the exception of the nitrate plus nitrite (NO2 + NO3) and total alkalinity analyses of the precipitation sample collected during the November 2013 Storm Event #2. The sample volume for the anions and total alkalinity analyses of this precipitation sample were inadvertently collected in a bottle containing nitric acid in the field, which prevented meaningful analyses for these analytes. All data reported is considered acceptable with qualification of selected data as described in **Appendix C**. Two analyses out of a total of 820 analyses of field samples and field duplicates were requested, which yields a completeness result of 99.76%, which meets the QAPP specified goal of 100%.

2.3.3.1 Outstanding Analytical Data

All data for the October 2013 Background Sediment Sampling , the November 2013 Storm Surface Water Sampling Event #2, the November 2013 Groundwater Sampling, and the February 2014 Storm Surface Water Sampling Event #3 has been received in final form. At the time of the writing of this report, the low-level mercury and methyl mercury data and the final electronic data deliverable (EDD) for groundwater and surface water samples collected in May 2014 performed by MEL has not yet been received.

2.3.3.2 Rejects

No data received to date, including samples collected during the October 2013 Background Sediment Sampling, the November 2013 Storm Event #2 Surface Water Sampling, the November 2013 Groundwater Sampling, the February 2014 Storm Event #3 Surface Water Sampling and the February 2014 DMA Soil Sampling have been rejected. All data is acceptable for use.

No alkalinity and NO2 + NO3 data could be obtained for the November 2013 precipitation data due to collection of the sample in an inappropriately preserved sample container.

2.3.3.3 Estimated Values

Analytical data has been estimated on the basis of blank contamination, MS/MSD analyses, field duplicate results, serial dilutions (metals), and possible artifact formation of methyl mercury during the analysis. A more detailed discussion of the results of the data validation and validation reports are included in **Appendix C**.

Section 3

References

CDM Smith, Inc. (CDM Smith). 2012a. Work Plan for a Remedial Investigation/Feasibility Study (RI/FS) at the Black Butte Mine Superfund Site. March 14.

CDM Smith. 2012b. Technical Memorandum on Phase 1 Implementation of the Work Plan. August 16.

CDM Smith. 2012c. Final Black Butte Mine Phase 1 Remedial Investigation – Surface Water Storm Sampling and Sediment Sampling Quality Assurance Project Plan. December 14.

CDM Smith. 2013a. Technical Memorandum on Phase 1a Implementation of the Work Plan. February 28.

CDM Smith. 2013b. Final Quality Assurance Project Plan for Black Butte Mine Phase 1 Remedial Investigation – Soil, Groundwater Investigation and Summer Quarter Baseline Surface Water Sampling. June 14.

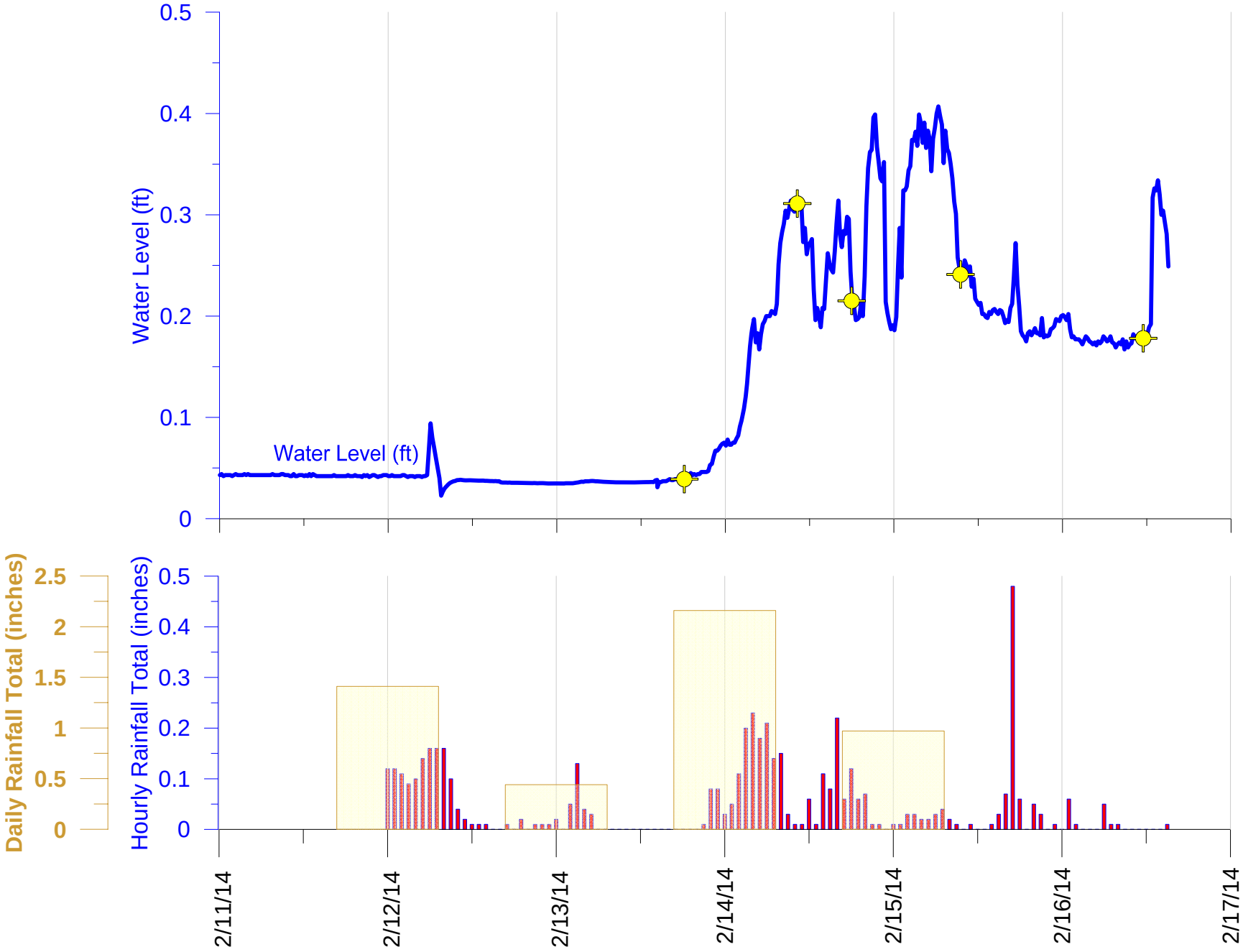
CDM Smith. 2013c. Technical Memorandum on Phase 2 Implementation of the Work Plan. October 17.

CDM Smith. 2013d. Final Quality Assurance Project plan for Black Butte Mine Phase 2 Remedial Investigation – Demonstration of Methods Applicability. December 31.

CDM Smith. 2014. Black Butte Mine OU1 Data Summary Report. July.

United States Environmental Protection Agency (USEPA). 2010. Contract Laboratories Program National Functional Guidelines for Inorganic Superfund Data Review. January 1.

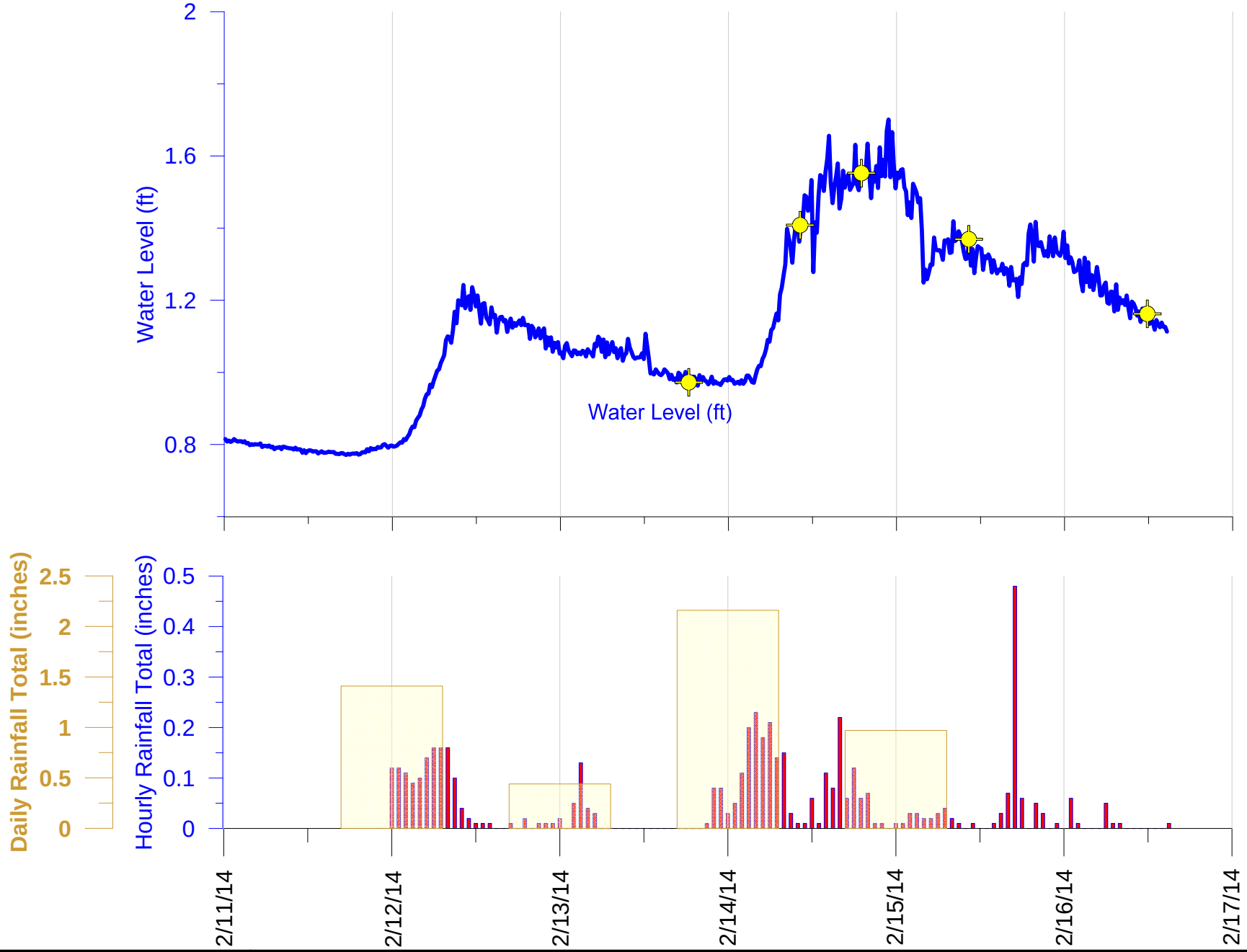
Figures



CDM Smith

Black Butte Mine Superfund Site

Figure 2.2-11
FC1 Hydrograph
and Sampling Interval
February 2014 Storm Event



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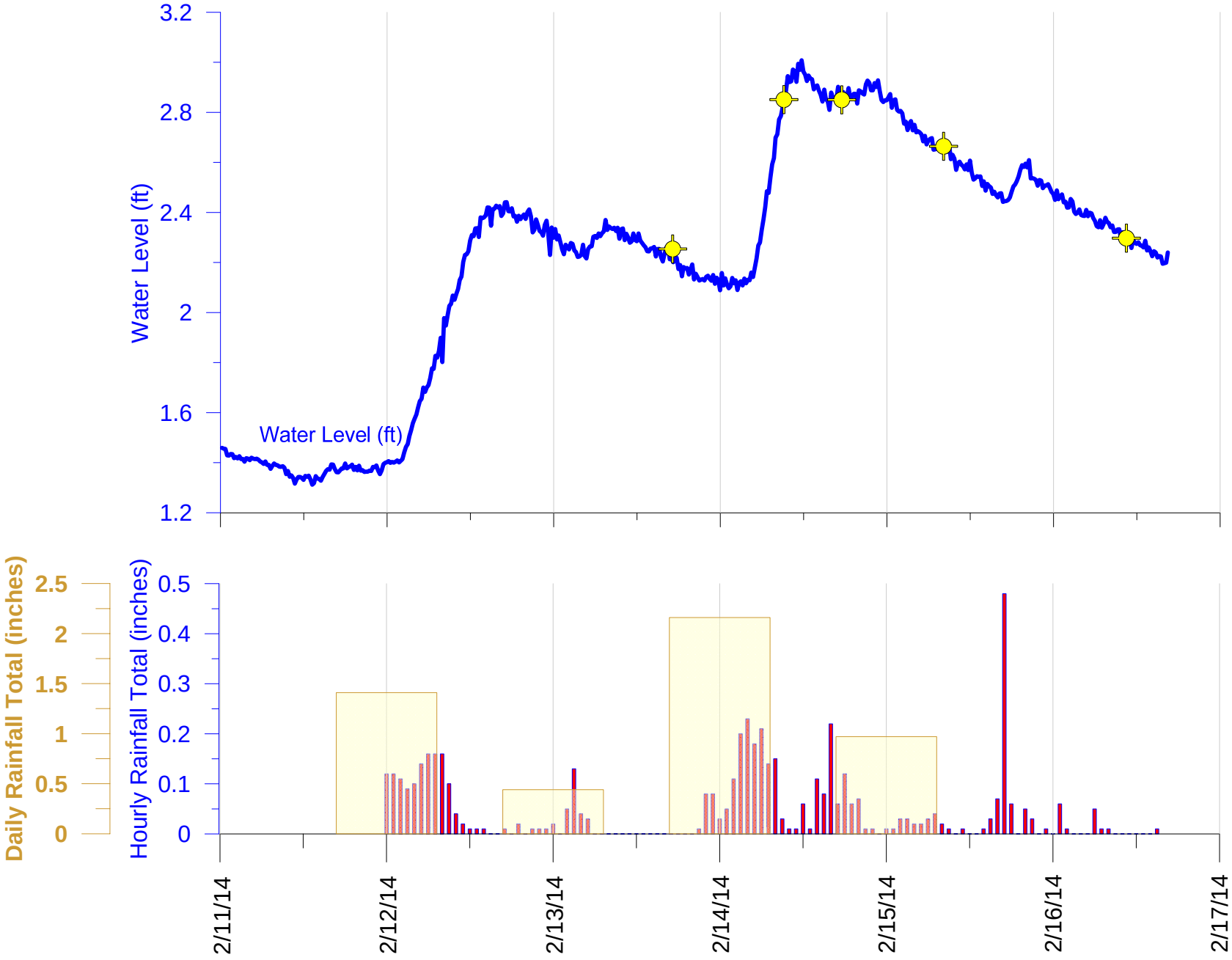
Black Butte Mine Superfund Site

Figure 2.2-12
DC1 Hydrograph
and Sampling Interval
February 2014 Storm Event



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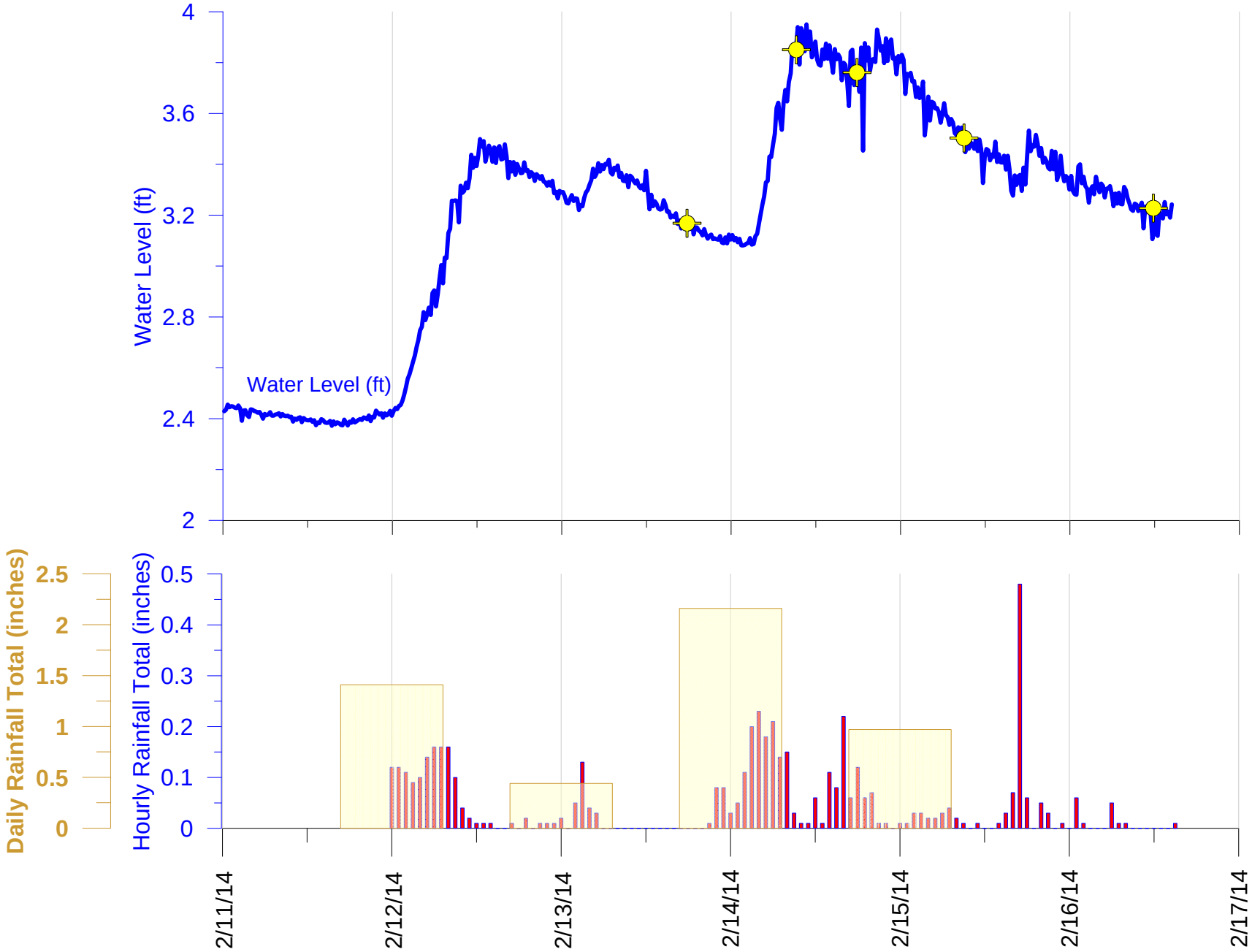
Black Butte Mine Superfund Site

Figure 2.2-13
GU1 Hydrograph
and Sampling Interval
February 2014 Storm Event



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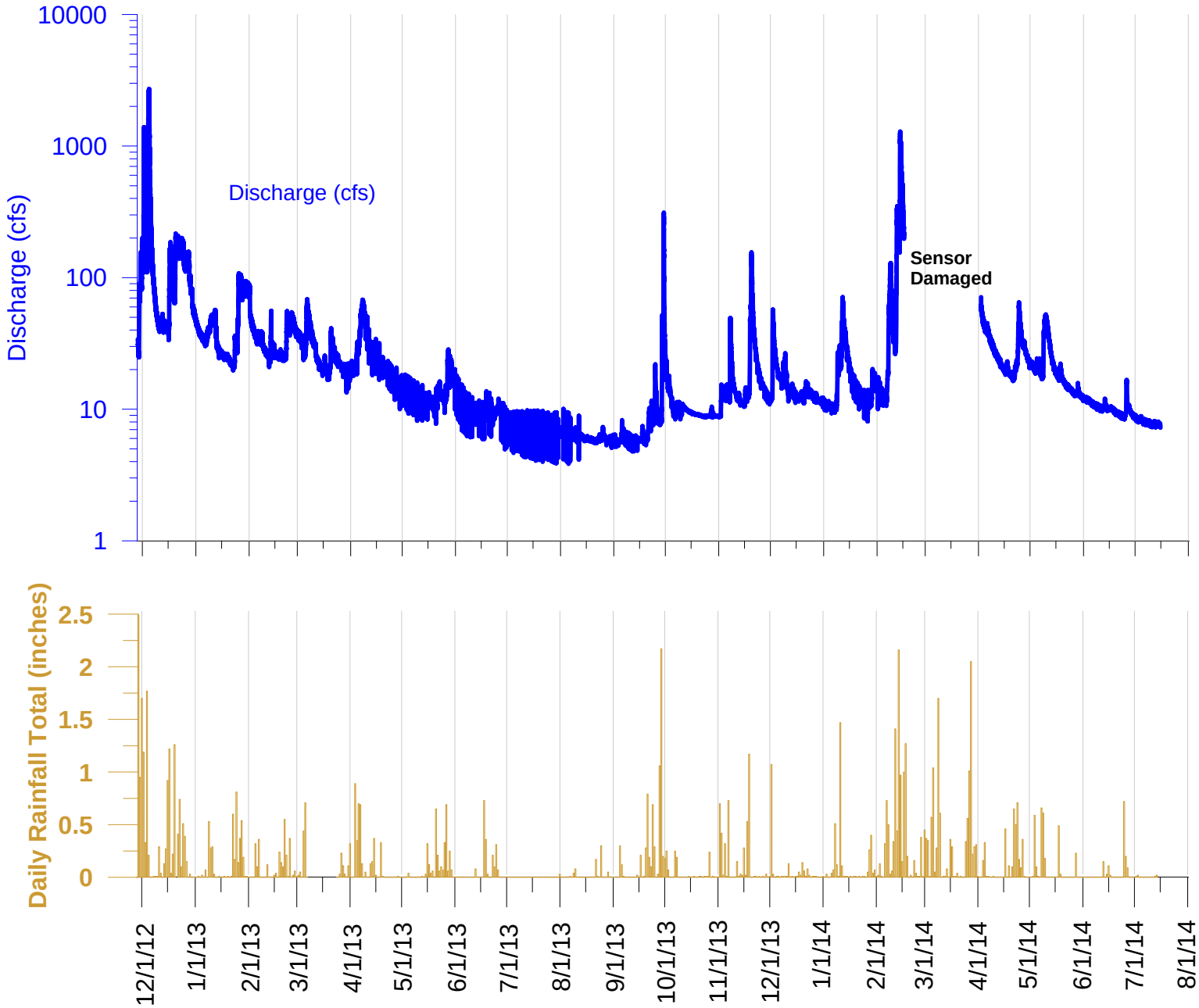
Black Butte Mine Superfund Site

Figure 2.2-14
GD1 Hydrograph
and Sampling Interval
February 2014 Storm Event



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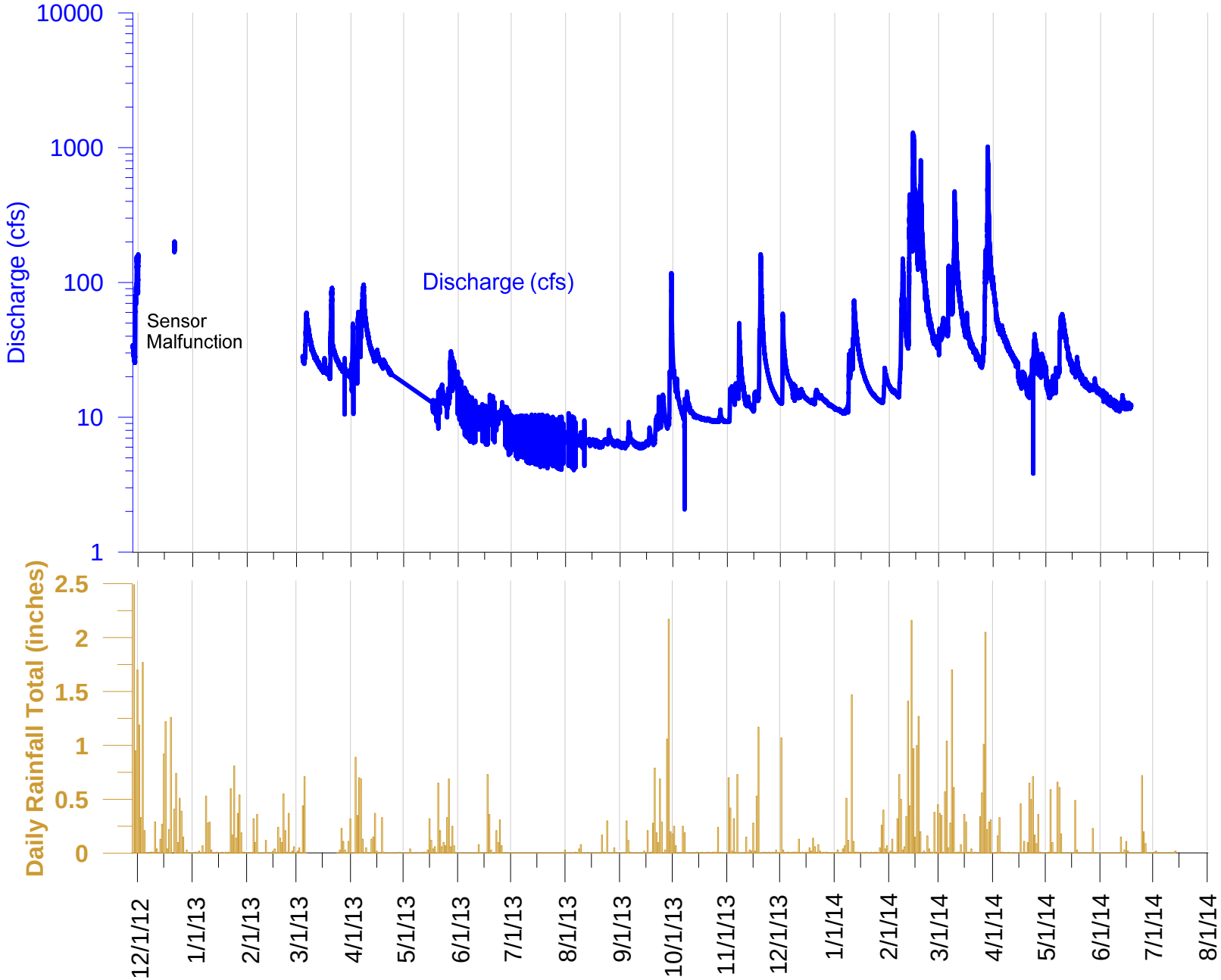
Black Butte Mine Superfund Site

Figure 3.3-5
GU1 Flow Vs. Precipitation



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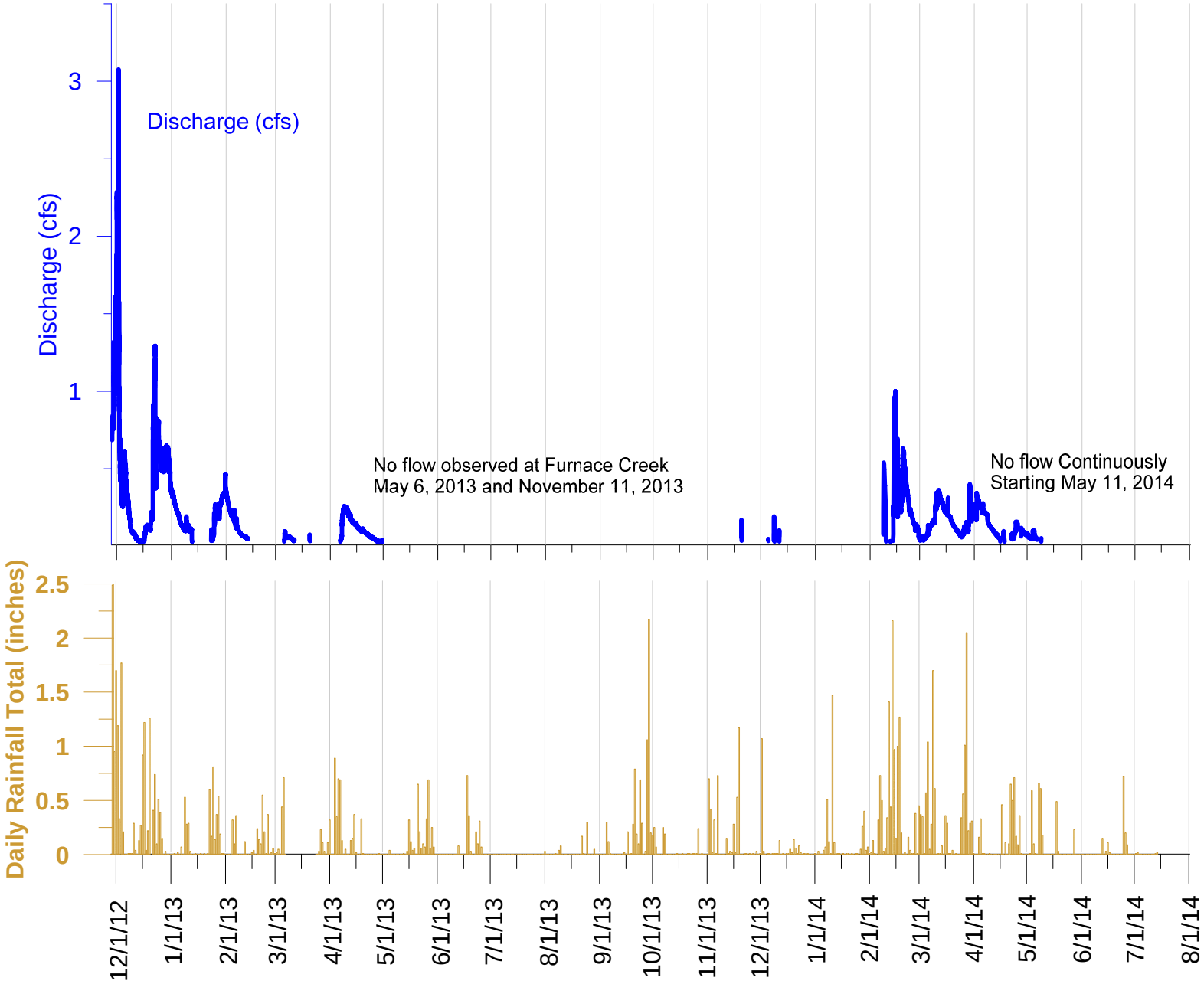
Black Butte Mine Superfund Site

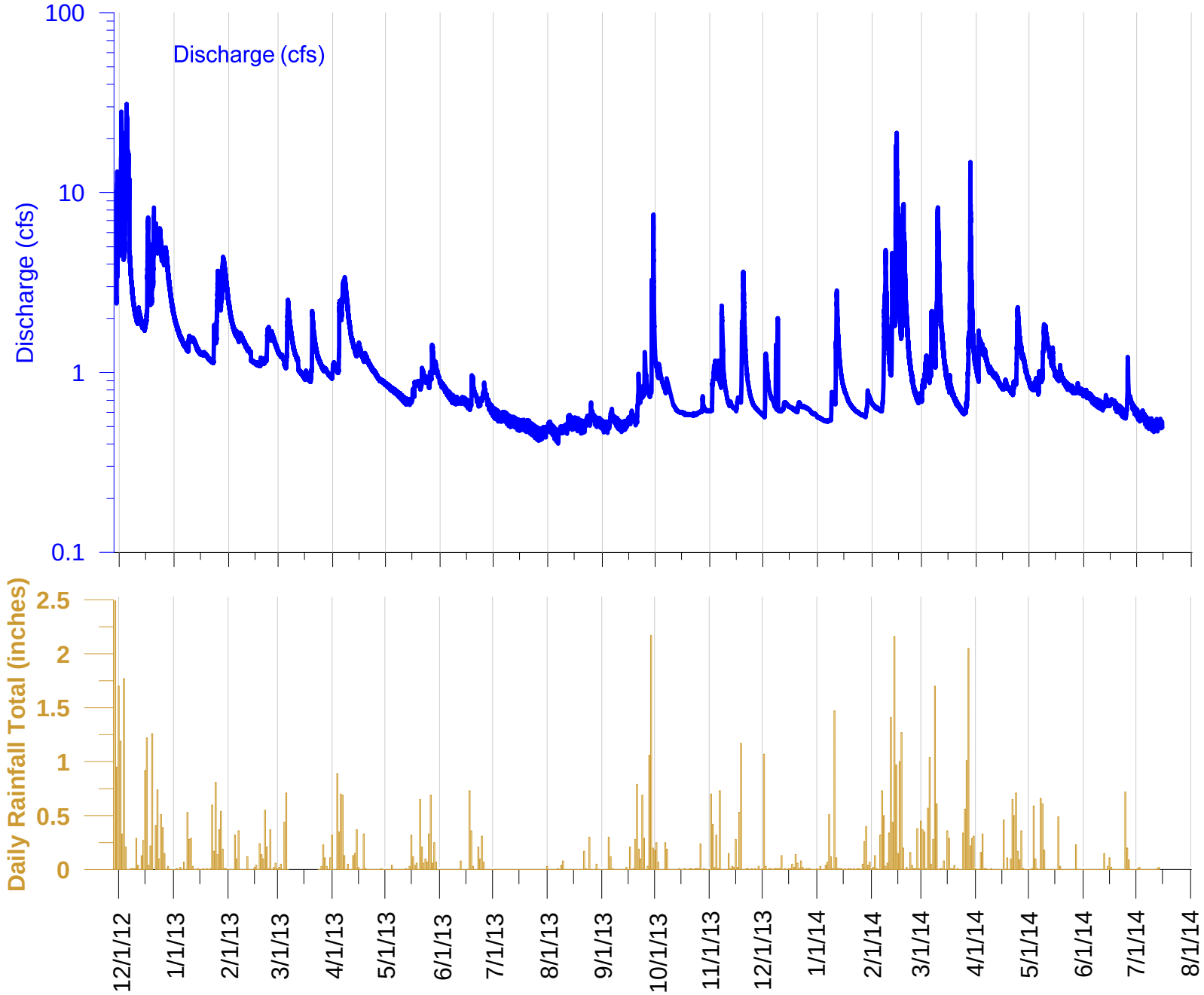
Figure 3.3-6
GD1 flow Vs. Precipitation



CDM Smith

Black Butte Mine Superfund Site

Figure 3.3-11
FC1 Flow vs. Precipitation



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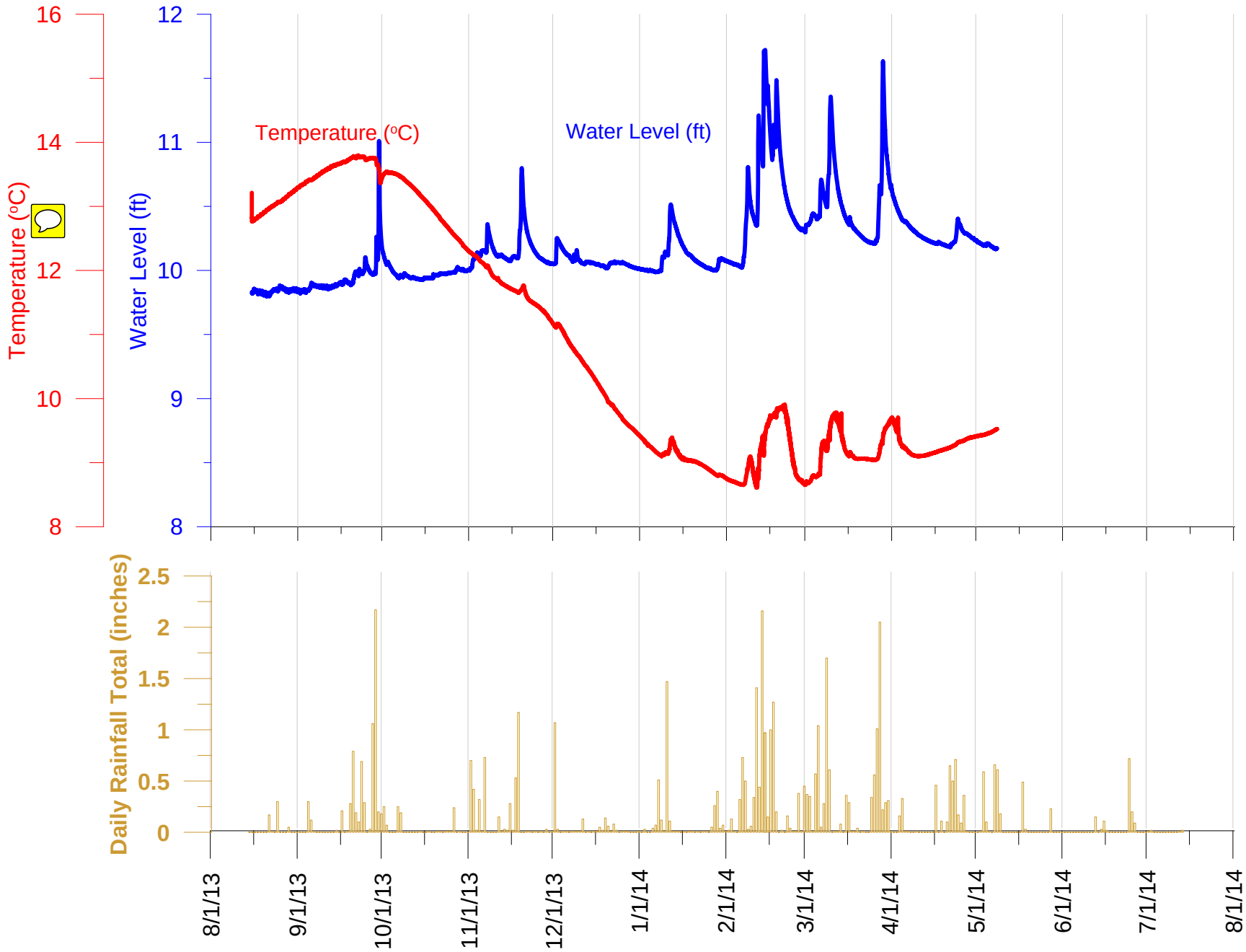
Black Butte Mine Superfund Site

Figure 3.3-13
DC1 Flow vs. Precipitation



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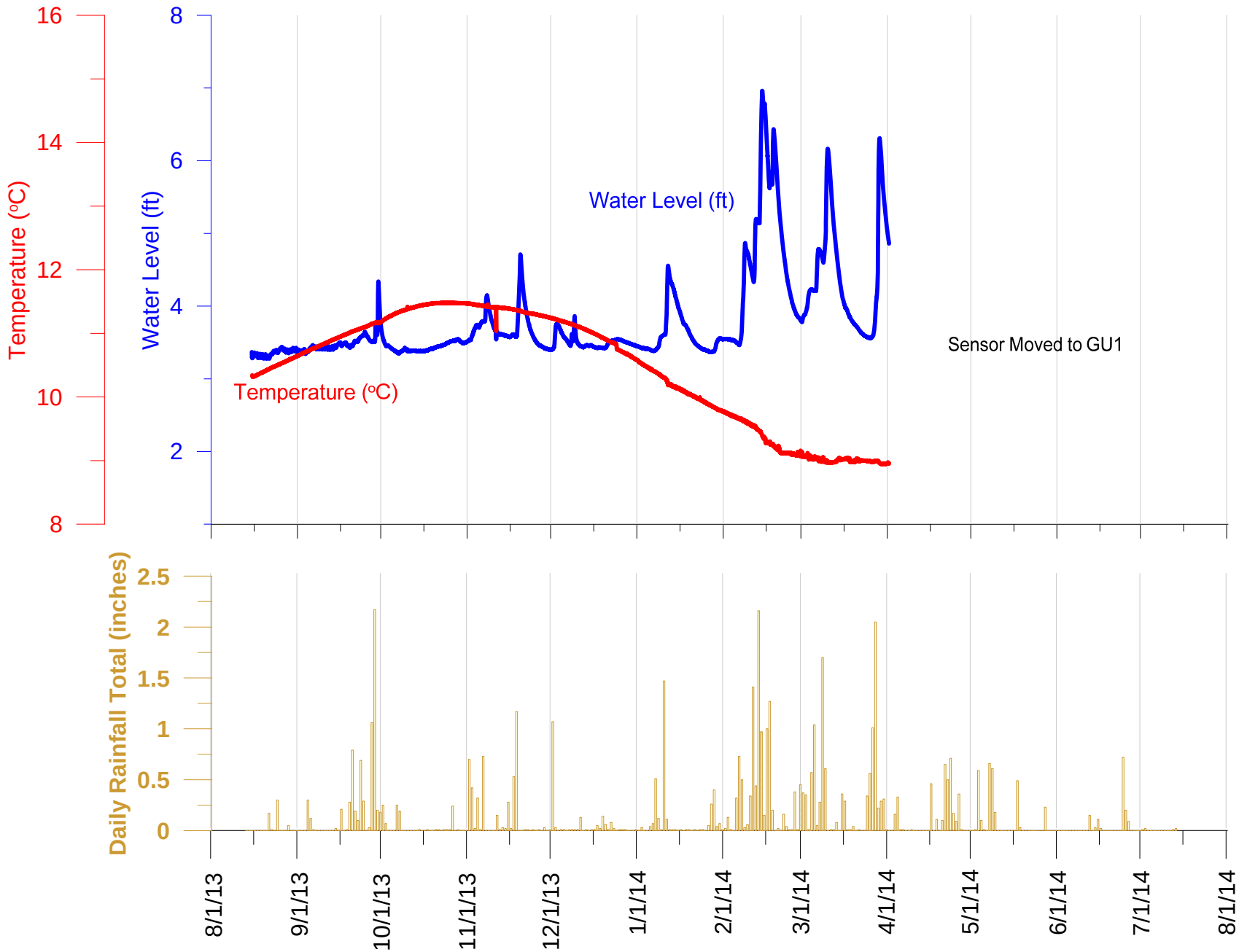
Black Butte Mine Superfund Site

Figure 3.5-2
MW2 Hydrograph with Temperature



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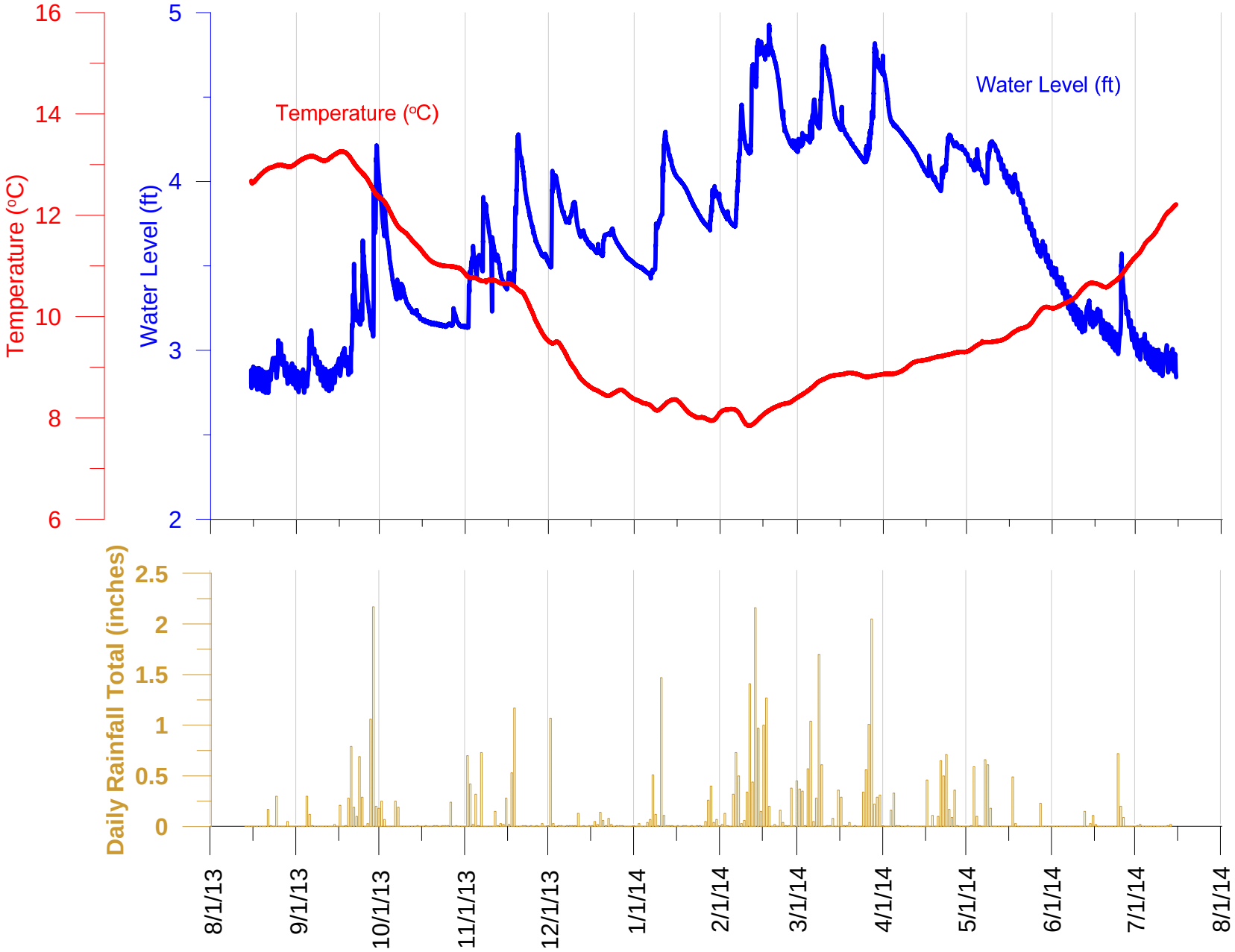
Black Butte Mine Superfund Site

Figure 3.5-3
MW3 Hydrograph with Temperature



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Black Butte Mine Superfund Site

Figure 3.5-4
MW8 Hydrograph with Temperature

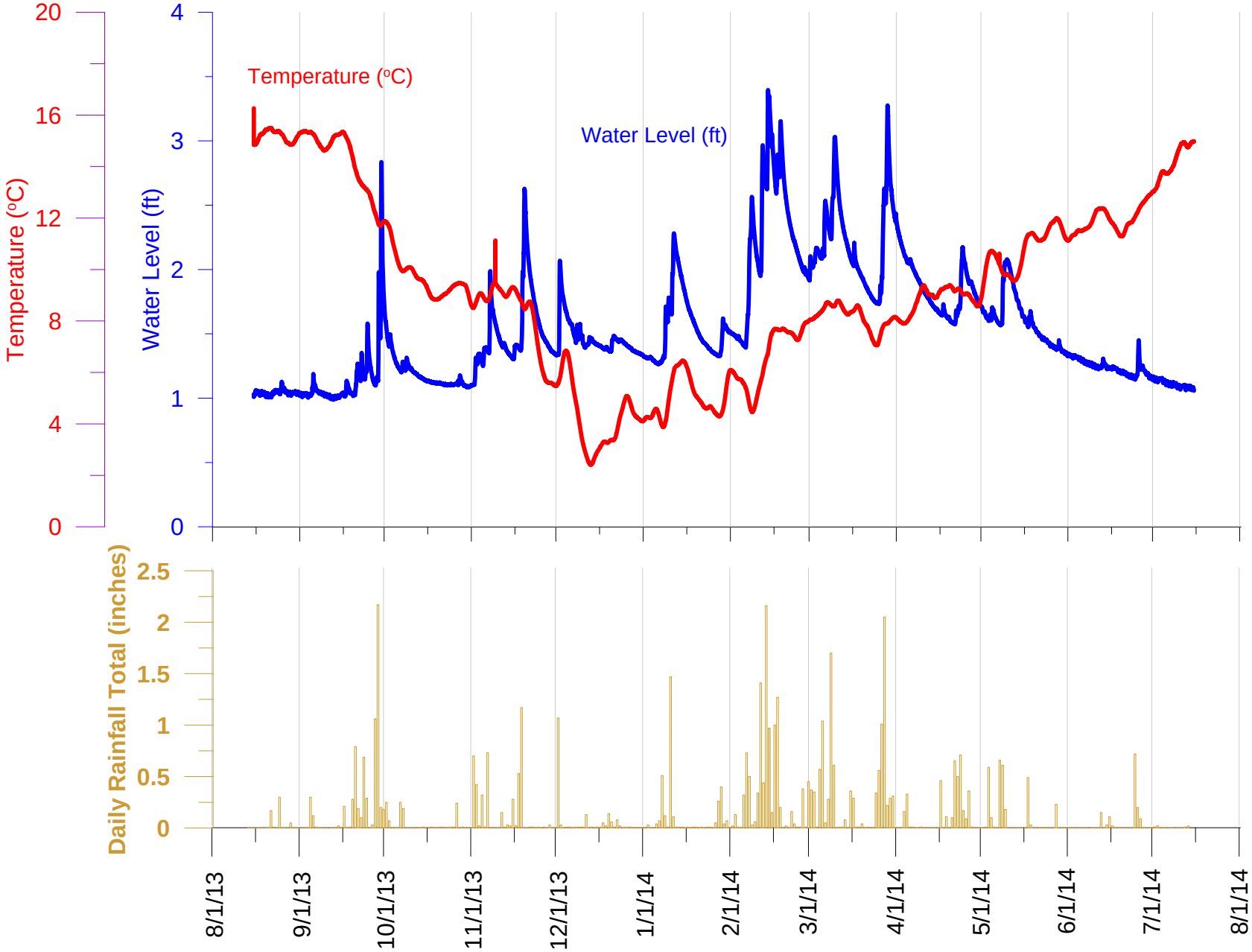

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Figure 3.5-5
MW12 Hydrograph with Temperature

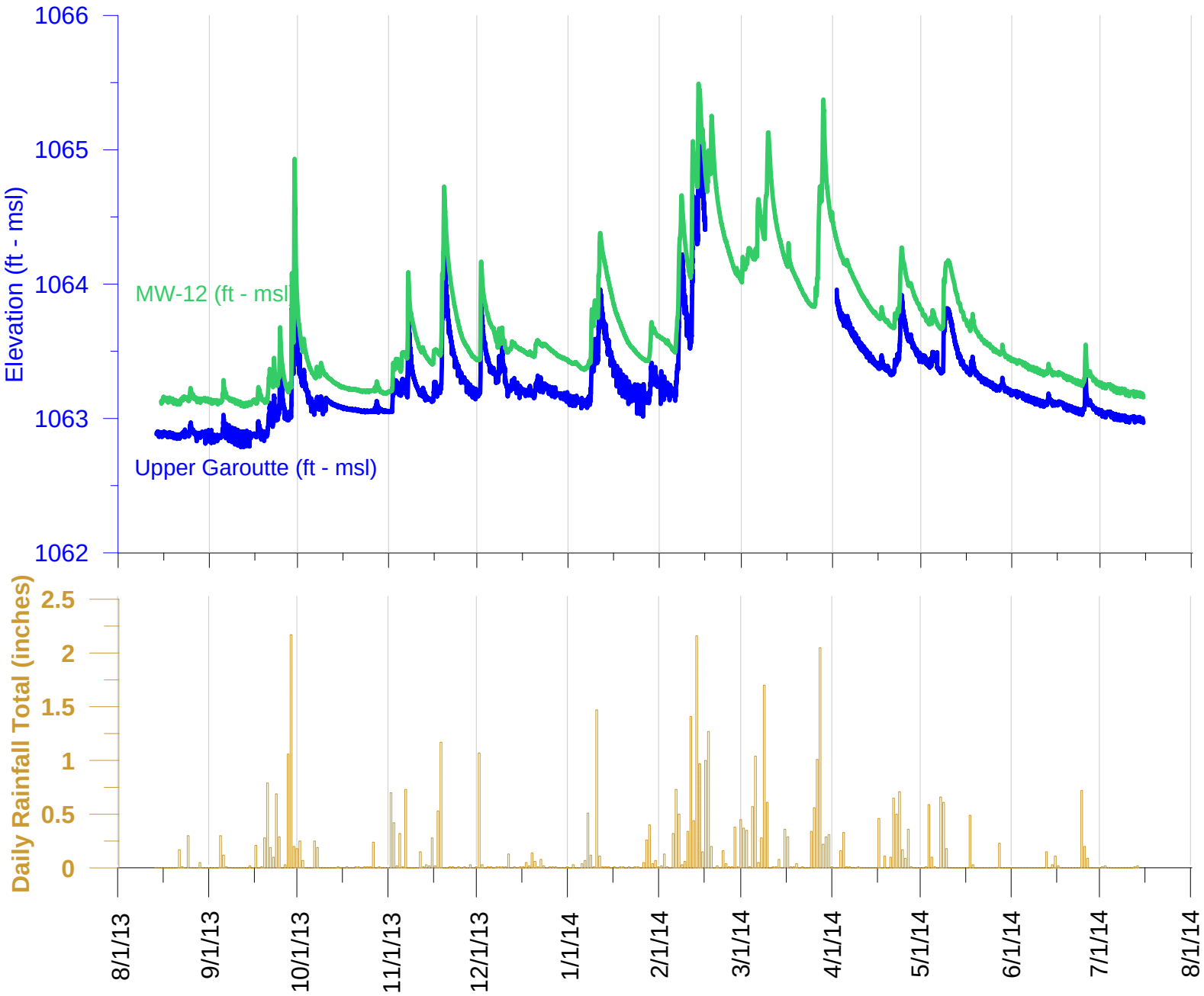

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Figure 3.5-6
Water Levels of GU1 and MW12

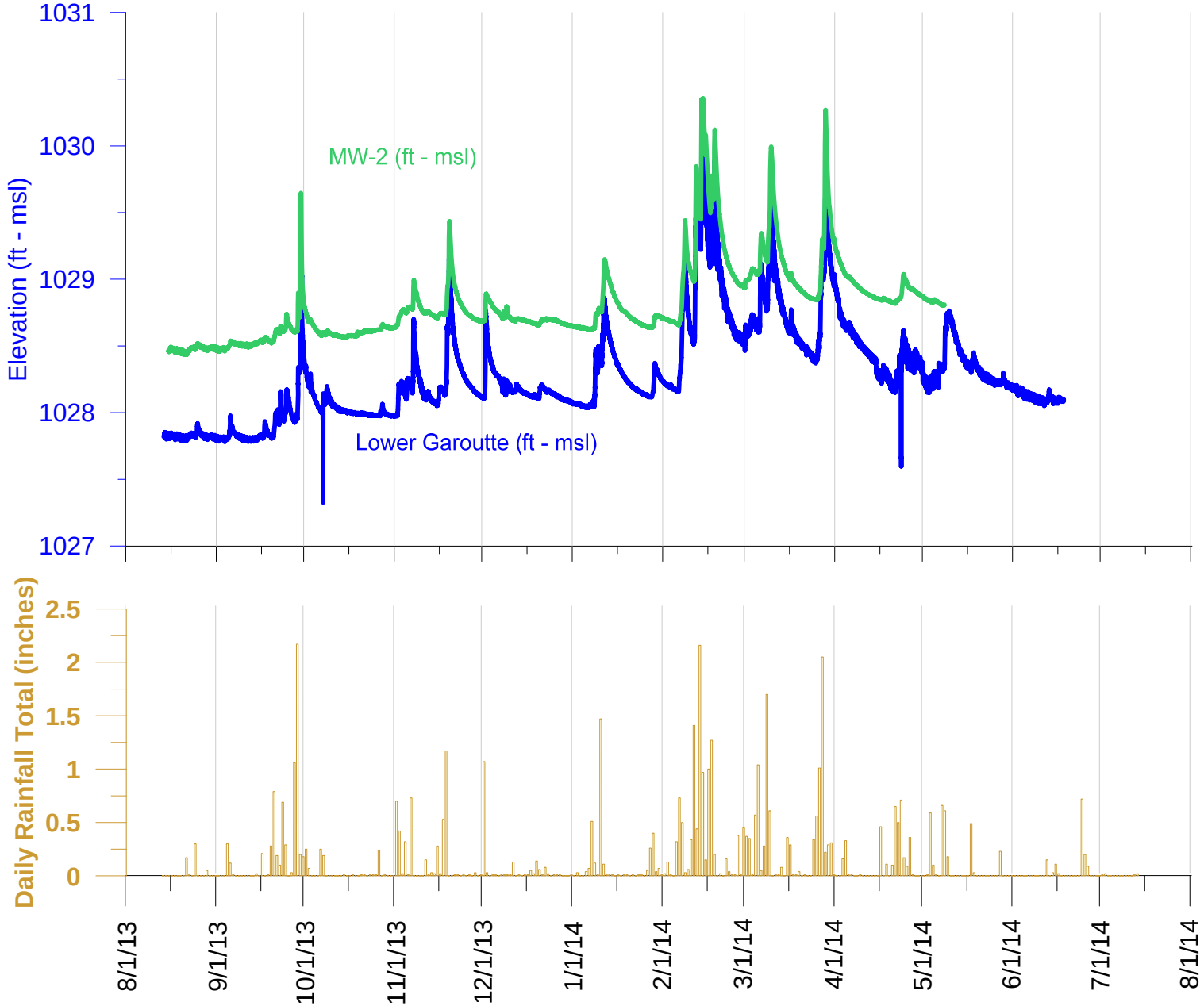

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Figure 3.5-7
Water Leves of GD1 and MW2

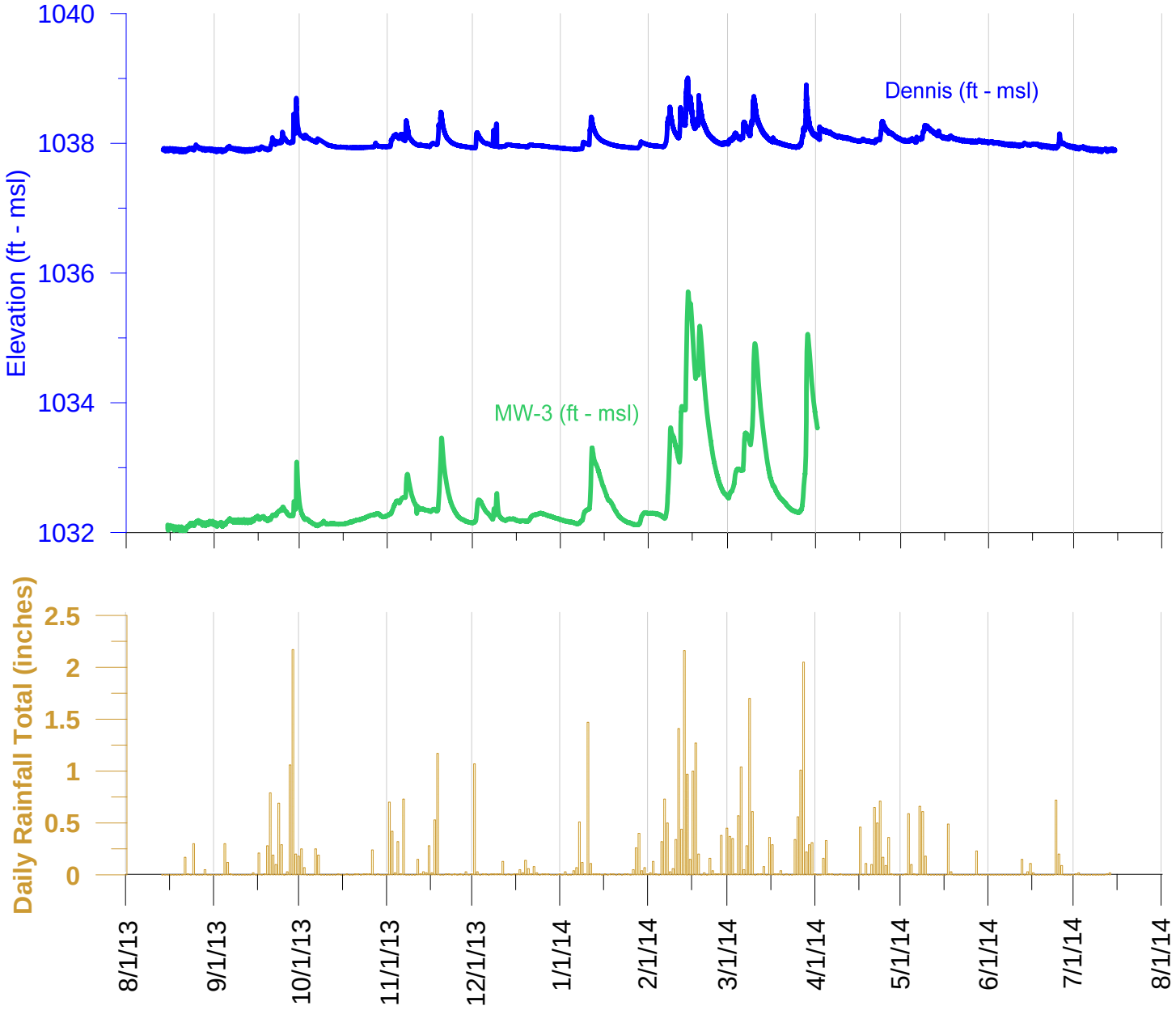

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Figure 3.5-8
Water Levels of DC1 and MW3

Tables

Table 2.1-1 Field Work Completed During Phases 1, 1a and 2

Date	Activity
8/23/2012	Site Reconnaissance
10/29/2012- 11/7/2012	Longitudinal Surveys of Upper Garoutte Creek, Lower Garoutte Creek, and Dennis Creek
10/30/2012-11/2/2012	Surface Water Monitoring Station Installation
11/3/2012	Atmospheric Deposition (Precipitation) Collectors and Weather Station Installation
11/27/2012-11/29/2012	Deployment of Stream Water Level/Water Quality Sensors with Integrated Data Loggers
3/4/2013- 3/8/2013	Storm Surface Water and Precipitation Sampling Event #1
3/9/2013- 3/11/2013	March 2013 Downstream Sediment Sampling Event
4/23/2013	LiDAR Survey
6/19/2013- 6/25/2013	Groundwater Monitoring Well Installation
8/12/2013- 8/15/2013	August 2013 Groundwater and Surface Water Sampling Event
10/8/2013 – 10/10/-2013	October 2013 Background Sediment Sampling Event
11/6/2013- 11/8/2013	Storm Surface Water and Precipitation Sampling Event #2
11/9/2013– 11/11/2013	November 2013 Groundwater Sampling Event
1/18/2014	Site Visit to Check Surface Water Stage Levels
2/11/2014 - 2/12/2014	Demonstration of Method Applicability Study
2/13/2014 - 2/16/2014	Storm Surface Water and Precipitation Sampling Event #3
4/1/2014 - 4/2/2014	Field Instrumentation Downloads and Groundwater and Surface Water Level Measurements
5/5/2014 - 5/8/2014	May 2014 Groundwater and Surface Water Sampling Event
7/15/2014	Field Instrumentation Downloads and Groundwater and Surface Water Level Measurements

Notes:

Highlighted cells indicated activites that are described or have analytical data reported on in the OU1 Data Summary Report Addendum 1

Table 2.1-2 Black Butte Mine Data Collection Summary for OU1 Remedial Investigation (November 2012 - July 2014)

Parameter		Data Locations			
		Long-Term Surface Water Monitoring Stations (4 locations)	**Monitoring Wells (13 locations)**	**On-Site Weather Station**	**Site Wide**
Continuous Water Level Data		x	4 locations (August 2013 deployment)		
Stream Discharge (from rating curve)		x			
Continuous Field WQ Data	Temperature	x			
	pH	x			
	Conductivity	x			
	Turbidity	x (except FC1 station)			
Surface Water Quality Data (Lab Analyzed) Includes Total and Dissolved TAL Metals, Total & Dissolved Hg, Total and Dissolved MeHg, UVA/SUVA, DOC, TSS, Anions/Cations	Spring Quarter (March 2013 Storm Event)	x			
	Summer Quarter (mid August 2013)	x (FC1 not flowing, so upper Furnace above tailings sampled)			
	Fall Quarter / Seasonal First Flush (November 2013)	x			
	Winter High Flow Storm Event (February 2014)	x			
	Spring Quarter (early May 2014)	x			
Sediment Data (Lab Analyzed) Includes TAL Metals, Hg, MeHg, TOC, AVS, grain size		x (except GU1 station)			
Background Sediment Data (Lab Analyzed) Includes TAL Metals, Hg, MeHg, TOC, AVS, grain size		October 2013; Three background sites: GU1 station, Upper Furnace Creek (Above Tailings), and Upper Dennis Creek (Above Mine/Ore Body)			
Soil (Field XRF and Lab) Includes TAL metals, Total Hg			x		x DMA February 2014
Groundwater Quality (Lab Analyzed & Field Parameters) pH, dissolved oxygen, oxidation-reduction potential, conductivity, temperature, turbidity, Dissolved TAL Metals, Dissolved Hg, Dissolved MeHg, DOC, TDS, Anions/Cations	Summer Qtr (mid August 2013)		x		
	Fall Qtr (Following November 2013 Storm Event)		x		
	Spring Qtr (early May 2014)		x		
Climate Data (precipitation, temperature, wind etc…)				x	
Atmospheric Deposition (Total Hg, MeHg, TAL metals, anion/cations in rainfall)				x	
LiDAR (1 ft DEM at OU1; 3 ft for 10 mi^2 watershed					x

Notes:

XRF = X-ray diffraction

TAL = Target Analyte List

Hg = Mercury

MeHg = methyl mercury

AVS = Acid volatile sulfide

TOC = Total organic carbon

DOC = dissolved organic carbon

TDS = total dissolved solids

DEM - digital elevation model

Table 2.4-7 November 2013 Surface Water Duplicate Comparison Black Butte Mine Superfund Site, Lane County, Oregon

Location		GU1					GU1					GD1					GD1					GU1					GU1				
Sample Name		MJSJQ5		MJSJQ6			MJSJQ5		MJSJQ7			MJSJR9		MJSJS3			MJSJR8		MJSJS2			MJSJW1		MJSJW3			MJSJW0		MJSJW2		
Sample Type		N		FD			N		FD			N		FD			N		FD			N		FD			N		FD		
Sample Date		11/7/2013		11/7/2013			11/7/2013		11/7/2013			11/7/2013		11/7/2013			11/7/2013		11/7/2013			11/8/2013		11/8/2013			11/8/2013		11/8/2013		
Total/Dissolved		D		D		RPD	T		T		RPD	D		D		RPD	T		T		RPD	D		D		RPD	T		T		RPD
Chemical	Unit	Result	Q	Result	Q	%	Result	Q	Result	Q	%	Result	Q	Result	Q	%	Result	Q	Result	Q	%	Result	Q	Result	Q	%	Result	Q	Result	Q	%
Mercury	ng/L	8.57		9.84		13.8	5.6		5.15		8.4	8.08		10.2		23.2	33.5		31.3		6.8	4.76		5.36		11.9	7.6		7.52		1.1
Methylmercury	ng/L	0.05	U	0.0679		NA	0.05	U	0.051	U	2.0	0.049	U	0.05	U	NA	0.149	J	0.162	J	8.4	0.049	U	0.05	U	NA	0.05	U	0.049	U	NA
Aluminum	ug/l	20	UJ	20	UJ	NA	69.7		48.5		35.9	63	J	57.3	J	9.5	249		246		1.2	22		36.4		49.3	57.5		54.9		4.6
Antimony	ug/l	60	U	60	U	NA	60	U	60	U	NA	60	U	60	U	NA	60	U	60	U	NA	60	U	60	U	NA	60	U	60	U	NA
Arsenic	ug/l	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA
Barium	ug/l	10	U	10	U	NA	10	U	10	U	NA	10	U	10	U	NA	10	U	10	U	NA	10	U	10	U	NA	10	U	10	U	NA
Beryllium	ug/l	5	U	5	U	NA	5	U	5	U	NA	5	U	5	U	NA	5	U	5	U	NA	5	U	5	U	NA	5	U	5	U	NA
Cadmium	ug/l	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA
Calcium	ug/l	9400		9880		5.0	9620		10700		10.6	9320		8980		3.7	8430		9160		8.3	8080		8560		5.8	9360		9640		2.9
Chromium	ug/l	0.19	J	0.17	J	abs	2	U	2	U	NA	2	U	2	U	NA	0.32	J	2	U	NA	2	U	2	U	NA	2	U	2	U	NA
Cobalt	ug/l	0.11	J	0.07	J	abs	1	U	1	U	NA	1	U	1	U	NA	0.38	J	1	U	NA	1	U	1	U	NA	1	U	1	U	NA
Copper	ug/l	2	U	2	U	NA	2	U	2	U	NA	2	U	2	U	NA	2.6		2.6		NA	2	U	2	U	NA	2	U	2	U	NA
Iron	ug/l	100	U	100	U	NA	150		164		8.9	184		181		1.6	607		672		10.2	100	U	100	U	NA	184		187		1.6
Lead	ug/l	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA
Magnesium	ug/l	1990	J	2080	J	abs	1990	J	2210	J	abs	1930	J	1910	J	abs	1800	J	1950	J	abs	1740	J	1840	J	abs	1940	J	2030	J	abs
Manganese	ug/l	4.3	J	4.7	J	8.9	11.1	J	11.2	J	abs	12.4	J	12.7	J	abs	61.2		64.2		4.8	3.7	J	4.6	J	21.7	10.2	J	10.8	J	abs
Nickel	ug/l	0.23	J	0.12	J	abs	1	U	1	U	NA	0.15	J	0.16	J	abs	1	U	1.7		NA	0.12	J	0.095	J	abs	1	U	1	U	NA
Potassium	ug/l	568	J	584	J	2.8	597	J	649	J	abs	605	J	629	J	abs	576	J	652	J	12.4	612	J	609	J	abs	589	J	615	J	abs
Selenium	ug/l	5	U	5	U	NA	5	U	5	U	NA	5	U	5	U	NA	5	U	5	U	NA	5	U	5	U	NA	5	U	5	U	NA
Silver	ug/l	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA
Sodium	ug/l	3910	J	4140	J	abs	4040	J	4560	J	abs	4160	J	3950	J	abs	3520	J	3880	J	abs	3580	J	3760	J	abs	4180	J	4350	J	abs
Thallium	ug/l	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA
Vanadium	ug/l	5	U	5	U	NA	5	U	5	U	NA	5	U	5	U	NA	5	U	5	U	NA	5	U	5	U	NA	5	U	5	U	NA
Zinc	ug/l	2	U	2	U	NA	2	U	6		NA	2	U	2		NA	2.1		2	U	NA	2	U	2	U	NA	2	U	2	U	NA
Other																															
Alkalinity, Total (As Caco3)	mg/L	--		--		--	41.9		41.9		0.0	--		--		--	35.2		35.4		0.57	--		--		--	35.9		35.3		1.7
Chloride	mg/L	--		--		--	2.17		2.18		0.46	--		--		--	2.39		2.4		0.42	--		--		--	2.22		2.2		0.90
Fluoride	mg/L	--		--		--	0.04	U	0.04	U	NA	--		--		--	0.04	U	0.04	U	NA	--		--		--	0.04	U	0.04	U	NA
Nitrate plus Nitrite as N	mg/L	--		--		--	0.05	U	0.05	U	NA	--		--		--	0.175		0.176		0.57	--		--		--	0.251		0.265		5.4
Sulfate	mg/L	--		--		--	1.21		1.2		0.83	--		--		--	1.11		1.14		2.7	--		--		--	1.19		1.18		0.84
Total Suspended Solids	mg/L	--		--		--	3.71		2.46		40.5	--		--		--	28.1		28.5		1.4	--		--		--	2.44		3.01		20.9
DOC	mg/L	2.3		2.5		8.3	--		--			5.2		4.7		10.1	--		--		--	2.6		2.5		3.9	--		--		--
UV254	/cm	0.102		0.15		38.1	--		--			0.256		0.238		7.3	--		--		--	0.121		0.11		9.5	--		--		--
SUVA254	L/mg-M	4.73		6		23.7	--		--			4.92		5.06		2.8	--		--		--	4.65		4.4		5.5	--		--		--

- abs: absolute value of difference between concentrations is less than the reporting limit. Applicable when either N or FD concentration is less than 5 times the reporting limit.
- Bold: exceeds criteria
- N: Normal sample
- U: Below detection limit (reporting limit shown)
- D: dissolved metals
- NA: Not applicable
- ug/L: micrograms per liter
- FD: Field Duplicate
- Laboratory qualifier
- UJ: concentration estimated at the reporting limit shown
- J: Estimated value
- e percent difference
- mg/L: milligrams per liter
- T: total metals

Table 2.4-8 November 2013 Groundwater Duplicate Comparison Black Butte Mine Superfund Site, Lane County, Oregon

Location		MW-5					MW-5				
Sample Name											
Sample Type		N		FD			N		FD		
Sample Date		11/10/2013		11/10/2013			11/10/2013		11/10/2013		
Total/Dissolved		D		D		RPD	T		T		RPD
Chemical	Unit	Result	Q	Result	Q	%	Result	Q	Result	Q	%
Mercury	ng/l	3.57		2.31		42.9	--		--		--
Methylmercury	ng/l	0.724		0.778		7.2	--		--		--
Aluminum	ug/l	200	U	200	U	NA	--		--		--
Antimony	ug/l	2	U	2	U	NA	--		--		--
Arsenic	ug/l	15		14.7		2.0	--		--		--
Barium	ug/l	102	J	96.5	J	5.5	--		--		--
Beryllium	ug/l	5	U	5	U	NA	--		--		--
Cadmium	ug/l	5	U	5	U	NA	--		--		--
Calcium	ug/l	34100		33200		2.7	--		--		--
Chromium	ug/l	10	U	10	U	NA	--		--		--
Cobalt	ug/l	0.48	J	0.41	J	abs	--		--		--
Copper	ug/l	25	U	25	U	NA	--		--		--
Iron	ug/l	1480		1420		4.1	--		--		--
Lead	ug/l	1	U	1	U	NA	--		--		--
Magnesium	ug/l	6120		5980		2.3	--		--		--
Manganese	ug/l	164		161		1.8	--		--		--
Nickel	ug/l	40	U	40	U	NA	--		--		--
Potassium	ug/l	5000	U	5000	U	NA	--		--		--
Selenium	ug/l	35	U	35	U	NA	--		--		--
Silver	ug/l	10	U	10	U	NA	--		--		--
Sodium	ug/l	10900		10900		0.0	--		--		--
Thallium	ug/l	1	U	1	U	NA	--		--		--
Vanadium	ug/l	50	U	50	U	NA	--		--		--
Zinc	ug/l	60	U	60	U	NA	--		--		--
Alkalinity, Total (As Caco3)	mg/l	--		--		--	138		138		0.0
Chloride	mg/l	--		--		--	2.94		2.92		0.68
Fluoride	mg/l	--		--		--	0.103		0.104		0.97
Nitrate+Nitrite As N	mg/l	--		--		--	0.05	U	0.05	U	NA
Sulfate	mg/l	--		--		--	3.7		3.8		4.0
Total Dissolved Solids	mg/l	--		--		--	162		168		3.6
DOC	mg/L	2		1.7		16.2	--		--		--

* ***Notes:***

- abs: absolute value of difference between concentrations is less than the reporting limit. Applicable when either N or FD conc
- Bold: exceeds criteria
- D: dissolved metals
- FD: Field Duplicate
- J: Estimated value
- mg/L: milligrams per liter
- N: Normal sample
- NA: Not applicable
- Q: Laboratory qualifier
- RPD: relative percent difference
- T: total metals
- U: Below detection lim
- ug/L: micrograms per l
- UJ: concentration estir

Table 2.4-9 February 2014 Surface Water Duplicate Comparison Black Butte Mine Superfund Site, Lane County, Oregon

	Location	DC1					DC1					DC1					DC1					GD1					GD1				
	Sample Name	MJGLE2		MJGLE4			MJGLE1		MJGLE3			MJGLF2		MJGLF8			MJGLF1		MJGLF7			MJGLG4		MJGLG6			MJGLG3		MJGLG5		
	Sample Type	N		FD			N		FD			N		FD		RPD %	N		FD			N		FD			N		FD		
	Sample Date	2/13/2014		2/13/2014			2/13/2014		2/13/2014			2/14/2014		2/14/2014			2/14/2014		2/14/2014			2/14/2014		2/14/2014			2/14/2014		2/14/2014		
	Total/Dissolved	D		D		RPD	T		T		RPD	D		D			T		T		RPD	D		D		RPD	T		T		RPD
Chemical	Unit	Result	Q	Result	Q	%	Result	Q	Result	Q	%	Result	Q	Result	Q		Result	Q	Result	Q	%	Result	Q	Result	Q	%	Result	Q	Result	Q	%
Mercury	ng/l	5.39		5.4		0.19	50.6		58.9		15.2	14.3		14.6		2.1	862		1020		16.8	7.09		14.8		70.4	249		211		16.5
Methylmercury	ng/l	0.052	U	0.05	U	NA	0.05	U	0.05	U	NA	0.049	U	0.051	U	NA	0.5	J+	0.715		35.4	0.05	U	0.05	U	NA	0.132		0.123		7.1
Aluminum	ug/l	37.2	J	110		98.9	558		491		12.8	72.5	J	20	UJ	113.5	3410		3390		0.59	256		286		11.1	1870		1680		10.7
Antimony	ug/l	60	U	60	U	NA	60	U	60	U	NA	60	U	60	U	0.00	60	U	60	U	NA	60	U	60	U	NA	60	U	60	U	NA
Arsenic	ug/l	0.76	J	0.95	J	abs	2.1		2		4.9	0.94	J	0.65	J	36.5	12.9		13.6		5.3	0.44	J	1	U	NA	1.9		1.9		0.0
Barium	ug/l	9.2	J	8.1	J	abs	12.6		12.6		0.0	6.6	J	6.5	J	1.53	48.4		49.7		2.7	4.7	J	4.8	J	ABS	23.1		23.1		0.0
Beryllium	ug/l	5	U	5	U	NA	5	U	5	U	NA	5	U	5	U	0.00	5	U	5	U	NA	5	U	5	U	NA	5	U	5	U	NA
Cadmium	ug/l	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	0.00	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA
Calcium	ug/l	11400		11300		0.88	10900		10500		3.7	8720		8900		2.04	10600		10300		2.9	5140		5180		0.78	5920		6070		2.50
Chromium	ug/l	2	U	2	U	NA	2	U	3	J+	NA	2	U	2	U	0.00	6.5	J+	6.1	J+	6.3	2	U	2	U	NA	2.2	J+	12.5	J+	140.1
Cobalt	ug/l	0.24	J	0.053	J	abs	1	U	1	U	NA	0.11	J	1	U	NA	6.8		6.3		7.6	0.26	J	0.28	J	7.4	2.2	J	4.8	J	74.3
Copper	ug/l	2	U	2	U	NA	2.6	J+	2.9	J+	10.9	2	U	2	U	0.00	16.1	J+	16.3	J+	1.2	2.1		2.5		17.4	9.9	J+	10.7	J+	7.8
Iron	ug/l	100	U	138		NA	865		894		3.3	134		100	U	29.1	7190		6920		3.8	673		596		12.1	3420		3500		2.3
Lead	ug/l	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	0.00	1.3	J+	1.3	J+	0.0	1	U	1	U	NA	1.5	J+	1	U	NA
Magnesium	ug/l	5000	U	5000	U	NA	5000	U	5000	U	NA	5000	U	5000	U	0.00	5000	U	5000	U	0.0	5000	U	5000	U	NA	5000	U	5000	U	NA
Manganese	ug/l	15	U	15	U	NA	34.9		31.3		10.9	15	U	15	U	0.00	507		473		6.9	31.1		33		5.9	233		243		4.2
Nickel	ug/l	1	U	1	U	NA	2.2	J+	2.9	J+	27.5	1	U	1	U	0.00	6.9	J+	5.9	J+	15.6	1	U	1	U	NA	2.5	J+	178	J	194.5
Potassium	ug/l	5000	U	5000	U	NA	5000	U	5000	U	NA	5000	U	5000	U	0.00	5000	U	5000	U	NA	5000	U	5000	U	NA	5000	U	5000	U	NA
Selenium	ug/l	5	U	5	U	NA	5	U	5	U	NA	5	U	5	U	0.00	5	U	5	U	NA	5	U	5	U	NA	5	U	5	U	NA
Silver	ug/l	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	0.00	0.083	J	0.057	J	abs	1	U	1	U	NA	1	U	1	U	NA
Sodium	ug/l	5000	U	5000	U	NA	5000	U	5000	U	NA	5000	U	5000	U	0.00	5000	U	5000	U	NA	5000	U	5000	U	NA	5000	U	5000	U	NA
Thallium	ug/l	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	0.00	1	U	1	U	NA	1	U	1	U	NA	1	U	1	U	NA
Vanadium	ug/l	0.18	J	0.27	J	ABS	1.8	J	1.7	J	abs	0.26	J	0.4	J	42.4	11.8		12		1.7	0.6	J	0.53	J	12.4	5.9		5.1		14.5
Zinc	ug/l	3.8	J+	2.6	J+	37.5	5.7	J+	5.9	J+	3.4	2.1	J+	2	U	4.9	14.3	J+	13.7	J+	4.3	4.4	J+	5.1	J+	14.7	9.7	J+	8.5	J+	13.2
Alkalinity As Caco3	mg/l	--		--		NA	30.9		30.9		0.0	--		--		NA	25.9		25.8		0.39	--		--		--	17.6		17.8		1.1
Chloride	mg/l	--		--		NA	1.81		1.81		0.0	--		--		NA	1.77		1.75		1.1	--		--		--	1.55		1.53		1.3
Fluoride	mg/l	--		--		NA	0.04	U	0.04	U	NA	--		--		NA	0.04	U	0.04	U	NA	--		--		--	0.04	U	0.04	U	NA
Nitrate+Nitrite As N	mg/l	--		--		NA	0.374		0.378		1.1	--		--		NA	0.583		0.582		0.17	--		--		--	0.421		0.428		1.6
Sulfate	mg/l	--		--		NA	11.8		11.8		0.0	--		--		NA	7.88		7.87		0.13	--		--		--	0.935		0.932		0.32
Total Suspended Solids	mg/l	--		--		NA	14.2		14.2		0.0	--		--		NA	289		293		1.37	--		--		--	139		132		5.2
DOC	mg/l	3.6		4.7		26.5	--		--		--	6.1		5		19.8	--		--		--	4.2		4.4		4.7	--		--		--
UV254	/cm	0.068		0.068		0.0	--		--		--	0.085	J	0.175	J	69.2	--		--		--	0.115		0.115		0.0	--		--		--
Specific Ultraviolet Absorbance	L/mg-M	1.89		1.45		26.3	--		--		--	1.39	J	3.5	J	86.3	--		--		--	2.74		2.61		4.9	--		--		--

* ***Notes:***

- abs: absolute value of difference between concentrations is less than the reporting limit. Applicable when either N or FD concentration is less than 5 times the reporting limit.
- Bold: exceeds criteria
- D: dissolved metals
- FD: Field Duplicate
- J: Estimated value
- mg/L: milligrams per liter
- N: Normal sample
- NA: Not applicable
- Q: Laboratory qualifier
- RPD: relative percent difference
- T: total metals
- U: Below detection limit (reporting limit shown)
- ug/L: micrograms per liter
- UJ: concentration estimated at the reporting limit shown

Table 2.4-10 February 2014 Soil Duplicate Comparison Black Butte Mine Superfund Site, Lane County, Oregon

Location		SO1					SO28					SO21					SO35				
Sample Name		MJGM19		MJGM27			MJGM48		MJGM49			MJGM40		MJGM41			MJGM56		MJGM57		
Sample Type		N		FD			N		FD			N		FD			N		FD		
Sample Date		2/12/2014		2/12/2014			2/12/2014		2/12/2014			2/12/2014					2/15/2014		2/15/2014		
Total/Dissolved		T		T		RPD	T		T		RPD	T		T		RPD	T		T		RPD
Chemical	Unit	Result	Q	Result	Q	%	Result	Q	Result	Q	%	Result	Q	Result	Q	%	Result	Q	Result	Q	%
Aluminum	mg/kg	38200	J	39400	J	3.1	27800	J	29900	J	7.3	2740	J	2700	J	1.47	37800		35800		5.4
Antimony	mg/kg	21.9	UJ	21.3	UJ	2.8	19.4	UJ	20.1	UJ	NA	18.6	UJ	17.9	UJ	NA	22.7	UJ	22.3	UJ	NA
Arsenic	mg/kg	98.3		121		20.7	88.3		99.1		11.5	54.6		42.4		25.2	55.1		59.4		7.5
Barium	mg/kg	85.3	J	76.5	J	10.9	59.3	J	61.3	J	3.3	26.1	J	25.1	J	3.9	142		143		0.70
Beryllium	mg/kg	0.8		0.74		7.8	0.65		0.69		6.0	0.54		0.58		7.1	0.45	J	0.43	J	4.5
Cadmium	mg/kg	0.45	U	0.4	U	11.8	0.41	UJ	0.41	UJ	NA	1.1		0.94	J	15.7	1.3	J	1.4	J	7.4
Calcium	mg/kg	950	J	852	J	10.9	1050	J	1060	J	0.95	1580	J	1270	J	21.8	4570	J	5740	J	22.7
Chromium	mg/kg	80.2	J	81.7	J	1.9	56.5	J	58.8	J	4.0	73.9	J	68.5	J	7.6	83.4		65.1		24.6
Cobalt	mg/kg	39.9		33.2		18.3	27.8		27.1		2.6	30.2		29.7		1.7	30		30.5		1.7
Copper	mg/kg	125	J	121	J	3.3	84	J	85	J	1.2	201	J	125	J	46.6	103		118		13.6
Iron	mg/kg	59200	J	57300	J	3.3	78500	J	82000	J	4.4	86000	J	81600	J	5.3	51700	J	51800	J	0.19
Lead	mg/kg	3.6	J+	4	J+	10.5	5.4		4.4		20.4	27.6	J+	24.9		10.3	27.4		223		156.2
Magnesium	mg/kg	6700	J	6450	J	3.8	1680	J	1560	J	7.4	617	J	613	J	0.65	5770		6370		9.9
Manganese	mg/kg	1710	J	1330	J	25.0	1010	J	1060	J	4.8	2050	J	2190	J	6.6	1370	J	1470	J	7.0
Mercury	mg/kg	1.8		1.7		5.7	21.8		15.5		33.8	325		177		59.0	22.4		12.3		58.2
Nickel	mg/kg	44.2		44		0.45	24.5		25.8		5.2	32.9		30.2		8.6	41.4		33.3		21.7
Potassium	mg/kg	609		529		14.1	192	J	187	J	2.6	380	U	397	U	NA	625		734		16.0
Selenium	mg/kg	54.8	U	53.2	U	NA	48.5	U	50.2	U	NA	46.6	U	44.8	U	NA	56.7	U	55.6	U	NA
Silver	mg/kg	11	U	10.6	U	NA	9.7	U	10	U	NA	9.3	U	9	U	NA	11.3	U	11.1	U	NA
Sodium	mg/kg	239	J	219	J	8.7	291	J	334	J	13.8	213	J	203	J	4.8	447	J	448		0.22
Thallium	mg/kg	11	U	10.6	U	NA	9.7	U	10	U	NA	9.3	U	9	U	NA	11.3	U	11.1	U	NA
Vanadium	mg/kg	123	J+	122	J+	0.82	158	J	163	J	3.1	159	J+	161	J	1.3	152	J	159	J	NA
Zinc	mg/kg	79.9		73.6		8.2	83.3	J	84.7	J	1.7	111		92	J	18.7	139	J	236	J	NA

* ***Notes:***

- abs: absolute value of difference between concentrations is less than the reporting limit. Applicable when either N or FD concentration is less than 5 times the reporting limit.
- Bold: exceeds criteria
- N: Normal sample
- U: Below detection limit (reporting limit shown)
- D: dissolved metals
- NA: Not applicable
- ug/L: micrograms per liter
- FD: Field Duplicate
- Q: Laboratory qualifier
- UJ: concentration estimated at the reporting limit shown
- J: Estimated value
- RPD: relative percent difference
- mg/L: milligrams per l
- T: total metals

Table 3.5-1 Manual Water Level Measurements

Well ID	Stick up (ft)	Date & time	Depth to water (ft)	Comments
MW-1	2.36	6/28/13 10:55 AM	8.48	Pre-development
		8/12/13 12:32 PM	9.52	
		11/8/13 12:35 PM	8.61	
		4/1/14 9:00 AM	8.22	Nearby Stream Flowing
		5/5/14 12:10 PM	8.82	Nearby Stream Flowing
		7/15/14 10:30 AM	10.28	Nearby Stream Not Flowing
MW-2	2.79	6/27/13 12:15 PM	7.92	Pre-development
		8/12/13 12:10 PM	7.98	
		11/8/13 12:18 PM	7.6	
		2/15/14 3:00 PM	6.59	
		4/1/14 4:53 PM	7.27	
		5/8/14 4:40 PM	7.63	
		7/15/14 3:20 PM	7.91	
MW-3	2.64	6/26/13 10:00 AM	11.54	Pre-development
		8/12/13 12:15 PM	11.54	
		11/8/13 12:13 PM	10.89	
		2/15/14 2:30 PM	8.29	
		4/1/14 4:19 PM	10.06	
		5/5/14 12:45 PM	11.36	
		7/15/14 1:10 PM	11.78	
MW-4	3.71	6/27/13 3:35 PM	9.8	Pre-development
		8/12/13 11:20 AM	9.52	
		11/8/13 1:00 PM	8.52	
		4/1/14 5:37 PM	6.58	
		5/8/14 12:00 PM	8.75	
		7/15/14 12:40 PM	9.57	
MW-5	3.15	6/27/13 4:05 PM	11.97	Pre-development
		8/12/13 11:13 AM	13.2	
		11/8/13 12:55 PM	11.4	
		4/1/14 5:33 PM	6.5	
		5/5/14 1:10 PM	9.92	
		7/15/14 1:00 PM	12.51	
MW-6	2.37	6/28/13 11:00 AM	5.6	Pre-development
		8/12/13 10:57 AM	7.15	
		11/8/13 2:45 PM	5.87	
		4/1/14 12:30 PM	5.62	
		5/5/14 11:50 AM	6.24	
		7/15/14 12:25 PM	7	
MW-7	2.76	8/12/13 11:33 AM	15.65	
		11/8/13 1:10 PM	14.04	
		4/1/14 11:15 AM	9.06	
		5/5/14 1:05 PM	13.96	
		7/15/14 12:48 PM	15.31	

Table 3.5-1 Manual Water Level Measurements

Well ID	Stick up (ft)	Date & time	Depth to water (ft)	Comments
MW-8	3.08	8/14/13 9:30 AM	9.71	
		11/8/13 2:00 PM	3.22	Water level rising after pulling troll transducer; stable after 45 min
		2/15/14 1:50 PM	2.46	
		4/1/14 11:27 AM	2.57	Standing Water Around Monument
		5/5/14 1:25 PM	3.11	Standing Water Around Monument
		7/15/14 6:54 PM	4.2	No Standing Water Around Monument
MW-9	N/A	6/28/13 4:35 PM	8.49	Pre-development
		8/14/13 11:50 AM	dry	
		11/8/13 3:32 PM	8.15	
		4/1/14 11:00 AM	5.87	Furnace Creek Flowing
		5/5/14 1:45 PM	6.93	Furnace Creek with Flow, but Subducting Before Reaching Garoutte Creek
		7/15/14 5:36 PM	8.72	Furnace Creek Not Flowing
MW-10	2.35	6/27/13 12:00 PM	18.1	Pre-development
		8/12/13 10:42 AM	18.07	
		11/8/13 2:30 PM	15.58	
		4/1/14 11:55 AM	14.48	Furnace Creek Flowing
		5/5/14 1:30 PM	16.38	Furnace Creek Flowing
		7/15/14 11:40 AM	17.18	Furnace Creek Flowing
MW-11	2.67	8/12/13 10:30 AM	18.07	
		11/8/13 2:24 PM	15.58	
		4/1/14 12:10 PM	15.39	
		5/5/14 10:25 AM	16.32	
		7/15/14 11:30 AM	17.4	
MW-12	3.14	8/12/13 12:53 PM	6.28	
		11/8/13 3:13 PM	5.61	
		2/15/14 3:30 PM	4.44	
		4/1/14 10:47 AM	5.02	
		5/5/14 12:35 PM	5.64	
		7/15/14 5:50 PM	6.18	
MW-13	2.75	6/28/13 1:20 PM	6.16	Pre-development
		8/12/13 12:43 PM	7.42	
		11/8/13 3:00 PM	5.62	
		4/1/14 9:51 AM	5.54	
		5/5/14 12:25 PM	6.07	
		7/15/14 11:10 AM	7.07	

* ***Notes*** :
- ft: foot
- ID: identification
- MW: monitoring well
- N/A: not available

Table 4.2-3 November 2013 Surface Water Data - Storm Event #2

Sample ID	Sampling location	Sampling date	Analyte	ALKALINITY	ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHLORIDE	CHROMIUM	COBALT	COPPER
			Unit	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L
			Screening level/Sample type (T/D)	NA	87	1600	150	4	5.3	0.25	116000	860	11	23	9
1113BBM-DC1-SW-001	Dennis Creek	11/6/2013	D	--	20 UJ	60 U	1.5	21.3	5 U	1 U	32200	--	2 U	1 U	2 U
1113BBM-DC1-SW-001	Dennis Creek	11/6/2013	T	60.9	40 U	60 U	1.5	21	5 U	1 U	30800	2.47	2 U	1 U	2 U
1113BBM-DC1-SW-002	Dennis Creek	11/7/2013	D	--	20 UJ	60 U	1.5	20.3	5 U	1 U	29000	--	2 U	1 U	2 U
1113BBM-DC1-SW-002	Dennis Creek	11/7/2013	T	56.6	66.6	60 U	1.6	18.9	5 U	1 U	31500	2.35	2 U	1 U	2 U
1113BBM-DC1-SW-003	Dennis Creek	11/7/2013	D	--	20 UJ	60 U	1.4	14.2	5 U	1 U	22300	--	2 U	1 U	2 U
1113BBM-DC1-SW-003	Dennis Creek	11/7/2013	T	51	437	60 U	6.8	31.1	5 U	0.11 J	23200	2.36	4	1.9	5.3
1113BBM-DC1-SW-004	Dennis Creek	11/7/2013	D	--	287	60 U	2.5	16.8	5 U	1 U	20300	--	2 U	1 U	2.2
1113BBM-DC1-SW-004	Dennis Creek	11/7/2013	T	44.7	285	60 U	3.6	19.6	5 U	1 U	19600	2.52	0.55 J	0.54 J	3
1113BBM-DC1-SW-005	Dennis Creek	11/7/2013	D	--	45.9 J	60 U	1.4	17.5	5 U	1 U	27500	--	2 U	1 U	2 U
1113BBM-DC1-SW-005	Dennis Creek	11/7/2013	T	52.1	125	60 U	2	19.2	5 U	1 U	25100	2.55	0.39 J	0.25 J	2 U
1113BBM-DC1-SW-006	Dennis Creek	11/8/2013	D	--	20 U	60 U	1.4	18.8	5 U	1 U	26400	--	2 U	1 U	2 U
1113BBM-DC1-SW-006	Dennis Creek	11/8/2013	T	53.1	91.4	60 U	1.5	17.9	5 U	1 U	30300	2.42	2 U	1 U	2 U
1113BBM-FC1-SW-001	Furnace Creek	11/6/2013	D	--	20 UJ	60 U	1 U	14	5 U	1 U	7680	--	2 U	1 U	2 U
1113BBM-FC1-SW-001	Furnace Creek	11/6/2013	T	37.2	20 U	60 U	1 U	13.9	5 U	1 U	7410	1.49	2 U	1 U	2 U
1113BBM-FC1-SW-003	Furnace Creek	11/7/2013	D	--	20 UJ	60 U	1 U	16.8	5 U	1 U	7510	--	2 U	1 U	2 U
1113BBM-FC1-SW-003	Furnace Creek	11/7/2013	T	37.4	40 U	60 U	1 U	17	5 U	1 U	7280	1.48	2 U	0.13 J	2 U
1113BBM-GD1-SW-001	Lower Garoutte	11/6/2013	D	--	20 UJ	60 U	1 U	10 U	5 U	1 U	10600	--	2 U	1 U	2 U
1113BBM-GD1-SW-001	Lower Garoutte	11/6/2013	T	43.3	42.5	60 U	1 U	10 U	5 U	1 U	9930	2.26	2 U	1U	2 U
1113BBM-GD1-SW-002	Lower Garoutte	11/7/2013	D	--	20 UJ	60 U	1 U	10 U	5 U	1 U	8990	--	0.15 J	1 U	2 U
1113BBM-GD1-SW-002	Lower Garoutte	11/7/2013	T	43.3	167	60 U	1 U	10 U	5 U	1 U	10200	2.11	2 U	1 U	2 U
1113BBM-GD1-SW-003	Lower Garoutte	11/7/2013	D	--	20 UJ	60 U	1 U	10 U	5 U	1 U	9770	--	2 U	1 U	2 U
1113BBM-GD1-SW-003	Lower Garoutte	11/7/2013	T	38.5	381	60 U	1.3	16.1	5 U	1 U	10300	2.2	0.46 J	1.2	4.6
1113BBM-GD1-SW-004	Lower Garoutte	11/7/2013	D	--	63 J	60 U	1 U	10 U	5 U	1 U	9320	--	2 U	1 U	2 U
1113BBM-GD1-SW-004	Lower Garoutte	11/7/2013	T	35.2	249	60 U	1 U	10 U	5 U	1 U	8430	2.39	0.32 J	0.38 J	2.6
1113BBM-GD1-SW-005	Lower Garoutte	11/7/2013	D	--	20 UJ	60 U	1 U	10 U	5 U	1 U	8750	--	2 U	1 U	2 U
1113BBM-GD1-SW-005	Lower Garoutte	11/7/2013	T	35	143	60 U	1 U	10 U	5 U	1 U	8090	2.34	0.21 J	0.16 J	2 U
1113BBM-GD1-SW-006	Lower Garoutte	11/8/2013	D	--	20 U	60 U	1 U	10 U	5 U	1 U	9210	--	2 U	1 U	2 U
1113BBM-GD1-SW-006	Lower Garoutte	11/8/2013	T	37.3	96	60 U	1 U	10 U	5 U	1 U	9380	2.19	2 U	1 U	2 U
1113BBM-GU1-SW-001	Upper Garoutte	11/6/2013	D	--	20 UJ	60 U	1 U	10 U	5 U	1 U	10300	--	2 U	1 U	2 U
1113BBM-GU1-SW-001	Upper Garoutte	11/6/2013	T	44.7	28.8	60 U	1 U	10 U	5 U	1 U	10600	2.2	2 U	1 U	2 U
1113BBM-GU1-SW-002	Upper Garoutte	11/7/2013	D	--	20 UJ	60 U	1 U	10 U	5 U	1 U	9400	--	0.19 J	0.11 J	2 U
1113BBM-GU1-SW-002	Upper Garoutte	11/7/2013	T	41.9	69.7	60 U	1 U	10 U	5 U	1 U	9620	2.17	2 U	1 U	2 U
1113BBM-GU1-SW-003	Upper Garoutte	11/7/2013	D	--	29.5 J	60 U	1 U	10 U	5 U	1 U	9460	--	2 U	1 U	2 U
1113BBM-GU1-SW-003	Upper Garoutte	11/7/2013	T	40.1	320	60 U	1.1	13.6	5 U	1 U	9490	2.18	0.40 J	0.89 J	3.8
1113BBM-GU1-SW-004	Upper Garoutte	11/7/2013	D	--	80.3 J	60 U	1 U	10 U	5 U	1 U	8720	--	2 U	1 U	2 U
1113BBM-GU1-SW-004	Upper Garoutte	11/7/2013	T	36.3	416	60 U	1.1	12	5 U	1 U	8430	2.35	2 U	1 U	3.8
1113BBM-GU1-SW-005	Upper Garoutte	11/7/2013	D	--	44.1 J	60 U	1 U	10 U	5 U	1 U	8940	--	2 U	1 U	2 U
1113BBM-GU1-SW-005	Upper Garoutte	11/7/2013	T	34.9	119	60 U	1 U	10 U	5 U	1 U	9100	2.33	0.28 J	0.19 J	2 U
1113BBM-GU1-SW-006	Upper Garoutte	11/8/2013	D	--	22	60 U	1 U	10 U	5 U	1 U	8080	--	2 U	1 U	2 U
1113BBM-GU1-SW-006	Upper Garoutte	11/8/2013	T	35.9	57.5	60 U	1 U	10 U	5 U	1 U	9360	2.22	2 U	1 U	2 U

Notes:
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- UV254: ultraviolet at 254 nanometer wavelength
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* ***Key to Storm Sample IDs***:
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- SW-002: First Rising Limb Sample
- SW-003: Second Rising Limb Sample
- SW-004: Peak Sample

Table 4.2-3 November 2013 Surface Water Data - Storm Event #2

Sample ID	Sampling location	Sampling date	Analyte	FLUORIDE	IRON	LEAD	MAGNESIUM	MANGANESE	MERCURY (low level)	METHYL MERCURY	NICKEL	NITRATE + NITRITE	POTASSIUM	SELENIUM	SILVER
			Unit	mg/L	µg/L	µg/L	µg/L	µg/L	ng/L	ng/L	µg/L	mg/L	µg/L	µg/L	µg/L
			Screening level/Sample type (T/D)	NA	1000	2.5	82000	120	12	50000	52	10	53000	5	0.12
1113BBM-DC1-SW-001	Dennis Creek	11/6/2013	D	--	100 U	1 U	7240	11.7 J	4.82	0.050 U	0.42 J	--	493 J	5 U	1 U
1113BBM-DC1-SW-001	Dennis Creek	11/6/2013	T	0.040 U	100 U	1 U	6900	12.3 J	10.3	0.050 U	1 U	0.050 U	501 J	5 U	1 U
1113BBM-DC1-SW-002	Dennis Creek	11/7/2013	D	--	100 U	1 U	6500	12 J	6.7	0.050 U	0.33 J	--	677 J	5 U	1 U
1113BBM-DC1-SW-002	Dennis Creek	11/7/2013	T	0.040 U	193	1 U	6940	24.2	19.6	0.0968	1 U	0.050 U	749 J	5 U	1 U
1113BBM-DC1-SW-003	Dennis Creek	11/7/2013	D	--	100 U	1 U	4970 J	8.2 J	7.97	0.0754	0.28 J	--	746 J	5 U	1 U
1113BBM-DC1-SW-003	Dennis Creek	11/7/2013	T	0.040 U	1880	1 U	5190	243	192	0.492	2.7	0.050 U	866 J	5 U	1 U
1113BBM-DC1-SW-004	Dennis Creek	11/7/2013	D	--	347	1 U	4570 J	26.7	11.8	0.0527	0.46 J	--	581 J	5 U	1 U
1113BBM-DC1-SW-004	Dennis Creek	11/7/2013	T	0.040 U	757	1 U	4510 J	68.1	184	0.236	1 U	0.245	589 J	5 U	1 U
1113BBM-DC1-SW-005	Dennis Creek	11/7/2013	D	--	100 U	1 U	6200	11.5 J	7.9	0.050 U	0.40 J	--	498 J	5 U	1 U
1113BBM-DC1-SW-005	Dennis Creek	11/7/2013	T	0.040 U	271	1 U	5700	23.4	34	0.0828	1 U	0.319	481 J	5 U	1 U
1113BBM-DC1-SW-006	Dennis Creek	11/8/2013	D	--	100 U	1 U	5930	8 J	5.63	0.049 U	4.5	--	577 J	5 U	1 U
1113BBM-DC1-SW-006	Dennis Creek	11/8/2013	T	0.040 U	171	2 U	6750	16	20.2	0.0627	1 U	0.215	554 J	5 U	1 U
1113BBM-FC1-SW-001	Furnace Creek	11/6/2013	D	--	100 U	1 U	2790 J	5.6 J	6.14	0.050 U	0.15 J	--	639 J	5 U	1 U
1113BBM-FC1-SW-001	Furnace Creek	11/6/2013	T	0.040 U	100 U	1 U	2680 J	15.0 U	10.3	0.050 U	1 U	0.050 U	655 J	5 U	1 U
1113BBM-FC1-SW-003	Furnace Creek	11/7/2013	D	--	100 U	1 U	2890 J	37.3	9.21	0.050 U	0.47 J	--	579 J	5 U	1 U
1113BBM-FC1-SW-003	Furnace Creek	11/7/2013	T	0.040 U	100 U	1 U	2800 J	40.9	34.1	0.050 U	1 U	0.050 U	613 J	5 U	1 U
1113BBM-GD1-SW-001	Lower Garoutte	11/6/2013	D		100 U	1 U	2240 J	3.7 J	4.71	0.050 U	0.17 J		704 J	5 U	1 U
1113BBM-GD1-SW-001	Lower Garoutte	11/6/2013	T	0.040 U	109	1 U	2100 J	4.6 J	7.75	0.049 U	1 U	0.050 U	557 J	5 U	1 U
1113BBM-GD1-SW-002	Lower Garoutte	11/7/2013	D	--	100 U	1 U	1900 J	4 J	5.95	0.050 U	0.090 J	--	681 J	5 U	1 U
1113BBM-GD1-SW-002	Lower Garoutte	11/7/2013	T	0.040 U	343	1 U	2130 J	42.5	14.1	0.0565	1 U	0.050 U	844 J	5 U	1 U
1113BBM-GD1-SW-003	Lower Garoutte	11/7/2013	D	--	100 U	1 U	2050 J	6 J	5.29	0.049 U	0.077 J	--	701 J	5 U	1 U
1113BBM-GD1-SW-003	Lower Garoutte	11/7/2013	T	0.040 U	1340	4.6	2140 J	196	61.9	0.319	1U	0.050 U	735 J	5 U	1 U
1113BBM-GD1-SW-004	Lower Garoutte	11/7/2013	D	--	184	1 U	1930 J	12.4 J	8.08	0.049 U	0.15 J	--	605 J	5 U	1 U
1113BBM-GD1-SW-004	Lower Garoutte	11/7/2013	T	0.040 U	607	1 U	1800 J	61.2	33.5	0.149	1 U	0.175	576 J	5 U	1 U
1113BBM-GD1-SW-005	Lower Garoutte	11/7/2013	D	--	100 U	1 U	1870 J	3.8 J	4.8	0.049 U	0.10 J	--	543 J	5 U	1 U
1113BBM-GD1-SW-005	Lower Garoutte	11/7/2013	T	0.040 U	282	1 U	1750 J	22.4	14.8	0.0574	1 U	0.281	511 J	5 U	1 U
1113BBM-GD1-SW-006	Lower Garoutte	11/8/2013	D	--	100 U	1 U	1960 J	15 U	4.44	0.049 U	0.098 J	--	934 J	5 U	1 U
1113BBM-GD1-SW-006	Lower Garoutte	11/8/2013	T	0.040 U	183	1 U	2030 J	10.1 J	10.1	0.050 U	1 U	0.275	665 J	5 U	1 U
1113BBM-GU1-SW-001	Upper Garoutte	11/6/2013	D	--	100 U	1 U	2180 J	15 U	5.08	0.053 U	0.054 J	--	536 J	5 U	1 U
1113BBM-GU1-SW-001	Upper Garoutte	11/6/2013	T	0.040 U	111	1 U	2200 J	4.8 J	6.63	0.049 U	1 U	0.050 U	571 J	5 U	1 U
1113BBM-GU1-SW-002	Upper Garoutte	11/7/2013	D	--	100 U	1 U	1990 J	4.3 J	5.6	0.050 U	0.23 J	--	568 J	5 U	1 U
1113BBM-GU1-SW-002	Upper Garoutte	11/7/2013	T	0.040 U	150	1 U	1990 J	11.1 J	8.57	0.050 U	1 U		597 J	5 U	1 U
1113BBM-GU1-SW-003	Upper Garoutte	11/7/2013	D	--	115	1 U	1990 J	11.2 J	5.86	0.050 U	0.15 J	--	629 J	5 U	1 U
1113BBM-GU1-SW-003	Upper Garoutte	11/7/2013	T	0.040 U	949	1 U	2020 J	148	27	0.153	1 U	0.050 U	657 J	5 U	1 U
1113BBM-GU1-SW-004	Upper Garoutte	11/7/2013	D	--	257	1 U	1860 J	20.8	9.66	0.050 U	0.24 J	--	624 J	5 U	1 U
1113BBM-GU1-SW-004	Upper Garoutte	11/7/2013	T	0.040 U	957	1 U	1810 J	114	25.7	0.176	1 U	0.0728	610 J	5 U	1 U
1113BBM-GU1-SW-005	Upper Garoutte	11/7/2013	D	--	136	1 U	1900 J	7.6 J	5.18	0.050 U	0.10 J	--	533 J	5 U	1 U
1113BBM-GU1-SW-005	Upper Garoutte	11/7/2013	T	0.040 U	348	1 U	1900 J	25.5	11.6	0.0573	1 U	0.266	552 J	5 U	1 U
1113BBM-GU1-SW-006	Upper Garoutte	11/8/2013	D	--	100 U	1 U	1740 J	3.7 J	4.76	0.049 U	0.12 J	--	612 J	5 U	1 U
1113BBM-GU1-SW-006	Upper Garoutte	11/8/2013	T	0.040 U	184	1 U	1940 J	10.2 J	7.6	0.050 U	1 U	0.251	589 J	5 U	1 U

Notes:
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- TSS: total suspended solid
- U: not detected
- UV254: ultraviolet at 254 nanometer wavelength
- Value exceeding screening level

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Table 4.2-3 November 2013 Surface Water Data - Storm Event #2

Sample ID	Sampling location	Sampling date	Analyte	SODIUM	SULFATE	THALLIUM	TSS	VANADIUM	ZINC	UV254	DOC	SUVA
			Unit	µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	/cm	mg/L	L/mg-M
			Screening level/Sample type (T/D)	680000	NA	40	NA	20	120	NA	NA	NA
1113BBM-DC1-SW-001	Dennis Creek	11/6/2013	D	4860 J	--	1 U	--	5 U	2 U	0.066	2.6	2.54
1113BBM-DC1-SW-001	Dennis Creek	11/6/2013	T	4580 J	64.8	1 U	4.62	5 U	2 U	--	--	--
1113BBM-DC1-SW-002	Dennis Creek	11/7/2013	D	4430 J	--	1 U	--	5 U	2 U	0.105	3.3	3.18
1113BBM-DC1-SW-002	Dennis Creek	11/7/2013	T	4840 J	57.6	1 U	5.61	5 U	2 U	--	--	--
1113BBM-DC1-SW-003	Dennis Creek	11/7/2013	D	4320 J	--	1 U	--	5 U	2 U	0.177	4.1	4.32
1113BBM-DC1-SW-003	Dennis Creek	11/7/2013	T	4530 J	37.9	1 U	70	5 U	17.9	--	--	--
1113BBM-DC1-SW-004	Dennis Creek	11/7/2013	D	4550 J	--	1 U	--	5 U	2 U	0.26	4.8	5.42
1113BBM-DC1-SW-004	Dennis Creek	11/7/2013	T	4290 J	30	1 U	31.5	5 U	2.4	--	--	--
1113BBM-DC1-SW-005	Dennis Creek	11/7/2013	D	4570 J	--	1 U	--	5 U	2 U	0.141	3.5	4.03
1113BBM-DC1-SW-005	Dennis Creek	11/7/2013	T	4090 J	49.1	1 U	7.07	5 U	2.2	--	--	--
1113BBM-DC1-SW-006	Dennis Creek	11/8/2013	D	4100 J	--	1 U	--	5 U	2 U	0.083	3.2	2.59
1113BBM-DC1-SW-006	Dennis Creek	11/8/2013	T	4800 J	53.9	1 U	2.25	5 U	2 U	--	--	--
1113BBM-FC1-SW-001	Furnace Creek	11/6/2013	D	3200 J	--	1 U	--	5 U	20.9	0.003 U	1.4 U	0.214 U
1113BBM-FC1-SW-001	Furnace Creek	11/6/2013	T	3020 J	3.19	1 U	2.0 U	5 U	20.8	--	--	--
1113BBM-FC1-SW-003	Furnace Creek	11/7/2013	D	3210 J	--	1 U	--	5 U	35.9	0.007 U	1.2 U	0.583 U
1113BBM-FC1-SW-003	Furnace Creek	11/7/2013	T	3050 J	3.22	1 U	2.0 U	5 U	35.3	--	--	--
1113BBM-GD1-SW-001	Lower Garoutte	11/6/2013	D	4510 J	--	1 U	--	5 U	2	0.089	2.5	3.56
1113BBM-GD1-SW-001	Lower Garoutte	11/6/2013	T	4140 J	1.32	1 U	2.0 U	5 U	2 U	--	--	--
1113BBM-GD1-SW-002	Lower Garoutte	11/7/2013	D	3810 J	--	1 U	--	5 U	2 U	0.119	2.4	4.96
1113BBM-GD1-SW-002	Lower Garoutte	11/7/2013	T	4420 J	1.10	1 U	14	5 U	2 U	--	--	--
1113BBM-GD1-SW-003	Lower Garoutte	11/7/2013	D	4240 J	--	1 U	--	5 U	2 U	0.192	3.7	5.19
1113BBM-GD1-SW-003	Lower Garoutte	11/7/2013	T	4180 J	1.11	1 U	83.2	5 U	3.7	--	--	--
1113BBM-GD1-SW-004	Lower Garoutte	11/7/2013	D	4160 J	--	1 U	--	5 U	2 U	0.256	5.2	4.92
1113BBM-GD1-SW-004	Lower Garoutte	11/7/2013	T	3520 J	1.14	1 U	28.1	5 U	2.1	--	--	--
1113BBM-GD1-SW-005	Lower Garoutte	11/7/2013	D	3840 J	--	1 U	--	5 U	2 U	0.176	3.6	4.89
1113BBM-GD1-SW-005	Lower Garoutte	11/7/2013	T	3430 J	1.2	1 U	9.79	5 U	2 U	--	--	--
1113BBM-GD1-SW-006	Lower Garoutte	11/8/2013	D	4140 J	--	1 U	--	5 U	2 U	0.109	3.2	3.41
1113BBM-GD1-SW-006	Lower Garoutte	11/8/2013	T	4170 J	1.22	1 U	2.83	5 U	2 U	--	--	--
1113BBM-GU1-SW-001	Upper Garoutte	11/6/2013	D	4320 J	--	1 U	--	5 U	2 U	0.089	2.6	3.42
1113BBM-GU1-SW-001	Upper Garoutte	11/6/2013	T	4440 J	1.25	1 U	2	5 U	2 U	--	--	--
1113BBM-GU1-SW-002	Upper Garoutte	11/7/2013	D	3910 J	--	1 U	--	5 U	2 U	0.102	2.3	4.43
1113BBM-GU1-SW-002	Upper Garoutte	11/7/2013	T	4040 J	1.21	1 U	3.71	5 U	2 U	--	--	--
1113BBM-GU1-SW-003	Upper Garoutte	11/7/2013	D	4050 J	--	1 U	--	5 U	2 U	0.142	3.2	4.44
1113BBM-GU1-SW-003	Upper Garoutte	11/7/2013	T	3760 J	1.11	1 U	61.9	5 U	3.2	--	--	--
1113BBM-GU1-SW-004	Upper Garoutte	11/7/2013	D	3810 J	--	1 U	--	5 U	6.5	0.238	4.7	5.06
1113BBM-GU1-SW-004	Upper Garoutte	11/7/2013	T	3400 J	1.08	1 U	50.8	5 U	2.8	--	--	--
1113BBM-GU1-SW-005	Upper Garoutte	11/7/2013	D	3900 J	--	1 U	--	5 U	2 U	0.176	4.8	3.67
1113BBM-GU1-SW-005	Upper Garoutte	11/7/2013	T	3920 J	1.18	1 U	11.2	5 U	2 U	--	--	--
1113BBM-GU1-SW-006	Upper Garoutte	11/8/2013	D	3580 J	--	1 U	--	5 U	2 U	0.121	2.6	4.65
1113BBM-GU1-SW-006	Upper Garoutte	11/8/2013	T	4180 J	1.19	1 U	2.44	5 U	2 U	--	--	--

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Table 4.2-4 - February 2014 Surface Water Data - Storm Event #3

Sample ID	Sampling location	Sampling date	Analyte	ALKALINITY	ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHLORIDE	CHROMIUM	COBALT	COPPER	FLUORIDE	IRON	LEAD	MAGNESIUM	MANGANESE	MERCURY (low level)	METHYL MERCURY
			Unit	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	ng/L	ng/L
			Comparison level/Sample type (T/D)	NA	87	1600	150	4	5.3	0.25	116000	860	11	23	9	NA	1000	2.5	82000	120	12	50000
0214BBM-DC1-SW-001	Dennis Creek	2/13/2014	D	--	37.2J	60U	0.76J	9.2J	5U	1U	11400	--	2U	0.24J	2U		100U	1U	5000U	15U	5.39	0.052U
0214BBM-DC1-SW-001	Dennis Creek	2/13/2014	T	30.9	558	60U	2.1	12.6	5U	1U	10900	1.81	2U	1U	2.6J+	0.04U	865	1U	5000U	34.9	50.6	0.05U
0214BBM-DC1-SW-002	Dennis Creek	2/14/2014	D	--	72.5J	60U	0.94J	6.6J	5U	1U	8720	--	2U	0.11J	2U		134	1U	5000U	15U	14.3	0.049U
0214BBM-DC1-SW-002	Dennis Creek	2/14/2014	T	25.9	3410	60U	12.9	48.4	5U	1U	10600	1.77	6.5J+	6.8	16.1J+	0.04U	7190	1.3J+	5000U	507	862	0.5J+
0214BBM-DC1-SW-003	Dennis Creek	2/14/2014	D	--	505	60U	2.2	12.8	5U	1U	8650	--	2.1J+	0.86J	3.4		839	1.4	5000U	46.7	12.4	0.05U
0214BBM-DC1-SW-003	Dennis Creek	2/14/2014	T	24.4	2180	60U	7.9	30.3	5U	1U	9130	1.69	4J+	3	10.4J+	0.04U	3700	1.6J+	5000U	234	356	0.261
0214BBM-DC1-SW-004	Dennis Creek	2/15/2014	D	--	20UJ	60U	0.85J	6.7J	5U	1U	8520	--	2U	1U	2U		100U	1U	5000U	15U	8.23	0.05U
0214BBM-DC1-SW-004	Dennis Creek	2/15/2014	T	24.4	597	60U	3	15.4	5U	1U	8320	1.69	3.2J+	1U	4.2J+	0.04U	1340	1U	5000U	76.7	129	0.123
0214BBM-DC1-SW-005	Dennis Creek	2/16/2014	D	--	807J	60U	0.55J	7.2J	5U	1U	8160	--	2U	0.086J	2U		151	1.9	5000U	15U	9.1	0.05U
0214BBM-DC1-SW-005	Dennis Creek	2/16/2014	T	24.7	663	60U	2.5	12.2	5U	1U	8240	1.67	3.6J+	1U	3.2J+	0.04U	943	1.1J+	5000U	43.5	132	0.049U
0214BBM-DC1-SW-301	Dennis Creek	2/13/2014	D	--	110	60U	0.95J	8.1J	5U	1U	11300	--	2U	0.053J	2U		138	1U	5000U	15U	5.4	0.05U
0214BBM-DC1-SW-301	Dennis Creek	2/13/2014	T	30.9	491	60U	2	12.6	5U	1U	10500	1.81	3J+	1U	2.9J+	0.04U	894	1U	5000U	31.3	58.9	0.05U
0214BBM-DC1-SW-302	Dennis Creek	2/14/2014	D	--	20UJ	60U	0.65J	6.5J	5U	1U	8900	--	2U	1U	2U		100U	1U	5000U	15U	14.6	0.051U
0214BBM-DC1-SW-302	Dennis Creek	2/14/2014	T	25.8	3390	60U	13.6	49.7	5U	1U	10300	1.75	6.1J+	6.3	16.3J+	0.04U	6920	1.3J+	5000U	473	1020	0.715
0214BBM-FC1-SW-001	Furnace Creek	2/13/2014	D	--	157	60U	0.47J	14.7	5U	1U	5830	--	2U	0.11J	2U		217	1U	5000U	15U	248	0.05U
0214BBM-FC1-SW-001	Furnace Creek	2/13/2014	T	16.2	358	60U	1.1	22.4	5U	1U	5750	1.54	2.3J+	1U	3.3J+	0.04U	921	1U	5000U	36	2100	0.3J+
0214BBM-FC1-SW-002	Furnace Creek	2/14/2014	D	--	372	60U	1	16.1	5U	1U	6030	--	2U	0.27J	2.3		488	1U	5000U	17.5	8790	0.74J
0214BBM-FC1-SW-002	Furnace Creek	2/14/2014	T	16.3	1330	60U	3.5	32.4	5U	1U	6170	1.47	2J+	1.2	7.7J+	0.0434	2370	1U	5000U	88.5	27900	0.42J+
0214BBM-FC1-SW-003	Furnace Creek	2/14/2014	D	--	274	60U	1	13.3	5U	1U	5540	--	2U	0.22J	2U		387	1U	5000U	16	10300	1.1J+
0214BBM-FC1-SW-003	Furnace Creek	2/14/2014	T	15.8	3740	60U	10.4	95.1	5U	1U	7360	1.43	36.5	17.8	41.9J	0.0464	5460	2.4J+	5000U	370	93800	1.7J+
0214BBM-FC1-SW-004	Furnace Creek	2/15/2014	D	--	20UJ	60U	0.4J	8.3J	5U	1U	5230	--	2U	1U	2U		100U	1U	5000U	15U	491	0.05UJ+
0214BBM-FC1-SW-004	Furnace Creek	2/15/2014	T	15.3	1540	60U	4.8	42.6	5U	1U	5660	1.46	2.3J+	2.1	10.1J+	0.0428	3540	1U	5000U	153	26700	0.38J+
0214BBM-FC1-SW-005	Furnace Creek	2/16/2014	D	--	20UJ	60U	0.34J	6.4J	5U	1U	5000U	--	4.5J+	0.18J	2U		100U	1U	5000U	15U	586	0.051U
0214BBM-FC1-SW-005	Furnace Creek	2/16/2014	T	15	475	60U	1.4	22.7	5U	1U	5000U	1.43	2UJ	1U	4J+	0.04U	1040	1.3J+	5000U	67.9	7490	0.29J+
0214BBM-GD1-SW-001	Garoutte Downstream	2/13/2014	D	--	20UJ	60U	0.3J	3.2J	5U	1U	6100	--	2U	1U	2U		100U	1U	5000U	15U	3.24	0.05U
0214BBM-GD1-SW-001	Garoutte Downstream	2/13/2014	T	23.4	486	60U	0.5J	10U	5U	1U	6210	1.62	3J+	1U	3.9J+	0.04U	1070	1U	5000U	64.8	26.8	0.05U
0214BBM-GD1-SW-002	Garoutte Downstream	2/14/2014	D	--	169	60U	0.3J	3.8J	5U	1U	5000U	--	2U	0.17J	2U		263	1U	5000U	20.2	6.45	0.049U
0214BBM-GD1-SW-002	Garoutte Downstream	2/14/2014	T	17.8	5380	60U	5	69.5	5U	1U	9300	1.51	5.8J+	7.3	31.3J+	0.04U	11700	1.6J+	5000U	828	353	0.411
0214BBM-GD1-SW-003	Garoutte Downstream	2/14/2014	D	--	256	60U	0.44J	4.7J	5U	1U	5140	--	2U	0.26J	2.1		673	1U	5000U	31.1	7.09	0.05U
0214BBM-GD1-SW-003	Garoutte Downstream	2/14/2014	T	17.6	1870	60U	1.9	23.1	5U	1U	5920	1.55	2.2J+	2.2J	9.9J+	0.04U	3420	1.5J+	5000U	233	249	0.132
0214BBM-GD1-SW-004	Garoutte Downstream	2/14/2014	D	--	143	60U	1U	4.2J	5U	1U	5490	--	2U	0.12J	2U		248	1.7	5000U	15U	18.2	0.05U
0214BBM-GD1-SW-004	Garoutte Downstream	2/15/2014	T	19	998	60U	0.92J	12.3	5U	1U	5580	1.56	2.4J+	1	5.5J+	0.04U	1740	1U	5000U	99.2	164	0.05U
0214BBM-GD1-SW-005	Garoutte Downstream	2/16/2014	D	--	117	60U	1U	4J	5U	1U	5370	--	2U	0.11J	2U		182	1.2	5000U	15U	9.66	0.049U
0214BBM-GD1-SW-005	Garoutte Downstream	2/16/2014	T	21.9	519	60U	0.64J	10U	5U	1U	5460	1.56	2UJ	1U	2.8J+	0.04U	759	1.4J+	5000U	44.5	40	0.05U
0214BBM-GD1-SW-303	Garoutte Downstream	2/14/2014	D	--	286	60U	1U	4.8J	5U	1U	5180	--	2U	0.28J	2.5		596	1U	5000U	33	14.8	0.05U
0214BBM-GD1-SW-303	Garoutte Downstream	2/14/2014	T	17.8	1680	60U	1.9	23.1	5U	1U	6070	1.53	12.5J+	4.8J	10.7J+	0.04U	3500	1U	5000U	243	211	0.123
0214BBM-GU1-SW-001	Garoutte Upstream	2/13/2014	D	--	75.5J	60U	0.24J	3.5J	5U	1U	6140	--	2U	1U	2U		142	1U	5000U	15U	3.17	0.051U
0214BBM-GU1-SW-001	Garoutte Upstream	2/13/2014	T	23.6	459	60U	0.37J	10U	5U	1U	5740	1.62	2.5J+	1U	3.3J+	0.04U	713	1U	5000U	57.7	21.4	0.049U
0214BBM-GU1-SW-002	Garoutte Upstream	2/14/2014	D	--	300	60U	0.43J	5.1J	5U	1U	5210	--	6J+	0.86J	2.7		521	1U	5000U	37.4	7.1	0.05U
0214BBM-GU1-SW-002	Garoutte Upstream	2/14/2014	T	18.1	2870	60U	2.9	50.4	5U	1U	8100	1.5	3.5J+	4.9	19.5J+	0.04U	6450	1.2J+	5000U	601	192	0.335
0214BBM-GU1-SW-003	Garoutte Upstream	2/14/2014	D	--	389	60U	0.53J	5.7J	5U	1U	5160	--	2U	0.34J	2.1		652	1U	5000U	35.9	4.44	0.05U
0214BBM-GU1-SW-003	Garoutte Upstream	2/14/2014	T	17.9	1160	60U	1.2	22.7	5U	1U	5800	1.54	2.7J+	1.9	8.1J+	0.04U	2750	1U	5000U	253	61.7	0.118
0214BBM-GU1-SW-004	Garoutte Upstream	2/15/2014	D	--	140	60U	1U	4J	5U	1U	5370	--	2U	0.13J	2U		230	1U	5000U	15U	8.78	0.05U
0214BBM-GU1-SW-004	Garoutte Upstream	2/15/2014	T	19.1	773	60U	0.86J	12.4	5U	1U	5530	1.51	3.8J+	1	4.8J+	0.04U	1120	1U	5000U	94	36.3	0.05U
0214BBM-GU1-SW-005	Garoutte Upstream	2/16/2014	D	--	53.7J	60U	1U	3.4J	5U	1U	5390	--	7J+	0.11J	2U		132	1U	5000U	15U	3.32	0.049U
0214BBM-GU1-SW-005	Garoutte Upstream	2/16/2014	T	21.9	555	60U	0.54J	10U	5U	0.16J	5000U	1.56	71.9J	1U	5.4J+	0.04U	819	4.8J+	5000U	39.3	21.2	0.05U
0214BBM-PRECIP-000	Precipitation Station	2/15/2014	T	5U	20U	60U	1U	10U	5U	1U	5000U	0.306	2.6J+	1U	2U	0.04U	100U	1U	5000U	15U	2.61	0.108
0214BBM-WH1-SW-000	Weyerhauser Road Ditch	2/15/2014	D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	30.3	0.049U
0214BBM-WH1-SW-000	Weyerhauser Road Ditch	2/15/2014	T	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	55	0.124

* ***Notes***:
- T: total
- /cm: per centimeter
- µg/L: microgram per liter
- D: dissolved
- DOC: dissolved organic carbon
- J: estimated value
- L/mg-M: liter per milligram meter
- mg/L: milligram per liter
- ng/L: nanogram per liter
- SUVA: specific ultraviolet absorbance
- TSS: total suspended solid
- U: not detected
- UV254: ultraviolet at 254 nanometer wavelength

Value exceeding screening level

* ***Key to Storm Sample IDs***:
- SW-001: Baseline Sample
- SW-002: First Rising Limb Sample
- SW-003: Second Rising Limb Sample
- SW-004: Peak Sample
- SW-005: First Falling Limb Sample
- SW-006: Second Falling Limb Sample

Table 4.2-4 - February 2014 Surface Water Data - Storm Event #3

Sample ID	Sampling location	Sampling date	Analyte	NICKEL	NITRATE + NITRITE	POTASSIUM	SELENIUM	SILVER	SODIUM	SULFATE	THALLIUM	TSS	VANADIUM	ZINC	UV254	DOC	SUVA
			Unit	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	/cm	mg/L	L/mg-M
			Comparison level/Sample type (T/D)	52	10	53000	5	0.12	680000	NA	40	NA	20	120	NA	NA	NA
0214BBM-DC1-SW-001	Dennis Creek	2/13/2014	D	1U	--	5000U	5U	1U	5000U	;--	1U	;--	0.18J	3.8J+	0.068	3.6	1.89
0214BBM-DC1-SW-001	Dennis Creek	2/13/2014	T	2.2J+	0.374	5000U	5U	1U	5000U	11.8	1U	14.2	1.8J	5.7J+	--	--	--
0214BBM-DC1-SW-002	Dennis Creek	2/14/2014	D	1U	--	5000U	5U	1U	5000U	--	1U	--	0.26J	2.1J+	0.085J	6.1	1.39J
0214BBM-DC1-SW-002	Dennis Creek	2/14/2014	T	6.9J+	0.583	5000U	5U	0.083J	5000U	7.88	1U	289	11.8	14.3J+	--	--	--
0214BBM-DC1-SW-003	Dennis Creek	2/14/2014	D	2.7	--	5000U	5U	1U	5000U	--	1U	--	2.2J	10.2J+	0.143	5.9	2.42
0214BBM-DC1-SW-003	Dennis Creek	2/14/2014	T	4J+	0.525	5000U	5U	1U	5000U	7.19	1U	143	6.7	20.8J+	--	--	--
0214BBM-DC1-SW-004	Dennis Creek	2/15/2014	D	1.1	--	5000U	5U	1U	5000U	--	1U	--	5U	4J+	0.082	4.6	1.78
0214BBM-DC1-SW-004	Dennis Creek	2/15/2014	T	3.4J+	0.455	5000U	5U	1U	5000U	7.78	1U	38.4	1.3J	10.7J+	--	--	--
0214BBM-DC1-SW-005	Dennis Creek	2/16/2014	D	1U	--	5000U	5U	1U	5000U	--	1U	--	5U	6.9J+	0.064	3.9	1.64
0214BBM-DC1-SW-005	Dennis Creek	2/16/2014	T	2.2J+	0.37	5000U	5U	0.074J	5000U	8.22	1U	21	5U	7J+	--	--	--
0214BBM-DC1-SW-301	Dennis Creek	2/13/2014	D	1U	--	5000U	5U	1U	5000U	--	1U	--	0.27J	2.6J+	0.068	4.7	1.45
0214BBM-DC1-SW-301	Dennis Creek	2/13/2014	T	2.9J+	0.378	5000U	5U	1U	5000U	11.8	1U	14.2	1.7J	5.9J+	--	--	--
0214BBM-DC1-SW-302	Dennis Creek	2/14/2014	D	1U	--	5000U	5U	1U	5000U	--	1U	--	0.4J	2U	0.175J	5	3.5J
0214BBM-DC1-SW-302	Dennis Creek	2/14/2014	T	5.9J+	0.582	5000U	5U	0.057J	5000U	7.87	1U	293	12	13.7J+	--	--	--
0214BBM-FC1-SW-001	Furnace Creek	2/13/2014	D	1U	--	5000U	5U	1U	5000U	--	1U	--	0.26J	4.6J+	0.031	2.5	1.24
0214BBM-FC1-SW-001	Furnace Creek	2/13/2014	T	2J+	1.03	5000U	5U	1U	5000U	4.59	1U	49.6	0.61J	9J+	--	--	--
0214BBM-FC1-SW-002	Furnace Creek	2/14/2014	D	1U	--	5000U	5U	1U	5000U	--	1U	--	1.1J	3.7J+	0.05	2.7	1.85
0214BBM-FC1-SW-002	Furnace Creek	2/14/2014	T	2.1J+	1.37	5000U	5U	0.075J	5000U	3.29	1U	82.7	3.7J	9.6J+	--	--	--
0214BBM-FC1-SW-003	Furnace Creek	2/14/2014	D	1U	--	5000U	5U	1U	5000U	--	1U	--	0.7J	2.9J+	0.017	5.4	0.315
0214BBM-FC1-SW-003	Furnace Creek	2/14/2014	T	732	1.18	5000U	5U	0.079J	5000U	2.93	1U	536	11.8	19.8J+	--	--	--
0214BBM-FC1-SW-004	Furnace Creek	2/15/2014	D	1U	--	5000U	5U	1U	5000U	--	1U	--	0.18J	2.4J+	0.039	2	1.95
0214BBM-FC1-SW-004	Furnace Creek	2/15/2014	T	2J+	0.793	5000U	5U	0.099J	5000U	2.6	1U	150	4.7J	8.5J+	--	--	--
0214BBM-FC1-SW-005	Furnace Creek	2/16/2014	D	9.7	--	5000U	5U	1U	5000U	--	1U	--	5U	4J+	0.024	2.2	1.09
0214BBM-FC1-SW-005	Furnace Creek	2/16/2014	T	3.5J+	0.516	5000U	5U	1U	5000U	2.29	1U	72.9	5U	6.7J+	--	--	--
0214BBM-GD1-SW-001	Garoutte Downstream	2/13/2014	D	1U	--	5000U	5U	1U	5000U	--	1U	--	0.21J	2U	0.077	3.3	2.33
0214BBM-GD1-SW-001	Garoutte Downstream	2/13/2014	T	2.2J+	0.386	5000U	5U	0.064J	5000U	1.07	1U	31.8	0.98J	17.3J+	--	--	--
0214BBM-GD1-SW-002	Garoutte Downstream	2/14/2014	D	1U	--	5000U	5U	1U	5000U	--	1U	--	0.83J	2.3J+	0.162	5.5	2.95
0214BBM-GD1-SW-002	Garoutte Downstream	2/14/2014	T	5.2J+	0.457	5000U	5U	1U	5000U	0.989	1U	382	18.5	23.1J+	--	--	--
0214BBM-GD1-SW-003	Garoutte Downstream	2/14/2014	D	1U	--	5000U	5U	1U	5000U	--	1U	--	0.6J	4.4J+	0.115	4.2	2.74
0214BBM-GD1-SW-003	Garoutte Downstream	2/14/2014	T	2.5J+	0.421	5000U	5U	1U	5000U	0.935	1U	139	5.9	9.7J+	--	--	--
0214BBM-GD1-SW-004	Garoutte Downstream	2/14/2014	D	1U	--	5000U	5U	1U	5000U	-	1U	--	0.16J	4J+	0.072	4.6	1.57
0214BBM-GD1-SW-004	Garoutte Downstream	2/15/2014	T	1.7J+	0.378	5000U	5U	1U	5000U	0.965	1U	57.6	2.5J	14.5J+	--	--	--
0214BBM-GD1-SW-005	Garoutte Downstream	2/16/2014	D	1.4	--	5000U	5U	1U	5000U	--	1U	--	5U	5.4J+	0.054	3.1	1.74
0214BBM-GD1-SW-005	Garoutte Downstream	2/16/2014	T	1.5J+	0.335	5000U	5U	0.11J	5000U	0.987	1U	22.7	5U	5.9J+	--	--	--
0214BBM-GD1-SW-303	Garoutte Downstream	2/14/2014	D	1U	--	5000U	5U	1U	5000U	--	1U	--	0.53J	5.1J+	0.115	4.4	2.61
0214BBM-GD1-SW-303	Garoutte Downstream	2/14/2014	T	178J	0.428	5000U	5U	1U	5000U	0.932	1U	132	5.1	8.5J+	--	--	--
0214BBM-GU1-SW-001	Garoutte Upstream	2/13/2014	D	1U	--	5000U	5U	1U	5000U	--	1U	--	5U	2U	0.07	3.5	2
0214BBM-GU1-SW-001	Garoutte Upstream	2/13/2014	T	2.5J+	0.389	5000U	5U	1U	5000U	1.08	1U	23.5	1.1J	3.8J+	--	--	--
0214BBM-GU1-SW-002	Garoutte Upstream	2/14/2014	D	27.2	--	5000U	5U	1U	5000U	--	1U	--	1J	7.1J+	0.18	4.8	3.75
0214BBM-GU1-SW-002	Garoutte Upstream	2/14/2014	T	3.3J+	0.457	5000U	5U	1U	5000U	0.975	1U	407	11.9	17.5J+	--	--	--
0214BBM-GU1-SW-003	Garoutte Upstream	2/14/2014	D	1U	--	5000U	5U	1U	5000U	--	1U	--	1.3J	3.4J+	0.113	4.6	2.46
0214BBM-GU1-SW-003	Garoutte Upstream	2/14/2014	T	2.9J+	0.412	5000U	5U	1U	5000U	0.957	1U	140	3.7J	7.6J+	--	--	--
0214BBM-GU1-SW-004	Garoutte Upstream	2/15/2014	D	1U	--	5000U	5U	1U	5000U	--	1U	--	0.43J	5.7J+	0.072	6.6	1.09
0214BBM-GU1-SW-004	Garoutte Upstream	2/15/2014	T	2.5J+	0.368	5000U	5U	1U	5000U	0.882	1U	65.2	1.8J	7.7J+	--	--	--
0214BBM-GU1-SW-005	Garoutte Upstream	2/16/2014	D	3	--	5000U	5U	1U	5000U	--	1U	--	5U	4.5J+	0.054	2.9	1.86
0214BBM-GU1-SW-005	Garoutte Upstream	2/16/2014	T	49.2J+	0.327	5000U	5U	1U	5000U	0.969	1U	29.2	5U	12J+	--	--	--
0214BBM-PRECIP-000	Precipitation Station	2/15/2014	T	1.2J+	0.05U	5000U	5U	0.065J	5000U	0.3U	1U	--	5U	6.3J+	--	--	--
0214BBM-WH1-SW-000	Weyerhauser Road Ditch	2/15/2014	D	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0214BBM-WH1-SW-000	Weyerhauser Road Ditch	2/15/2014	T	--	--	--	--	--	--	--	--	--	--	--	--	--	--

* ***Notes***:

- T: total
- /cm: per centimeter
- µg/L: microgram per liter
- D: dissolved
- DOC: dissolved organic carbon
- J: estimated value
- L/mg-M: liter per milligram meter
- mg/L: milligram per liter
- ng/L: nanogram per liter
- SUVA: specific ultraviolet absorba
- TSS: total suspended solid
- U: not detected
- UV254: ultraviolet at 254 nanome

Value exceeding screening level

Table 4.3-1 Total Metals Sediment Data - March 2013 Downstream Samples and October 2013 Background (Upstream) Samples

Sample ID	Sample type	Sampling location	Sampling date	Analyte	ALUMINUM	ANTIMONY	ARSENIC	AVS	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHROMIUM	COBALT	COPPER	IRON
				Unit	mg/kg	mg/kg	mg/kg	µmole/g	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				Comparison Level	N/A	3.0	4.0	N/A	N/A	122.0	0.60	N/A	37.0	N/A	35.7	N/A
1013BBM-GU1-C1-SE-2MM	2mm	Upper Garoutte	10/10/2013		22500J	1.4U	19	N/A	166	0.59J	0.49J	6170J	28.9	21.9	78J	58300
1013BBM-GU1-C2-SE-2MM	2mm	Upper Garoutte	10/10/2013		22900J	1.4U	17.4	N/A	121	0.51J	0.52J	6330J	30.1	24.7	73.5J	57200
1013BBM-GU1-C3-SE-2MM	2mm	Upper Garoutte	10/10/2013		25200J	1.4U	22	N/A	140	0.66J	0.54J	6790J	34.3	24.3	81.5J	59400
Average (GU1-SE-2mm)	**2mm**	**Upper Garoutte**	**10/10/2013**		**23533J**	**1.4U**	**19**	**N/A**	**142**	**0.59J**	**0.52J**	**6430J**	**31.1**	**24**	**77.7J**	**58300**
1013BBM-GU1-C1-SE-62U	62µm	Upper Garoutte	10/10/2013		31000J	2.3U	23	N/A	161	0.78J	0.6J	9420J	43.2	24.8	97.6J	54600
1013BBM-GU1-C2-SE-62U	62µm	Upper Garoutte	10/10/2013		32100J	2.2U	23.8	N/A	162	0.79J	0.63J	9550J	40.8	25.1	100J	57000
1013BBM-GU1-C3-SE-62U	62µm	Upper Garoutte	10/10/2013		33100J	2.6U	24.5	N/A	166	0.87J	0.64J	9790J	40.8	23.8	106J	58500
Average (GU1-SE-62µm)	**62µm**	**Upper Garoutte**	**10/10/2013**		**32067J**	**2.4U**	**23.8**	**N/A**	**163**	**0.81J**	**0.62J**	**9587J**	**41.6**	**24.6**	**101J**	**56700**
1013BBM-GU1-C1-SE-BULK	bulk	Upper Garoutte	10/10/2013		22000J	1.4U	17.5	N/A	113J	0.55J	0.52J	6290J	29.8	20.3	73J	59500J
1013BBM-GU1-C2-SE-BULK	bulk	Upper Garoutte	10/10/2013		22300J	1.4U	15.8	N/A	106J	0.42J	0.49J	5920J	31.2	19	69.6J	57700J
1013BBM-GU1-C3-SE-BULK	bulk	Upper Garoutte	10/10/2013		24300J	1.5U	20.1	N/A	130	0.64J	0.51J	6700J	28.1	28.7	77.3J	59800
Average (GU1-SE-bulk)	**bulk**	**Upper Garoutte**	**10/10/2013**		**22867J**	**1.4U**	**17.8**	**N/A**	**116J**	**0.54J**	**0.51J**	**6303J**	**29.7**	**22.7**	**73.3J**	**59000J**
1013BBM-GU1-SE-005	5th sub-sample	Upper Garoutte	10/10/2013		--	--	--	N/A	--	--	--	--	--	--	--	--
1013BBBM-GU1-SE-015	15th sub-sample	Upper Garoutte	10/10/2013		--	--	--	N/A	--	--	--	--	--	--	--	--
1013BBM-GU1-SE-025	25th sub-sample	Upper Garoutte	10/10/2013		--	--	--	N/A	--	--	--	--	--	--	--	--
Average (GU1-SE-sub-sample)	**sub-sample**	**Upper Garoutte**	**10/10/2013**		**--**	**--**	**--**	**N/A**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
1013BBM-GU1-SE-305	5th sub-sample (dup)	Upper Garoutte	10/10/2013		--	--	--	N/A	--	--	--	--	--	--	--	--
1013BBM-UDC1-C1-SE-2MM	2mm	Dennis Creek	10/8/2013		18300J	1.4U	58.8	N/A	126J	0.57J	0.47J	5280J	36.5	20.3	64.2J	41200J
1013BBM-UDC1-C2-SE-2MM	2mm	Dennis Creek	10/8/2013		20700J	1.4U	59.3	N/A	131J	0.59J	0.49J	5580J	41.7	21.8	66.8J	42700J
1013BBM-UDC1-C3-SE-2MM	2mm	Dennis Creek	10/8/2013		18500J	1.4U	73.3	N/A	122J	0.58J	0.5J	5090J	41.6	21	63.3J	51700J
Average (UDC1-SE-2mm)	**2mm**	**Dennis Creek**	**10/8/2013**		**19167**	**1.4U**	**63.8**	**N/A**	**126J**	**0.58J**	**0.5J**	**5317J**	**39.9**	**21.0**	**64.8J**	**45200J**
1013BBM-UDC1-C1-SE-62U	62µm	Dennis Creek	10/8/2013		25200J	2U	86.2	N/A	173J	0.73J	0.57J	7570J	44.8	22.5	73.9J	45800J
1013BBM-UDC1-C2-SE-62U	62µm	Dennis Creek	10/8/2013		26900J	2U	87.5	N/A	175J	0.75J	0.6J	7800J	48	23.8	76.4J	47100J
1013BBM-UDC1-C3-SE-62U	62µm	Dennis Creek	10/8/2013		32600J	2.1U	99.9	N/A	214J	0.93J	0.72J	9100J	53.4	29.2	93.8J	58200J
Average (UDC1-SE-62µm)	**62µm**	**Dennis Creek**	**10/8/2013**		**28233J**	**2.0U**	**91.2**	**N/A**	**187J**	**0.80J**	**0.63J**	**8157J**	**48.7**	**25.2**	**81.4J**	**50367J**
1013BBM-UDC1-C1-SE-BULK	bulk	Dennis Creek	10/8/2013		17900J	1.2U	53.4	N/A	123J	0.54J	0.39J	4790J	26.8	17	53.7J	33800J
1013BBM-UDC1-C2-SE-BULK	bulk	Dennis Creek	10/8/2013		17200J	1.5U	63.4	N/A	116J	0.6J	0.47J	5030J	40.8	20.1	67J	43400J
1013BBM-UDC1-C3-SE-BULK	bulk	Dennis Creek	10/8/2013		20300J	1.4U	66.8	N/A	147J	0.7J	0.54J	6540J	36.8	27.6	67.3J	54700J
Average (UDC1-SE-bulk)	**bulk**	**Dennis Creek**	**10/8/2013**		**18467J**	**1.4U**	**61.2**	**N/A**	**129J**	**0.6J**	**0.47J**	**5453J**	**34.8**	**21.6**	**62.7J**	**43967J**
1013BBM-UDC1-SE-006	6th sub-sample	Dennis Creek	10/8/2013		--	--	--	N/A	--	--	--	--	--	--	--	--
1013BBM-UDC1-SE-014	14th sub-sample	Dennis Creek	10/8/2013		--	--	--	N/A	--	--	--	--	--	--	--	--
1013BBM-UDC1-SE-024	24th sub-sample	Dennis Creek	10/8/2013		--	--	--	N/A	--	--	--	--	--	--	--	--
Average (UDC1-SE-sub-sample)	**sub-sample**	**Dennis Creek**	**10/8/2013**		**--**	**--**	**--**	**N/A**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
1013BBM-UFC1-C1-SE-2MM	2mm	Furnace Creek	10/9/2013		36600J	1.8U	25.7	N/A	229J	0.4J	0.58J	6040J	29.2	30.9	103J	53600J
1013BBM-UFC1-C2-SE-2MM	2mm	Furnace Creek	10/9/2013		31000J	1.8U	28.8	N/A	196J	0.46J	0.57J	5270J	26.3	29.2	93.4J	51100J
1013BBM-UFC1-C3-SE-2MM	2mm	Furnace Creek	10/9/2013		33000J	1.8U	25.9	N/A	214J	0.41J	0.59J	5370J	27.8	32.8	98.4J	64500J
Average (UFC1-SE-2mm)	**2mm**	**Furnace Creek**	**10/9/2013**		**33533**	**1.8U**	**26.8**	**N/A**	**213J**	**0.42J**	**0.58J**	**5560J**	**27.8**	**31.0**	**98.3J**	**56400J**
1013BBM-UFC1-C1-SE-62U	62µm	Furnace Creek	10/9/2013		40800J	2U	30	N/A	252J	0.57J	0.63J	5860J	30.1	26.5	107J	58900J
1013BBM-UFC1-C2-SE-62U	62µm	Furnace Creek	10/9/2013		45100J	2.4U	39.6	N/A	279J	0.78J	0.69J	6500J	25.9	25	118J	57800J
1013BBM-UFC1-C3-SE-62U	62µm	Furnace Creek	10/9/2013		41900J	2.1U	36.1	N/A	262J	0.69J	0.64J	5750J	24.3	24.3	109J	56000J
Average (UFC1-SE-62µm)	**62µm**	**Furnace Creek**	**10/9/2013**		**42600**	**2.2U**	**35.2**	**N/A**	**264J**	**0.68J**	**0.65J**	**6037J**	**26.8**	**25.3**	**111J**	**57567J**
1013BBM-UFC1-C1-SE-BULK	bulk	Furnace Creek	10/9/2013		34500J	1.8U	25.8	N/A	215J	0.44J	0.59J	5890J	27.7	29.1	96J	60200J
1013BBM-UFC1-C2-SE-BULK	bulk	Furnace Creek	10/9/2013		34000J	1.7U	24.4	N/A	228J	0.39J	0.56J	5960J	25.4	29.2	103J	49800J
1013BBM-UFC1-C3-SE-BULK	bulk	Furnace Creek	10/9/2013		34000J	1.7U	30	N/A	208J	0.49J	0.59J	5400J	27	30	101J	65200J
Average (UFC1-SE-bulk)	**bulk**	**Furnace Creek**	**10/9/2013**		**34167J**	**1.7U**	**26.7**	**N/A**	**217J**	**0.44J**	**0.58J**	**5750J**	**26.7**	**29.4**	**100J**	**58400J**
1013BBM-UFC1-SE-005	5th sub-sample	Furnace Creek	10/9/2013		--	--	--	N/A	--	--	--	--	--	--	--	--
1013BBM-UFC1-SE-015	15th sub-sample	Furnace Creek	10/9/2013		--	--	--	N/A	--	--	--	--	--	--	--	--
1013BBM-UFC1-SE-025	25th sub-sample	Furnace Creek	10/9/2013		--	--	--	N/A	--	--	--	--	--	--	--	--
Average (UFC1-SE-sub-sample)	**sub-sample**	**Furnace Creek**	**10/9/2013**		**--**	**--**	**--**	**N/A**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
0313BBM-DC1-C1-SE-2MM	2mm	Dennis Creek	3/10/2013		17600J	1.4U	52.9J	--	107J	0.47J	0.68J	4640J	39.1J	22.1	55.8J	38100J
0313BBM-DC1-C2-SE-2MM	2mm	Dennis Creek	3/10/2013		15900J	1.4U	44J	--	101J	0.48J	0.62J	4500J	36.6J	22.4	58.5J	38700J
0313BBM-DC1-C3-SE-2MM	2mm	Dennis Creek	3/10/2013		16700J	1.4U	49.1J	--	108J	0.49J	0.68J	4560J	41.6J	22.1	59.7J	40900J
Average (DC1-SE-2mm)	**2mm**	**Dennis Creek**	**3/10/2013**		**16733J**	**1.4U**	**48.7J**	**--**	**105J**	**0.48J**	**0.66J**	**4567J**	**39.1J**	**22.2**	**58.0J**	**39223J**
0313BBM-DC1-C1-SE-64µ	64µm	Dennis Creek	3/10/2013		--	--	--	--	--	--	--	--	--	--	--	--
0313BBM-DC1-C2-SE-64µ	64µm	Dennis Creek	3/10/2013		--	--	--	--	--	--	--	--	--	--	--	--
0313BBM-DC1-C3-SE-64µ	64µm	Dennis Creek	3/10/2013		--	--	--	--	--	--	--	--	--	--	--	--
Average (DC1-SE-64µ)	**64µm**	**Dennis Creek**	**3/10/2013**		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**

Table 4.3-1 Total Metals Sediment Data - March 2013 Downstream Samples and October 2013 Background (Upstream) Samples

Sample ID	Sample type	Sampling location	Sampling date	Analyte	ALUMINUM	ANTIMONY	ARSENIC	AVS	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHROMIUM	COBALT	COPPER	IRON
				Unit	mg/kg	mg/kg	mg/kg	µmole/g	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				Comparison Level	N/A	3.0	4.0	N/A	N/A	122.0	0.60	N/A	37.0	N/A	35.7	N/A
0313BBM-DC1-C1-SE-BULK	bulk	Dennis Creek	3/10/2013		14900J	1.4U	45.4J	--	90.1J	0.4J	0.61J	4330J	37.8J	19	53.8J	40900J
0313BBM-DC1-C2-SE-BULK	bulk	Dennis Creek	3/10/2013		15000J	1.3U	47J	--	83.8J	0.48J	0.65J	3830J	37.2J	19	77.4J	39900J
0313BBM-DC1-C3-SE-BULK	bulk	Dennis Creek	3/10/2013		16100J	1.4U	48.3J	--	105J	0.5J	0.71	4120J	36.6J	23.3	57J	50900J
Average (DC1-SE-bulk)	**bulk**	**Dennis Creek**	**3/10/2013**		**15333J**	**1.4U**	**46.9J**	**--**	**93J**	**0.46J**	**0.66J**	**4093J**	**37.2J**	**20.4J**	**62.7J**	**43900J**
0313BBM-DC1- SE-015	15th sub-sample	Dennis Creek	3/10/2013		--	--	--	0.034U	--	--	--	--	--	--	--	--
0313BBM-DC1-SE-008	8th sub-sample	Dennis Creek	3/10/2013		--	--	--	0.034U	--	--	--	--	--	--	--	--
0313BBM-DC1-SE-025	25th sub-sample	Dennis Creek	3/10/2013		--	--	--	0.032U	--	--	--	--	--	--	--	--
Average (DC1-SE-sub-sample)	**sub-sample**	**Dennis Creek**	**3/10/2013**		**--**	**--**	**--**	**0.033U**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
0313BBM-DC1-SE-315	15th sub-sample (dup)	Dennis Creek	3/10/2013		--	--	--	0.036U	--	--	--	--	--	--	--	--
0313BBM-FC1-C1-SE-2MM	2mm	Furnace Creek	3/11/2013		26200J	1.8U	54.1J	--	188J	0.43J	0.79J	4970J	30.9J	27.9	104J	46400J
0313BBM-FC1-C2-SE-2MM	2mm	Furnace Creek	3/11/2013		25600J	1.7U	50.7J	--	182J	0.32J	0.77J	4610J	31.3J	25.3	99.7J	46900J
0313BBM-FC1-C3-SE -2MM	2mm	Furnace Creek	3/11/2013		26800J	1.8U	48.2J	--	196J	0.39J	0.76J	4960J	33.9J	27.7	106J	44000J
Average (FC1-SE-2mm)	**2mm**	**Furnace Creek**	**3/11/2013**		**26200J**	**1.8U**	**51.0J**	**--**	**189J**	**0.38J**	**0.77J**	**4847J**	**32.0J**	**27.0**	**103.2J**	**45767J**
0313BBM-FC1-C1-SE-64µ	64µm	Furnace Creek	3/11/2013		--	--	--	--	--	--	--	--	--	--	--	--
0313BBM-FC1-C2-SE-64µ	64µm	Furnace Creek	3/11/2013		--	--	--	--	--	--	--	--	--	--	--	--
0313BBM-FC1-C3-SE-64µ	64µm	Furnace Creek	3/11/2013		--	--	--	--	--	--	--	--	--	--	--	--
Average (FC1-SE-64µ)	**64µm**	**Furnace Creek**	**3/11/2013**		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
0313BBM-FC1-C1-SE-BULK	bulk	Furnace Creek	3/11/2013		27200J	1.5U	51.2J	--	253J	0.49J	0.75J	4170J	28.4J	24.4	109J	40200J
0313BBM-FC1-C2-SE-BULK	bulk	Furnace Creek	3/11/2013		29200J	2U	54.1J	--	219J	0.43J	0.85J	5670J	34.4J	31.5	115J	47100J
0313BBM-FC1-C3-SE-BULK	bulk	Furnace Creek	3/11/2013		24200J	1.7U	49.5J	--	182J	0.44J	0.75J	4470J	28.8J	30	100J	42600J
Average (FC1-SE-bulk)	**bulk**	**Furnace Creek**	**3/11/2013**		**26867J**	**1.7U**	**51.6J**	**--**	**218J**	**0.45J**	**0.78J**	**4770J**	**30.5J**	**28.60**	**108J**	**43300J**
0313BBM-FC1-SE-005	5th sub-sample	Furnace Creek	3/11/2013		--	--	--	0.053U	--	--	--	--	--	--	--	--
0313BBM-FC1-SE-016	16th sub-sample	Furnace Creek	3/11/2013		--	--	--	0.04U	--	--	--	--	--	--	--	--
0313BBM-FC1-SE-025	25th sub-sample	Furnace Creek	3/11/2013		--	--	--	0.065U	--	--	--	--	--	--	--	--
Average (FC1-SE-sub-sample)	**sub-sample**	**Furnace Creek**	**3/11/2013**		**--**	**--**	**--**	**0.053U**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
0313BBM-GD1-C1-SE-2MM	2mm	Lower Garoutte	3/9/2013		20100J	1.5U	17.5J	--	109J	0.31J	0.47J	6090J	30.5J	24.1	76.6J	41700J
0313BBM-GD1-C2-SE-2MM	2mm	Lower Garoutte	3/9/2013		22200J	1.5U	22.4J	--	121J	0.39J	0.56J	6100J	37.8J	22.7	82.4J	63500J
0313BBM-GD1-C3-SE-2MM	2mm	Lower Garoutte	3/9/2013		18200J	1.4U	16J	--	94.6J	0.31J	0.42J	5480J	28J	19.5	65J	42000J
Average (GD1-SE-2mm)	**2mm**	**Lower Garoutte**	**3/9/2013**		**20167J**	**1.5U**	**18.63J**	**#N/A**	**108.2J**	**0.34J**	**0.48J**	**5890J**	**32.1J**	**22.1**	**75J**	**49067J**
0313BBM-GD1-C1-SE-64µ	64µm	Lower Garoutte	3/9/2013		--	--	--	--	--	--	--	--	--	--	--	--
0313BBM-GD1-C2-SE-64µ	64µm	Lower Garoutte	3/9/2013		--	--	--	--	--	--	--	--	--	--	--	--
0313BBM-GD1-C3-SE-64µ	64µm	Lower Garoutte	3/9/2013		--	--	--	--	--	--	--	--	--	--	--	--
Average (GD1-SE-64µ)	**64µm**	**Lower Garoutte**	**3/9/2013**		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
0313BBM-GD1-C1-SE-BULK	bulk	Lower Garoutte	3/9/2013		21900J	1.6U	22.4J	--	118J	0.43J	0.52J	6030J	32.9J	22.7	80.1J	56800J
0313BBM-GD1-C2-SE-BULK	bulk	Lower Garoutte	3/9/2013		21800J	1.5U	17.7J	--	120J	0.42J	0.47J	6070J	34.9J	22.6	77.1J	53800J
0313BBM-GD1-C3-SE-BULK	bulk	Lower Garoutte	3/9/2013		18400J	1.4U	15.8J	--	96.8J	0.72U	0.45J	6140J	33.6J	23.7	99.7J	58700J
Average (GD1-SE-bulk)	**bulk**	**Lower Garoutte**	**3/9/2013**		**20700J**	**1.5U**	**18.6J**	**--**	**112J**	**0.52U**	**0.48J**	**6080J**	**33.8J**	**23**	**85.6J**	**56433J**
0313BBM-GD1-SE-005	5th sub-sample	Lower Garoutte	3/9/2013		--	--	--	0.046U	--	--	--	--	--	--	--	--
0313BBM-GD1-SE-015	15th sub-sample	Lower Garoutte	3/9/2013		--	--	--	0.033U	--	--	--	--	--	--	--	--
0313BBM-GD1-SE-025	25th sub-sample	Lower Garoutte	3/9/2013		--	--	--	0.025U	--	--	--	--	--	--	--	--
Average (GD1-SE-sub-sample)	**25th sub-sample**	**Lower Garoutte**	**3/9/2013**		**--**	**--**	**--**	**0.035U**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
0313BBM-GD1-SE-025	25th sub-sample	Lower Garoutte	3/9/2013		--	--	--	0.025U	--	--	--	--	--	--	--	--

* ***Notes*** :

- %: percent
- µm: micron
- µmole/g: micromole per gram
- AVS: acid volatile sulfide
- D: dissolved
- ID: identification
- J: estimated value
- mg/kg: milligram per kilogram
- mm: millimiter
- N/A: not available/not applicable
- ng/g: nanogram per gram
- T: total
- U: not detected
- Value exceeding screening level

Table 4.3-1 Total Metals Sediment Data - March 2013 Downstream Samples and October 2013 Background

Sample ID	Sample type	Sampling location	Sampling date	Analyte	LEAD	MAGNESIUM	MANGANESE	MERCURY	METHYL MERCURY	NICKEL	POTASSIUM	SELENIUM	SILVER	SODIUM	SULFATE	THALLIUM
				Unit	mg/kg	mg/kg	mg/kg	mg/kg	ng/g	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg (wet weight)	mg/kg
				Comparison Level	35.0	N/A	1100.0	0.2	N/A	18.0	N/A	0.1	4.5	N/A	N/A	0.7
1013BBM-GU1-C1-SE-2MM	2mm	Upper Garoutte	10/10/2013		2.5	5860J	1000J	1.8	0.51	23.7	460J	3.4U	1.4U	273J	N/A	0.68U
1013BBM-GU1-C2-SE-2MM	2mm	Upper Garoutte	10/10/2013		2.8	5940J	1050J	0.23	0.487	23.5	460J	3.5U	1.4U	309J	N/A	0.69U
1013BBM-GU1-C3-SE-2MM	2mm	Upper Garoutte	10/10/2013		3.3	6000J	1370J	0.37	0.483	22.9	490J	3.5U	1.4U	301J	N/A	0.7U
Average (GU1-SE-2mm)	**2mm**	**Upper Garoutte**	**10/10/2013**		**2.9**	**5933J**	**1140J**	**0.80**	**0.493**	**23.4**	**470J**	**3.5U**	**1.4U**	**294J**	**N/A**	**0.69U**
1013BBM-GU1-C1-SE-62U	62µm	Upper Garoutte	10/10/2013		4.1	6190J	1450J	1.1	2.81	25.7	517J	0.31J	2.4U	277J	N/A	1.2U
1013BBM-GU1-C2-SE-62U	62µm	Upper Garoutte	10/10/2013		3.9	6590J	1360J	0.51	2.77	26.7	562J	5.4U	2.2U	272J	N/A	1.1U
1013BBM-GU1-C3-SE-62U	62µm	Upper Garoutte	10/10/2013		3.7	6440J	1350J	0.61	3.46	26	590J	6.5U	2.5U	250J	N/A	1.3U
Average (GU1-SE-62µm)	**62µm**	**Upper Garoutte**	**10/10/2013**		**3.9**	**6407J**	**1387J**	**0.74**	**3.01**	**26.1**	**556J**	**4.1U**	**2.4U**	**266J**	**N/A**	**1.2U**
1013BBM-GU1-C1-SE-BULK	bulk	Upper Garoutte	10/10/2013		2	5810J	859J	0.25J	0.484	22.6	431J	3.4U	1.4U	281J	N/A	0.69U
1013BBM-GU1-C2-SE-BULK	bulk	Upper Garoutte	10/10/2013		1.7	5940J	870J	0.14UJ	0.361	22.1	434J	3.4U	1.4U	317J	N/A	0.68U
1013BBM-GU1-C3-SE-BULK	bulk	Upper Garoutte	10/10/2013		3.4	6310J	1460J	0.18	0.423	23.5	510J	3.6U	1.5U	269J	N/A	0.73U
Average (GU1-SE-bulk)	**bulk**	**Upper Garoutte**	**10/10/2013**		**2.4**	**6020J**	**1063J**	**0.19J**	**0.423**	**22.7**	**458J**	**3.5U**	**1.4U**	**289J**	**N/A**	**0.7U**
1013BBM-GU1-SE-005	5th sub-sample	Upper Garoutte	10/10/2013		--	--	--	--	--	--	--	--	--	--	105	--
1013BBBM-GU1-SE-015	15th sub-sample	Upper Garoutte	10/10/2013		--	--	--	--	--	--	--	--	--	--	36.8	--
1013BBM-GU1-SE-025	25th sub-sample	Upper Garoutte	10/10/2013		--	--	--	--	--	--	--	--	--	--	22.5	--
Average (GU1-SE-sub-sample)	**sub-sample**	**Upper Garoutte**	**10/10/2013**		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**N/A**	**--**
1013BBM-GU1-SE-305	5th sub-sample (dup)	Upper Garoutte	10/10/2013		--	--	--	--	--	--	--	--	--	--	102	--
1013BBM-UDC1-C1-SE-2MM	2mm	Dennis Creek	10/8/2013		2.5	3770J	1270J	0.46J	0.307	23.8	329J	3.5U	1.4U	186J	N/A	0.71U
1013BBM-UDC1-C2-SE-2MM	2mm	Dennis Creek	10/8/2013		2.6	4130J	1270J	0.28J	0.354	26.5	374J	3.6U	1.4U	205J	N/A	0.72U
1013BBM-UDC1-C3-SE-2MM	2mm	Dennis Creek	10/8/2013		2.7	3920J	1230J	0.26J	0.011U	24.7	324J	3.4U	1.4U	197J	N/A	0.69U
Average (UDC1-SE-2mm)	**2mm**	**Dennis Creek**	**10/8/2013**		**2.6**	**3940J**	**1257J**	**0.33J**	**0.224U**	**25.0**	**342J**	**3.5U**	**1.4U**	**196J**	**N/A**	**0.71U**
1013BBM-UDC1-C1-SE-62U	62µm	Dennis Creek	10/8/2013		3.3	4480J	1460J	0.99J	2.8	25.9	407J	4.9U	1.9U	170J	N/A	0.98U
1013BBM-UDC1-C2-SE-62U	62µm	Dennis Creek	10/8/2013		3.3	4710J	1560J	0.61J	2.88	27.2	430J	4.9U	1.9U	181J	N/A	0.98U
1013BBM-UDC1-C3-SE-62U	62µm	Dennis Creek	10/8/2013		3.5	6020J	1960J	0.63J	1.85	32.1	525J	5.3U	2.1U	219J	N/A	1.1U
Average (UDC1-SE-62µm)	**62µm**	**Dennis Creek**	**10/8/2013**		**3.4**	**5070J**	**1660J**	**0.74J**	**2.51**	**28.4**	**454J**	**5.0U**	**2.0U**	**190J**	**N/A**	**1.02U**
1013BBM-UDC1-C1-SE-BULK	bulk	Dennis Creek	10/8/2013		1.9	3000J	979J	0.29J	0.164	19.5	258J	2.9U	1.2U	125J	N/A	0.58U
1013BBM-UDC1-C2-SE-BULK	bulk	Dennis Creek	10/8/2013		2.9	3610J	1160J	0.47J	0.262	23.2	316J	3.7U	1.5U	166J	N/A	0.73U
1013BBM-UDC1-C3-SE-BULK	bulk	Dennis Creek	10/8/2013		2.9	3820J	1530J	0.21J	0.011U	24.9	348J	3.5U	1.4U	216J	N/A	0.71U
Average (UDC1-SE-bulk)	**bulk**	**Dennis Creek**	**10/8/2013**		**2.6**	**3477**	**1223J**	**0.32J**	**0.146U**	**22.5**	**307J**	**3.4U**	**1.4U**	**169J**	**N/A**	**0.67U**
1013BBM-UDC1-SE-006	6th sub-sample	Dennis Creek	10/8/2013		--	--	--	--	--	--	--	--	--	--	15.5	--
1013BBM-UDC1-SE-014	14th sub-sample	Dennis Creek	10/8/2013		--	--	--	--	--	--	--	--	--	--	48.6	--
1013BBM-UDC1-SE-024	24th sub-sample	Dennis Creek	10/8/2013		--	--	--	--	--	--	--	--	--	--	14.7	--
Average (UDC1-SE-sub-sample)	**sub-sample**	**Dennis Creek**	**10/8/2013**		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**N/A**	**--**
1013BBM-UFC1-C1-SE-2MM	2mm	Furnace Creek	10/9/2013		4.8	8500J	1660J	4.9J	5.4	29.3	586J	4.5U	1.8U	265J	N/A	0.91U
1013BBM-UFC1-C2-SE-2MM	2mm	Furnace Creek	10/9/2013		5.5	6950J	1590J	6.4J	6.85	27.1	528J	4.5U	1.8U	239J	N/A	0.91U
1013BBM-UFC1-C3-SE-2MM	2mm	Furnace Creek	10/9/2013		4.8	8000J	1780J	4.2J	4.83	28.3	508J	4.4U	1.8U	234J	N/A	0.89U
Average (UFC1-SE-2mm)	**2mm**	**Furnace Creek**	**10/9/2013**		**5.0**	**7817J**	**1677J**	**5.2J**	**5.69**	**28.2**	**541J**	**4.5U**	**1.8U**	**246J**	**N/A**	**0.90U**
1013BBM-UFC1-C1-SE-62U	62µm	Furnace Creek	10/9/2013		4.8	7410J	1390J	6.5J	9.07	29.3	588J	5.1U	2U	179J	N/A	1U
1013BBM-UFC1-C2-SE-62U	62µm	Furnace Creek	10/9/2013		5.1	6390J	1400J	10J	9.28	29.2	623J	0.28J	2.4U	147J	N/A	1.2U
1013BBM-UFC1-C3-SE-62U	62µm	Furnace Creek	10/9/2013		4.8	6370J	1430J	7J	6.7	27.7	558J	0.32J	2.2U	134J	N/A	1.1U
Average (UFC1-SE-62µm)	**62µm**	**Furnace Creek**	**10/9/2013**		**4.9**	**6723J**	**1407J**	**8J**	**8.35**	**28.7**	**590J**	**1.9U**	**2.2U**	**153J**	**N/A**	**1.1U**
1013BBM-UFC1-C1-SE-BULK	bulk	Furnace Creek	10/9/2013		4.4	7470J	1830J	4.6J	5.13	26.7	536J	4.4U	1.7U	238J	N/A	0.88U
1013BBM-UFC1-C2-SE-BULK	bulk	Furnace Creek	10/9/2013		4.5	8360J	1660J	5.6J	4.97	27.6	550J	4.3U	1.7U	230J	N/A	0.87U
1013BBM-UFC1-C3-SE-BULK	bulk	Furnace Creek	10/9/2013		5.1	7390J	1580J	3.1J	5.95	27.2	529J	4.4U	1.8U	215J	N/A	0.87U
Average (UFC1-SE-bulk)	**bulk**	**Furnace Creek**	**10/9/2013**		**4.7**	**7740J**	**1690J**	**4.4J**	**5.35**	**27.2**	**538J**	**4.4U**	**1.7U**	**228J**	**N/A**	**0.87U**
1013BBM-UFC1-SE-005	5th sub-sample	Furnace Creek	10/9/2013		--	--	--	--	--	--	--	--	--	--	31.3	--
1013BBM-UFC1-SE-015	15th sub-sample	Furnace Creek	10/9/2013		--	--	--	--	--	--	--	--	--	--	15.8	--
1013BBM-UFC1-SE-025	25th sub-sample	Furnace Creek	10/9/2013		--	--	--	--	--	--	--	--	--	--	26	--
Average (UFC1-SE-sub-sample)	**sub-sample**	**Furnace Creek**	**10/9/2013**		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**N/A**	**--**
0313BBM-DC1-C1-SE-2MM	2mm	Dennis Creek	3/10/2013		2.9	3460J	1110J	172	1.16	23.5	270J	3.5UJ	1.4U	157J	--	0.7U
0313BBM-DC1-C2-SE-2MM	2mm	Dennis Creek	3/10/2013		2.8	3400J	1170J	3.5	0.567	23.4	254J	3.5UJ	1.4U	149J	--	0.7U
0313BBM-DC1-C3-SE-2MM	2mm	Dennis Creek	3/10/2013		2.3	3660J	1130J	8.7	0.344	25.3	266J	3.5UJ	1.4U	140J	--	0.69U
Average (DC1-SE-2mm)	**2mm**	**Dennis Creek**	**3/10/2013**		**2.7**	**3507J**	**1137J**	**61.4**	**0.69**	**24.1**	**263J**	**3.5UJ**	**1.4U**	**149J**	**--**	**0.70U**
0313BBM-DC1-C1-SE-64µ	64µm	Dennis Creek	3/10/2013		--	--	--	5.2	2.48	--	--	--	--	--	--	--
0313BBM-DC1-C2-SE-64µ	64µm	Dennis Creek	3/10/2013		--	--	--	8.3	3.11	--	--	--	--	--	--	--
0313BBM-DC1-C3-SE-64µ	64µm	Dennis Creek	3/10/2013		--	--	--	6.5	3.07	--	--	--	--	--	--	--
Average (DC1-SE-64µ)	**64µm**	**Dennis Creek**	**3/10/2013**		**--**	**--**	**--**	**6.70**	**2.9**	**--**	**--**	**--**	**--**	**--**	**--**	**--**

Table 4.3-1 Total Metals Sediment Data - March 2013 Downstream Samples and October 2013 Background

Sample ID	Sample type	Sampling location	Sampling date	Analyte	LEAD	MAGNESIUM	MANGANESE	MERCURY	METHYL MERCURY	NICKEL	POTASSIUM	SELENIUM	SILVER	SODIUM	SULFATE	THALLIUM
				Unit	mg/kg	mg/kg	mg/kg	mg/kg	ng/g	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg (wet weight)	mg/kg
				Comparison Level	35.0	N/A	1100.0	0.2	N/A	18.0	N/A	0.1	4.5	N/A	N/A	0.7
0313BBM-DC1-C1-SE-BULK	bulk	Dennis Creek	3/10/2013		2.6	3440J	980J	14.1	0.664	23.6	256J	3.5UJ	1.4U	150J	--	0.7U
0313BBM-DC1-C2-SE-BULK	bulk	Dennis Creek	3/10/2013		2.3	2930J	925J	4.4	0.186	23.6	224J	3.3UJ	1.4U	118J	--	0.67U
0313BBM-DC1-C3-SE-BULK	bulk	Dennis Creek	3/10/2013		2.5	3070J	1190J	1	0.945	26.1	248J	3.5UJ	1.4U	110J	--	0.7U
Average (DC1-SE-bulk)	**bulk**	**Dennis Creek**	**3/10/2013**		**2.5**	**3147J**	**1032J**	**6.5**	**0.598**	**24.4**	**243J**	**3.4UJ**	**1.4U**	**126J**	**--**	**0.69U**
0313BBM-DC1- SE-015	15th sub-sample	Dennis Creek	3/10/2013		--	--	--	--	--	--	--	--	--	--	32.4	--
0313BBM-DC1-SE-008	8th sub-sample	Dennis Creek	3/10/2013		--	--	--	--	--	--	--	--	--	--	44.2	--
0313BBM-DC1-SE-025	25th sub-sample	Dennis Creek	3/10/2013		--	--	--	--	--	--	--	--	--	--	26.4	--
Average (DC1-SE-sub-sample)	**sub-sample**	**Dennis Creek**	**3/10/2013**		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**34.3**	**--**
0313BBM-DC1-SE-315	15th sub-sample (dup)	Dennis Creek	3/10/2013		--	--	--	--	--	--	--	--	--	--	31.7	--
0313BBM-FC1-C1-SE-2MM	2mm	Furnace Creek	3/11/2013		5.4	6270J	1400J	136	4.54	23.2	395J	4.6UJ	1.9U	106J	--	0.92U
0313BBM-FC1-C2-SE-2MM	2mm	Furnace Creek	3/11/2013		5.5	6330J	1240J	148	4.66	22.8	383J	4.2UJ	1.7U	100J	--	0.85U
0313BBM-FC1-C3-SE -2MM	2mm	Furnace Creek	3/11/2013		5.2	6300J	1440J	146	5.68	23.5	392J	4.4UJ	1.8U	102J	--	0.88U
Average (FC1-SE-2mm)	**2mm**	**Furnace Creek**	**3/11/2013**		**5.40**	**6300J**	**1360J**	**143.00**	**4.96**	**23.20**	**390J**	**4.4UJ**	**1.8U**	**103J**	**--**	**0.88U**
0313BBM-FC1-C1-SE-64µ	64µm	Furnace Creek	3/11/2013		--	--	--	199	7.38	--	--	--	--	--	--	--
0313BBM-FC1-C2-SE-64µ	64µm	Furnace Creek	3/11/2013		--	--	--	187	7.02	--	--	--	--	--	--	--
0313BBM-FC1-C3-SE-64µ	64µm	Furnace Creek	3/11/2013		--	--	--	199	7.82	--	--	--	--	--	--	--
Average (FC1-SE-64µ)	**64µm**	**Furnace Creek**	**3/11/2013**		**--**	**--**	**--**	**195**	**7.41**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
0313BBM-FC1-C1-SE-BULK	bulk	Furnace Creek	3/11/2013		5.1	4570J	1240J	117	9.06	26.5	378J	3.9UJ	1.6U	103J	--	0.77U
0313BBM-FC1-C2-SE-BULK	bulk	Furnace Creek	3/11/2013		6.5	7110J	1710J	158	9.55	25.6	441J	4.9UJ	2U	120J	--	0.98U
0313BBM-FC1-C3-SE-BULK	bulk	Furnace Creek	3/11/2013		5.6	5250J	1700J	134	6.73	21.6	363J	4.1UJ	1.7U	94J	--	0.83U
Average (FC1-SE-bulk)	**bulk**	**Furnace Creek**	**3/11/2013**		**5.70**	**5643J**	**1550J**	**136.00**	**8.45**	**24.60**	**394J**	**4.3UJ**	**1.8U**	**106J**	**--**	**0.86U**
0313BBM-FC1-SE-005	5th sub-sample	Furnace Creek	3/11/2013		--	--	--	--	--	--	--	--	--	--	28.2	--
0313BBM-FC1-SE-016	16th sub-sample	Furnace Creek	3/11/2013		--	--	--	--	--	--	--	--	--	--	19.2	--
0313BBM-FC1-SE-025	25th sub-sample	Furnace Creek	3/11/2013		--	--	--	--	--	--	--	--	--	--	43.5	--
Average (FC1-SE-sub-sample)	**sub-sample**	**Furnace Creek**	**3/11/2013**		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**30.30**	**--**
0313BBM-GD1-C1-SE-2MM	2mm	Lower Garoutte	3/9/2013		2.6	5570J	1020J	1	0.802	18.3	516J	3.8UJ	1.5U	236J	--	0.76U
0313BBM-GD1-C2-SE-2MM	2mm	Lower Garoutte	3/9/2013		2.3	5950J	1120J	0.8	0.54	20.1	462J	3.7UJ	1.5U	276J	--	0.73U
0313BBM-GD1-C3-SE-2MM	2mm	Lower Garoutte	3/9/2013		2	5230J	953J	0.79	0.569	17	389J	3.6UJ	1.5U	197J	--	0.72U
Average (GD1-SE-2mm)	**2mm**	**Lower Garoutte**	**3/9/2013**		**2.3**	**5583J**	**1031J**	**0.86**	**0.637**	**18.5**	**456J**	**3.7UJ**	**1.5U**	**236J**	**--**	**0.74U**
0313BBM-GD1-C1-SE-64µ	64µm	Lower Garoutte	3/9/2013		--	--	--	3.8	3.96	--	--	--	--	--	--	--
0313BBM-GD1-C2-SE-64µ	64µm	Lower Garoutte	3/9/2013		--	--	--	3.5	2.99	--	--	--	--	--	--	--
0313BBM-GD1-C3-SE-64µ	64µm	Lower Garoutte	3/9/2013		--	--	--	5.1	3.48	--	--	--	--	--	--	--
Average (GD1-SE-64µ)	**64µm**	**Lower Garoutte**	**3/9/2013**		**--**	**--**	**--**	**4.1**	**3.48**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
0313BBM-GD1-C1-SE-BULK	bulk	Lower Garoutte	3/9/2013		2.8	6330J	1170J	0.97	0.774	20.8	470J	3.9UJ	1.6U	229J	--	0.78U
0313BBM-GD1-C2-SE-BULK	bulk	Lower Garoutte	3/9/2013		2.8	6080J	1270J	0.74	1.02	20.2	465J	3.7UJ	1.5U	206J	--	0.74U
0313BBM-GD1-C3-SE-BULK	bulk	Lower Garoutte	3/9/2013		1.8	8900J	1050J	1.7	0.432	22.7	390J	3.5UJ	1.4U	266J	--	0.7U
Average (GD1-SE-bulk)	**bulk**	**Lower Garoutte**	**3/9/2013**		**2.5**	**7103J**	**1163J**	**1.1**	**0.742**	**21.2**	**442J**	**3.7UJ**	**1.5U**	**234J**	**--**	**0.74U**
0313BBM-GD1-SE-005	5th sub-sample	Lower Garoutte	3/9/2013		--	--	--	--	--	--	--	--	--	--	368	--
0313BBM-GD1-SE-015	15th sub-sample	Lower Garoutte	3/9/2013		--	--	--	--	--	--	--	--	--	--	11.5	--
0313BBM-GD1-SE-025	25th sub-sample	Lower Garoutte	3/9/2013		--	--	--	--	--	--	--	--	--	--	13.1	--
Average (GD1-SE-sub-sample)	**25th sub-sample**	**Lower Garoutte**	**3/9/2013**		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**131**	**--**
0313BBM-GD1-SE-025	25th sub-sample	Lower Garoutte	3/9/2013		--	--	--	--	--	--	--	--	--	--	13.1	--

* ***Notes*** :

- %: percent
- µm: micron
- µmole/g: micromole per gram
- AVS: acid volatile sulfide
- D: dissolved
- ID: identification
- J: estimated value
- mg/kg: milligram per kilogram
- mm: millimiter
- N/A: not available/not applicable
- ng/g: nanogram per gram
- T: total
- U: not detected
- Value exceeding screening level

Table 4.4-2 - Atmospheric Deposition Data - Total Low Level Mercury, Total TAL Metals and Common Ions - November 2013

Sample ID: 0313BBM-PR-001
Sampling Location: Black Butte Mine Precipitation Collector
Sampling Date: 11/20/2013

Analyte	ALKALINITY	ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHLORIDE	CHROMIUM
Unit	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L
Screening level	NA	87	1600	150	4	5.3	0.25	116000	860	11
	--	20 U	60U	1 U	10 U	5 U	1 U	5000 U	0.060 UJ	2 U

Analytes Continued Below

Analyte	COBALT	COPPER	FLUORIDE	IRON	LEAD	MAGNESIUM	MANGANESE	MERCURY	METHYL MERCURY	NICKEL
Unit	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	ng/L	ng/L	µg/L
Screening level	23	9	NA	1000	2.5	82000	120	770	50000	52
	1 U	2.7	0.051 J	100 U	1 U	5000	15 U	4.84	0.068	1 U

Analytes Continued Below

Analyte	NITRATE + NITRITE	POTASSIUM	SELENIUM	SILVER	SODIUM	SULFATE	THALLIUM	VANADIUM	ZINC
Unit	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L
Screening level	52	53000	5	0.12	680000	NA	40	20	120
	--	5000 U	5 U	1 U	5000 U	1.8 J	1 U	5 U	18.5

* ***Notes*** :
-- Alkalinity and nitrate + nitrite analyses compromised by inadvertent preservation with nitric acid.
- µg/L: microgram per liter
- D: dissolved
- J: estimated value
- mg/L: milligram per liter
- NA: not available/not applicable
- ng/L: nanogram per liter
- T: total
- U: not detected
- Highlighted cells reflect values that are greater than the screening level value

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Table 4.4-3 Atmospheric Deposition Data - Total Low Level Mercury, Total TAL Metals and Common Ions - February 2014

Sample ID: 0214BBM-PRECIP-000

Sampling Location: Black Butte Mine Precipitation Collector
Sampling Date: 2/15/2014

Analyte	ALKALINITY	ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHLORIDE	CHROMIUM
Unit	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L
Comparison level	NA	87	1600	150	4	5.3	0.25	116000	860	11
	5U	20U	60U	1U	10U	5U	1U	5000U	0.306	2.6J+

Analytes Continued Below

Analyte	COBALT	COPPER	FLUORIDE	IRON	LEAD	MAGNESIUM	MANGANESE	MERCURY	METHYL MERCURY	NICKEL
Unit	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	ng/L	ng/L	µg/L
Comparison level	23	9	NA	1000	2.5	82000	120	770	50000	52
	1U	2U	0.04U	100U	1U	5000U	15U	2.61	0.108	1.2J+

Analytes Continued Below

Analyte	NITRATE + NITRITE	POTASSIUM	SELENIUM	SILVER	SODIUM	SULFATE	THALLIUM	VANADIUM	ZINC
Unit	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L
Comparison level	52	53000	5	0.12	680000	NA	40	20	120
	0.05U	5000U	5U	0.065J	5000U	0.3U	1U	5U	6.3J+

* ***Notes*** :
- µg/L: microgram per liter
- D: dissolved
- J: estimated value
- mg/L: milligram per liter
- NA: not available/not applicable
- ng/L: nanogram per liter
- T: total
- U: not detected

CDM Smith

Table 4.5-3 November 2013 Groundwater

Table 4.5-3 - November 2013 Groundwater

Sample Sample Date Total/Dissolved			1113BBM-MW-12-GW-008 11/9/2013 D		1113BBM-MW-12-GW-008 11/9/2013 T		1113BBM-MW-13-GW-015 11/9/2013 D		1113BBM-MW-13-GW-015 11/9/2013 T		1113BBM-MW-2-GW-015 11/11/2013 D		1113BBM-MW-2-GW-015 11/11/2013 T		1113BBM-MW-3-GW-015 11/11/2013 D		1113BBM-MW-3-GW-015 11/11/2013 T		1113BBM-MW-4-GW-015 11/2/2013 D		1113BBM-MW-4-GW-015 11/2/2013 T		1113BBM-MW-5-GW-016 11/10/2013 D	
Analyte	**Unit**	**Comparison Criteria**	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
ALKALINITY, CARBONATE (AS CACO3)	mg/l	N/A	--		41.3		--		121		--		42.1		--		71.7		--		25.3		--	
ALUMINUM	ug/l	N/A	200	U	--		200	U	--		200	U	--		200	U	--		200	U	--		200	U
ANTIMONY	ug/l	N/A	2	U	--		2	U	--		2	U	--		2	U	--		2	U	--		2	U
ARSENIC	ug/l	50	0.41	J	--		0.89	J	--		0.3	J	--		14.7		--		1	U	--		15	
BARIUM	ug/l	1000	200	U	--		200	U	--		22.6	J	--		41.7	J	--		200	U	--		102	J
BERYLLIUM	ug/l	N/A	5	U	--		5	U	--		5	U	--		5	U	--		5	U	--		5	U
CADMIUM	ug/l	10	5	U	--		5	U	--		5	U	--		5	U	--		5	U	--		5	U
CALCIUM	ug/l	N/A	9810		--		28500		--		31700		--		23700		--		6010		--		34100	
Chloride	mg/l	250	--		2.16		--		2.31		--		2.4		--		2.04		--		1.34		--	
CHROMIUM	ug/l	50	10	U	--		10	U	--		10	U	--		10	U	--		10	U	--		10	U
COBALT	ug/l	N/A	0.084	J	--		1	U	--		1	U	--		1.6		--		0.1	J	--		0.48	J
COPPER	ug/l	1000	25	U	--		25	U	--		25	U	--		25	U	--		25	U	--		25	U
DOC	mg/L	N/A	2.4	J+	--		1.1	U	--		2.5	J+	--		1.7	U	--		1.2	U	--		2	J+
FLUORIDE	mg/l	4	--		0.04	U	--		0.0533		--		0.04	U	--		0.04	U	--		0.04	U	--	
IRON	ug/l	3000	180		--		100	U	--		100	U	--		5110		--		100	U	--		1480	
LEAD	ug/l	50	1	U	--		1	U	--		1	U	--		1		--		1	U	--		1	U
MAGNESIUM	ug/l	N/A	5000	U	--		6810		--		7910		--		5830		--		5000	U	--		6120	
MANGANESE	ug/l	50	30.6		--		58		--		15	U	--		388		--		24.9		--		164	
MERCURY (low level)	ng/l	2000	3.81		--		0.816	U	--		0.736	U	--		1.86	U	--		1.31	U	--		3.57	
METHYL MERCURY	ng/l	N/A	--		--		--		--		--		--		--		--		--		--		0.724	
NICKEL	ug/l	N/A	1	J	--		0.46	J	--		0.57	J	--		0.76	J	--		0.91	J	--		40	U
Nitrate+Nitrite as N	mg/l	10	--		0.266		--		0.05	U	--		0.0657		--		0.05	U	--		0.168		--	
POTASSIUM	ug/l	N/A	5000	U	--		5000	U	--		5000	U	--		5000	U	--		5000	U	--		5000	U
SELENIUM	ug/l	10	35	U	--		35	U	--		35	U	--		35	U	--		35	U	--		35	U
SILVER	ug/l	50	10	U	--		10	U	--		10	U	--		10	U	--		10	U	--		10	U
SODIUM	ug/l	N/A	4610	J	--		8310		--		4580	J	--		6810		--		3120	J	--		10900	
Sulfate	mg/l	250	--		1.26		--		1.81		--		84.3		--		36.6		--		4.83		--	
THALLIUM	ug/l	N/A	1	U	--		1	U	--		1	U	--		1	U	--		1	U	--		1	U
Total Dissolved Solids	mg/l	500	--		56		--		152		--		182		--		146		--		--		--	
VANADIUM	ug/l	N/A	50	U	--		50	U	--		50	U	--		50	U	--		50	U	--		50	U
ZINC	ug/l	5000	60	U	--		60	U	--		10.1	J	--		11.3	J	--		60	U	--		60	U

* ***Notes*** :
- /cm: per centimeter
- µg/L: microgram per liter
- D: dissolved
- DOC: dissolved organic carbon
- J: estimated value
- mg/L: milligram per liter
- ng/L: nanogram per liter
- T: total
- U: not detected

- Highlighted cells reflect values that are greater than the comparison level value

Table 4.5-3 November 2013 Groundwater

Table 4.5-3 - November 2013 Groundwater

Sample Sample Date Total/Dissolved			1113BBM-MW-5-GW-016 11/10/2013 T		1113BBM-MW-6-GW-010 11/10/2013 D		1113BBM-MW-6-GW-010 11/10/2013 T		1113BBM-MW-7-GW-015 11/10/2013 D		1113BBM-MW-7-GW-015 11/10/2013 T		1113BBM-MW-8-GW-008 11/10/2013 D		1113BBM-MW-8-GW-008 11/10/2013 T		1113BBM-MW-9-GW-006 11/9/2013 D	
Analyte	**Unit**	**Comparison Criteria**	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
ALKALINITY, CARBONATE (AS CACO3)	mg/l	N/A	138		--		30		--		101		--		29.3		--	
ALUMINUM	ug/l	N/A	--		200	U	--		200	U	--		200	U	--		200	U
ANTIMONY	ug/l	N/A	--		2	U	--		2	U	--		2	U	--		2	U
ARSENIC	ug/l	50	--		1	U	--		1	U	--		0.59	J	--		7.1	
BARIUM	ug/l	1000	--		19.3	J	--		57.1	J	--		200	U	--		26.6	J
BERYLLIUM	ug/l	N/A	--		5	U	--		5	U	--		5	U	--		5	U
CADMIUM	ug/l	10	--		5	U	--		5	U	--		5	U	--		5	U
CALCIUM	ug/l	N/A	--		32200		--		27600		--		9370		--		13300	
Chloride	mg/l	250	2.94		--		1.19		--		1.34		--		2.18		--	
CHROMIUM	ug/l	50	--		10	U	--		10	U	--		10	U	--		10	U
COBALT	ug/l	N/A	--		2.5		--		0.35	J	--		2.5		--		3.2	
COPPER	ug/l	1000	--		25	U	--		25	U	--		25	U	--		25	U
DOC	mg/L	N/A	--		1.2	U	--		1.5	J+	--		1.3	U	--		2.8	J+
FLUORIDE	mg/l	4	0.103		--		0.04	U	--		0.0471		--		0.0861		--	
IRON	ug/l	3000	--		100	U	--		123		--		589		--		9990	
LEAD	ug/l	50	--		1	U	--		1.2	J+	--		1	U	--		1	U
MAGNESIUM	ug/l	N/A	--		21200		--		5730		--		5000	U	--		5000	U
MANGANESE	ug/l	50	--		691		--		146		--		244		--		863	
MERCURY (low level)	ng/l	2000	--		0.894	U	--		1.13	U	--		28.9		--		71	
METHYL MERCURY	ng/l	N/A	--		--		--		0.314		--		0.419		--		--	
NICKEL	ug/l	N/A	--		5	J	--		0.53	J			19.4	J	--		17.1	J
Nitrate+Nitrite as N	mg/l	10	0.05	U	--		0.252		--		0.05	U	--		0.346		--	
POTASSIUM	ug/l	N/A	--		5000	U	--		5000	U	--		5000	U	--		5000	U
SELENIUM	ug/l	10	--		35	U	--		35	U	--		35	U	--		35	U
SILVER	ug/l	50	--		10	U	--		10	U	--		10	U	--		10	U
SODIUM	ug/l	N/A	--		7270		--		5350				7620				4280	J
Sulfate	mg/l	250	3.69		--		157		--		9.18		--		19.6		--	
THALLIUM	ug/l	N/A	--		1	U	--		1	U	--		1	U			1	U
Total Dissolved Solids	mg/l	500	162		--		290		--		142		--		80		--	
VANADIUM	ug/l	N/A	--		50	U	--		50	U	--		50	U	--		50	U
ZINC	ug/l	5000	--		60	U	--		60	U	--		60	U	--		13.6	J

* ***Notes*** :
- /cm: per centimeter
- µg/L: microgram per liter
- D: dissolved
- DOC: dissolved organic carbon
- J: estimated value
- mg/L: milligram per liter
- ng/L: nanogram per liter
- T: total
- U: not detected

- Highlighted cells reflect values that are greater than the comparison level value

Table 4.5-3 Groundwater Field Water Quality Data - November 2014

Sampling location	Sampling date	Depth to water (ft)	Temp (^{o}C)	pH (SU)	Turbidity (NTU)	Cond. (µS/cm)	D.O. (mg/L)	ORP (mV)
MW10	11/11/2013	16.07	11.21	5.84	1.57	153	7.60	93.8
MW11	11/11/2013	16.11	11.38	6.18	75.70	166	2.69	102.4
MW12	11/9/2013	5.82	9.86	6.85	2.60	97	5.09	-75.1
MW13	11/9/2013	5.96	12.63	6.72	4.79	259	2.88	-86.9
MW1	11/11/2013	9.35	11.51	5.99	7.65	65	8.84	102.3
MW2	11/11/2013	7.72	11.94	6.05	0.30	281	2.74	75.0
MW3	11/11/2013	11.32	11.14	6.60	0.33	235	0.33	-72.4
MW4	11/10/2013	8.62	11.18	5.87	5.00	65	1.55	92.7
MW5	11/10/2013	11.18	11.61	7.19	2.47	288	2.47	-102.2
MW6	11/10/2013	6.14	10.31	6.01	3.61	417	1.19	63.8
MW7	11/10/2013	14.38	10.97	6.77	0.71	216	3.49	-74.8
MW8	11/10/2013	--	--	--	--	--	--	--
MW9	11/9/2013	--	--	--	--	--	--	--

*__*Notes*__ :

- µS/cm: microSiemen per centimeter
- ^{o}C: degree Celsius
- Cond.: conductivity
- D.O.: dissolved oxygen
- ft: foot
- mg/L: milligram per liter
- mV: millivolt
- MW: monitoring well
- NTU: Nephelometric Turbidity Unit
- ORP: oxidation-reduction potential
- SU: standard unit

--: Stabilized parameters were not collected due to well going dry during low-flow sampling

Table 4.5-5 Groundwater Field Water Quality Data - May 2014

Sampling location	Sampling date	Depth to water (ft)	Temp (^{o}C)	pH (SU)	Turbidity (NTU)	Cond. (µS/cm)	D.O. (mg/L)	ORP (mV)
MW10	5/5/2014	16.38	9.47	5.56	25.90	132	3.65	149.4
MW11	5/5/2014	16.32	11.59	6.23	86.00	164	1.27	166.7
MW12	5/7/2014	5.95	10.80	6.66	3.32	82	6.05	20.1
MW13	5/7/2014	6.45	10.62	6.77	3.19	238	2.03	78.8
MW1	5/5/2014	13.31	9.80	6.89	2.14	67	9.25	146.0
MW2	5/8/2014	7.88	9.89	6.08	0.86	150	3.20	90.7
MW3	5/8/2014	11.65	9.71	6.54	3.19	232	0.50	-30.7
MW4	5/8/2014	8.75	9.96	5.91	2.86	72	1.58	55.9
MW5	5/6/2014	10.18	10.41	7.12	1.45	281	0.60	-86.3
MW6	5/6/2014	6.45	9.41	6.11	6.15	390	0.97	88.0
MW7	5/5/2014	14.18	9.91	6.49	1.00	162	5.51	148.6
MW8	5/6/2014	3.05	10.70	6.61	57.30	198	4.87	68.2
MW9	5/6/2014	6.93	10.87	6.13	9.28	62	3.86	124.4

****Notes*** :

- µS/cm: microSiemen per centimeter
- ^{o}C: degree Celsius
- Cond.: conductivity
- D.O.: dissolved oxygen
- ft: foot
- mg/L: milligram per liter
- mV: millivolt
- MW: monitoring well
- NTU: Nephelometric Turbidity Unit
- ORP: oxidation-reduction potential
- SU: standard unit

Appendix A

Field Forms

Water Level Record

Stick up	2.36'		MW-1
Reference point	TOC		
Date	Time	Depth to water (ft)	Comments
6/28/2013	10:55	8.48	Prior to bailing standing water
8/12/2013	12:32	9.52	
11/8/2013	12:35	8.61	
4/1/2014	9:00	8.22	Stream flowing rapidly
5/5/2014	12:10	8.82	Stream flowing slightly
7/15/2014	10:30	10.28	Stream not flowing

Stick up	2.79'				MW-2
Reference point	TOC				
Date	Manual time	Manual DTW (ft)	Sensor Time	Sensor DTW (ft)	Comments
6/27/2013	12:15	7.92	N/A	N/A	Pre-development
8/12/2013	12:10	7.98	N/A	N/A	
11/8/2013	12:18	7.6	N/A	N/A	
2/15/2014	15:00	6.59	N/A	N/A	
4/1/2014	16:53	7.27	N/A	N/A	Downloaded sensor, desiccant good, battery at 48%
4/1/2014	17:25	7.27	17:25	7.27	Re-synched sensor to computer time, rugged reader malfunctioning and setting wrong time
5/8/2014	16:40	7.63	16:40	7.67	Temp 49.24 degrees F

Stick up	2.64'				MW-3
Reference point	TOC				
Date	Manual time	Manual DTW (ft)	Sensor time	Sensor DTW (ft)	Comments
6/26/2013	10:00	11.54	N/A	N/A	Pre-development
8/12/2013	12:15	11.54	N/A	N/A	
11/8/2013	12:13	10.89	N/A	N/A	
2/15/2014	14:30	8.29	N/A	N/A	
4/1/2014	16:19	10.06	19:20	10.06	Download sensor, desiccant good, battery 67%, re-synched time and changed reading to DTW
4/2/2014	11:13		2:10	10:25	Downloaded sensor and pulled sensor to install at GU1 Stilling well
5/5/2014	12:45	11.36	N/A	N/A	Sensor that was in MW-3 is now installed in GU1
7/15/2014	13:10	11.78	N/A	N/A	

Stick up	3.71'		MW-4
Reference point	TOC		
Date	Time	Depth to water (ft)	Comments
6/27/2013	15:35	9.8	Pre-development
8/12/2013	11:20	9.52	
11/8/2013	13:00	8.52	
4/1/2014	17:37	6.58	
5/8/2014	12:00	8.75	
7/15/2014	12:40	9.57	Well area very overgrown

Stick up	3.71'		MW-4
Reference point	TOC		
Date	Time	Depth to water (ft)	Comments
6/27/2013	15:35	9.8	Pre-development
8/12/2013	11:20	9.52	
11/8/2013	13:00	8.52	
4/1/2014	17:37	6.58	
5/8/2014	12:00	8.75	
7/15/2014	12:40	9.57	Well area very overgrown

Stick up	2.37'		MW-6
Reference point	TOC		
Date	Time	Depth to water (ft)	Comments
6/28/2013	11:00	5.6	Pre-development
8/12/2013	10:57	7.15	
11/8/2013	14:45	5.87	
4/1/2014	12:30	5.62	Lock in bad shape, very rusted
5/5/2014	11:50	6.24	Raining off and on
7/15/2014	12:25	7	Lock rusty but still functioning

Stick up	2.67'		MW-7
Reference point	TOC		
Date	Time	Depth to water (ft)	Comments
8/12/2013	11:33	15.65	
11/8/2013	13:10	14.04	Had to break lock to access
4/1/2014	11:15	9.06	Flooding down the road from well
5/5/2014	13:05	13.96	
7/15/2014	12:48	15.31	Road to MW-7 very overgrown, no lock on monument because it was broken during last round of sampling, installed new lock on well monument, key number A727 (Masterlock)

Stick up	3.08'				MW-8
Reference point	TOC				
Date	Time	Depth to water (ft)	Sensor time	Sensor DTW (ft)	Comments
8/14/2013	9:30	9.71			
11/8/2013	14:00	3.22			Water level was rising after pulling troll transducer; stable after 45 min
2/15/2014	13:50	2.46	14:30	4.768	Able to get depth sounder (Sinco) down casing without removing transducer
4/1/2014	11:27	2.57	19:00	4.61	Battery 73%, desiccant good
4/1/2014	17:47	2.6	20:54	4.6	Return to sync sensor clock: outside reading = 2.62 ft
4/1/2014	18:01	2.6	20:01	1.99 psi	Restart sensor/new log
5/5/2014	13:25	3.11	13:25	3.094	Depth to water outside of monument 2.92 ft from TOC
7/15/2014	18:54	4.2	18:54	4.247	No more standing water around monument, but ground is moist

Stick up			MW-9
Reference point	TOC		
Date	Time	Depth to water (ft)	Comments
6/28/2013	16:35	8.49	Pre-development
8/14/2013	11:50	dry	
11/8/2013	15:32	8.15	
4/1/2014	11:00	5.87	Furnace w/ significant flow
5/5/2014	13:45	6.93	Furnace with very low flow ~5 to 10 L/min, visual estimate
7/15/2014	17:36	8.72	Furnace not flowing and dry.

Stick up	2.35		MW-10
Reference point	TOC		
Date	Time	Depth to water (ft)	Comments
6/27/2013	12:00	18.1	Prior to bailing standing water
8/12/2013	10:42	18.07	
11/8/2013	14:30	15.58	Furnace creek is flowing
4/1/2014	11:55	14.48	Lock rusted and difficult to unlock, nearby Furnace creek is flowing
5/5/2014	13:30	16.38	
7/15/2014	11:40	17.18	Lock rusty but still working. Furnace with small trickle ~1L/min, visual estimate

Stick up	2.67		MW-11
Reference point	TOC		
Date	Time	Depth to water (ft)	Comments
8/12/2013	10:30	18.07	
11/8/2013	14:24	15.58	Furnace creek is flowing
4/1/2014	12:10	15.39	Furnace creek is flowing
5/5/2014	10:25	16.32	
7/15/2014	11:30	17.4	

Stick up	3.14'				MW-12
Reference point	TOC				
Date	Manual time	Manual DTW (ft)	Sensor time	Sensor DTW (ft)	Comments
8/12/2013	12:53	6.28	N/A	N/A	
11/8/2013	15:13	5.61	N/A	N/A	
12/15/2014	15:30	4.44	N/A	N/A	
4/1/2014	10:47	5.02	N/A	N/A	Battery 58%
4/1/2014	18:17	5.01	N/A	N/A	
4/1/2014	18:24	5.01	18:24	5.01	Sync sensor to computer time and change reading to DTW
5/5/2014	12:35	5.64	12:35	5.714	Difficult to get reading, moisture on casing kept triggering sounder alarm
7/15/2014	17:50	6.18	17:50	6.363	Difficult to get reading, moisture on casing kept triggering sounder alarm.

Stick up	2.75		MW-13
Reference point	TOC		
Date	Time	Depth to water (ft)	Comments
6/28/2013	13:20	6.16	Pre-development
8/12/2013	12:43	7.42	
11/8/2013	15:00	5.62	
4/1/2014	9:51	5.54	
5/5/2014	12:25	6.07	
7/15/2014	11:10	7.07	Well getting overgrown with vegetation

Storm Event Records

Staff Gauge and Precipitation Data

Project: BBM

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Surface Water Station: D1 Dennis

Date	Time	Staff Reading (feet)	Sample Collected?[1]	Running Total of Precipitation (inches)	Comments/Notes
11/6/2013	1600	NA	Yes	NA	Blank sample collected from 1600 - 1615
11/6/2013	1620	0.76	Yes	NA	Begin baseline sampling - 01
11/6/2013	1655	0.76	Yes	NA	End sampling - 01
11/7/2013	0848	0.76	No	0.16/0.16	Raining on & off overnight/moderate rainfall now
11/7/2013	1052	0.78	Yes	NA	Begin sampling - 02
11/7/2013	1148	0.8	Yes		End sampling - 02
11/7/2013	1248	0.84	Yes		Begin sampling - 03
11/7/2013	1340	0.91	Yes		End sampling - 03
11/7/2013	1518	0.93	No		
11/7/2013	1533	0.94			
11/7/2013	1548	0.94	No		
11/7/2013	1610	0.93	No		
11/7/2013	1625	0.93	No		
11/7/2013	1640	0.93	Yes		Begin sampling - 04
11/7/2013	1720	0.92			End sampling - 04
11/7/2013	2230	0.89	Yes	0.00/0.80	Begin sampling - 05
11/7/2013	2300	0.89	Yes	0.00/0.80	End sampling - 05
11/8/2013	0945	0.81	Yes	0.00/0.80	Begin sampling - 06 (sunny & clear skies)
11/8/2013	1015	0.81	Yes	0.00/0.80	End sampling - 06

Staff Gauge and Precipitation Data

Project: BBM

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Surface Water Station: GD1 Lower Garoutte

Date	Time	Staff Reading (feet)	Sample Collected?[1]	Running Total of Precipitation (inches)	Comments/Notes *
11/6/2013	1455	1.07	Yes	NA	Begin baseline sampling - 01
11/6/2013	1550	1.06	Yes	NA	End sampling - 01
11/7/2013	0848	1.06	No	0.16/0.16	Raining on and off overnight; moderate rainfall now
11/7/2013	0948	1.06	No	0.08/0.24	Rained heavily early in the hour but then stopped for the last 20 mins
11/7/2013	1048	1.075	No	0.21/0.45	Steady, consistent rain
11/7/2013	1148	1.14	Yes	0.16/0.61	Begin sampling - 02
11/7/2013	1248	1.25	Yes	0.12/0.73	End sampling - 02; turbidity increased throughout the sampling period
11/7/2013	1348	1.47	Yes	0.05/0.78	Begin sampling blank & 03
11/7/2013	1448	1.52	Yes	0.02/0.80	End sampling - 02; turbidity continued to increase
11/7/2013	1518	1.55	No		
11/7/2013	1533	1.56	No		
11/7/2013	1548	1.57	No	0.00/0.80	No rain with patches of blue sky
11/7/2013	1610	1.57	No	0.00/0.80	No rain with patches of blue sky
11/7/2013	1625	1.56	No	0.00/0.80	
11/7/2013	1725	1.56	Yes	0.00/0.00	
11/7/2013	1855	1.52	Yes	0.00/0.80	End sampling - 04 with duplicate collected

Date	Time	Staff Reading (feet)	Sample Collected?[1]	Running Total of Precipitation (inches)	Comments/Notes *
11/7/2013	2202	1.44	No		Check water level
11/7/2013	2300	1.43	Yes		Begin sampling - 05
11/7/2013	2350	1.41	Yes		End sampling - 05
11/8/2013	1015	1.27	Yes	0.00/0.80	Begin sampling - 06
11/8/2013	1055	1.27	Yes		End sampling - 06

* water quality parameters measured using YSI 556; grab samples collected in sample cup & measured with YSI 556

Staff Gauge and Precipitation Data

Project: BBM

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Surface Water Station: FC1 Furnace Creek

Date	Time	Staff Reading (feet)	Sample Collected?[1]	Running Total of Precipitation (inches)	Comments/Notes *
11/6/2013	1035	No flow	No	0	Furnace creek is not flowing; slow trickle @ ~ 100 mL/min from hanging culvert above F1 staff
11/6/2013	1537	No flow	Yes	0	Turbidity = 1.14 NTU; Temp = 14.54 ^{o}C @ 1557; pH = 6.68 SU; conductivity = 175 µS/cm. ***Note***: Water trickled out of end of hanging culvert at 100 mL/min - this trickling water was sampled
11/6/2013	1745	No flow	Yes	0	End sampling - FC1-001
11/7/2013	1035	No flow	No		Raining moderately; flow from hanging culvert does not appear to have changed; remained @ ~ 100 mL/min
11/7/2013	1138	No flow	Yes		Start sampling from 1138 to 1255; FC1 - 002; turbidity = 0.54; flow = 250 mL/min
11/7/2013	1255	No flow	Yes		End sampling - FC1-002
11/7/2013	1335	No flow	No		Check flow at culvert pipe; ~ 250 mL/min
11/7/2013	1350	No flow	Yes		Start sampling from culvert discharge - FC1-003; light to moderate rainfall
11/7/2013	1444	No flow	Yes		Check turbidity = 0.57 NTU; flow dropping off
11/7/2013	1505	No flow	Yes		End sampling @ 1430; light to moderate rainfall
11/7/2013	1614	No flow	No		Check flow; 1000 mL/6 min
11/7/2013	1740	No flow	No		Check flow; 1000 mL/6 min 10 sec; will not sample
11/7/2013	2320	No flow	No		Check flow at culvert; 1000 mL/7 min; will not sample

Date	Time	Staff Reading (feet)	Sample Collected?[1]	Running Total of Precipitation (inches)	Comments/Notes *
11/8/2013	1045	No flow	No		Check flow at culvert; 1000 mL/2 min 20 sec; will not sample but continue checking throughout day for higher flow
11/8/2013	1530	No flow	No		Check flow at culvert; 1000 mL/2 min 13 sec; will not sample but continue checking for higher flow; turbidity = 0.54 NTU
11/9/2013	1045	No flow	No		Check flow at culvert; 1000 mL/4 min 10 sec; will not sample due to low flow; turbidity = 0.54 NTU
11/9/2013	1730	No flow	No		Check flow at culvert; 1000 mL/6.5 min; will not sample due to low flow.

* water quality parameters measured using YSI 556; grab samples collected in sample cup & measured with YSI 556

Staff Gauge and Precipitation Data

Project: BBM

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Surface Water Station: GU1 Upper Garoutte

Date	Time	Staff Reading (feet)	Sample Collected?[1]	Running Total of Precipitation (inches)	Comments/Notes *
11/6/2013	1035	1.03	No	0	First check of water level since last site visit
11/6/2013	1350	1.01	No	0	
11/6/2013	1457	1.01	Yes	0	Begin sampling from 1457 - 1545; GU1 - 001
11/6/2013	1545	1.01	Yes	0	End sampling GU1-001; collected samples
11/7/2013	0848	NM	No	0.16/0.16 from lower rain gauge	Raining moderately; rain on and off overnight
11/7/2013	0927	1	No		Raining moderately
11/7/2013	1006	1.01	No		Raining moderately to heavy bursts
11/7/2013	1020	1.02	No		Raining moderately to heavy bursts
11/7/2013	1035	1.03	Yes		Begin sampling from 1035-1135: GU1-002 & duplicate
11/7/2013	1135	1.1	Yes		End sampling GU1-002
11/7/2013	1255	1.31	Yes		Begin sampling from 1255 to 1327: GU1-003
11/7/2013	1327	1.42	Yes		End sampling GU1-003
11/7/2013	1506	1.64	No		Checking on gauge for determining peak condition; stop raining
11/7/2013	1523	1.65	No		Checking on gauge for determining peak condition; stop raining
11/7/2013	1540	1.67	No		Checking on gauge for determining peak condition; stop raining
11/7/2013	1557	1.68	No		Checking staff gauge at set intervals to determine peak of hydrograph
11/7/2013	1614	1.68	No		
11/7/2013	1631	1.68	No		
11/7/2013	1641	1.68	Yes		Begin peak sampling from 1641 to 1722: GU1-004
11/7/2013	1722	1.67	Yes		End sampling GU1-004

Date	Time	Staff Reading (feet)	Sample Collected?1	Running Total of Precipitation (inches)	Comments/Notes *
11/7/2013	2222	1.52	Yes		Begin sampling 2222 to 2306: GU-005
11/7/2013	2306	1.51	Yes		End sampling GU1-005
11/8/2013	0945	1.32	No		Check staff gauge; water is moderately cloudy; large amount of leaf debris on GU1 stilling well; cleaned from screen on arrival
11/8/2013	0955	1.32	Yes		Begin sampling 0955 to 1055: GU1-006 & duplicate
11/8/2013	1055	1.3	Yes		End sampling GU1-006 & duplicate

Staff Gauge and Precipitation Data

Project: BBM

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Surface Water Station: DC1 Dennis

Date	Time	Staff Reading (feet)	Sample Collected?[1]	Running Total of Precipitation (inches)	Comments/Notes
2/13/2014	18:20	1.02	Yes	0/0	Round 1 sampling; DC1-01; Duplicate; End Sampling at 19:00
2/14/2014	8:15	1.34	No	1.43/1.43	Rain off and on
2/14/2014	9:15	1.35	No	0.025/1.455	Rain off and on
2/14/2014	10:15	1.3	Yes	0.01/1.465	Round 2 sampling; DC1-02; Duplicate; End at 11:00
2/14/2014	11:15	1.18	No	0.04/1.505	Rain off and on
2/14/2014	12:15	1.18	No	0.03/1.535	Rain off and on
2/14/2014	13:15	1.19	No	0.05/1.585	Rain off and on, a very intense but short burst
2/14/2014	14:15	1.19	No	0.1/1.685	rain off and on
2/14/2014	15:15	1.2	No	0.14/1.825	Rain off and on
2/14/2014	16:15	1.21	No	0.2/2.025	Rain off and on
2/14/2014	17:15	1.21	No	0.07/2.095	Rain off and on
2/14/2014	18:15	1.15	No	0.15/2.245	Rain off and on
2/14/2014	19:00	NM	Yes	NM	Round 3 sampling; DC1-03; MS/MSD; End sampling at 19:50
2/14/2014	19:15	1.1	No	0.07/2.315	Rain off and on
2/14/2014	20:15	1.1	No	0.05/2.365	Rain off and on
2/15/2014	0:55	1.35	No	0.05/2.415	Reading by HY, took midpoint of fluctuation from the bank. Not able to see pool area at base of staff gauge from bank.

Date	Time	Staff Reading (feet)	Sample Collected?[1]	Running Total of Precipitation (inches)	Comments/Notes
2/15/2014	3:10	1.35	No	0.08/2.495	Reading by HY, took midpoint of fluctuation from the bank. Not able to see pool area at base of staff gauge from bank.
2/15/2014	8:30	1.1	Yes	0.1/2.595	Sampled WH1, the Weyerhaueser Drainage; reading at Dennis now read from in stream so readings are comperable to readings before 2/15/14 at 0:55. MN took GPS of sample location.
2/15/2014	9:50	NM	Yes	NM	Round 4 Blank collected; End sampling at 10:20
2/15/2014	10:20	1.1	Yes	0.01/2.605	Round 4 sampling; DC1-04; End at 11:00
2/15/2014	13:30	1.15	No	0.01/2.615	light rain off and on
2/15/2014	16:00	1.15	No	0/2.615	Leaving site for the day.
2/16/2014	8:30	1.09	No	0.705/3.32	No rain, patches of blue.
2/16/2014	10:40	1.08	No	0/3.32	No rain, patches of blue.
2/16/2014	11:50	1.08	Yes	0/3.32	Round 5; DC1-05; Blank
2/16/2014	12:30	1.08	No	0/3.32	End Round 5

Staff Gauge and Precipitation Data

Project: BBM

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Surface Water Station: GD1 Lower Garoutte

Date	Time	Staff Reading (feet)	Sample Collected?[1]	Running Total of Precipitation (inches)	Comments/Notes *
2/13/2014	17:45	2.25	Yes	0/0	Baseline/Round 1 sample; GD1-01; End sampling at 18:20.
2/14/2014	8:15	3.2	No		Rained significantly over night. Raining off and on.
2/14/2014	9:15	3.2	Yes		Round 2 sample; GD1-02; MS/MSD; End Sampling at 10:15.
2/14/2014	10:15	3.3	No		Raining off and on.
2/14/2014	11:15	3.35	No		Raining off and on.
2/14/2014	12:15	3.3	No		Raining off and on.
2/14/2014	13:15	3.3	No		Raining off and on.
2/14/2014	14:15	3.25	No		Raining off and on.
2/14/2014	15:15	3.25	No		Raining off and on.
2/14/2014	16:15	3.3	No		Raining off and on.
2/14/2014	17:15	3.35	No		Raining off and on.
2/14/2014	17:50	NM	Yes		Round 3 Sample; GD1-03: Duplicate; End Sampling at 19:00. Bad light at dusk prevented a reading from across the creek.
2/14/2014	18:15	NM	No		Bad light at dusk prevented a reading from across the creek.
2/14/2014	20:00	3.45	No		Situated vehicle to shine brights across creek to get reading of staff gauge.
2/15/2014	0:55	3.25	No		Good reading using spot light and binoculars. Reading an estimate of midpoint of fluctuations.
2/15/2014	3:12	3.2	No		Light steady rain.
2/15/2014	5:35	3.15	No		Light rain.
2/15/2014	8:30	2.9	Yes		Collected WH1 Sample (the culvert draining the new Weyehauser clear cut area into Garoutte). MN took GPS of sample location.
2/15/2014	9:00	NM	Yes		Round 4 Sample; GD1-04: No QC; End sampling at 09:50.

Date	Time	Staff Reading (feet)	Sample Collected?[1]	Running Total of Precipitation (inches)	Comments/Notes *
2/15/2014	10:20	2.8	No		Very light rain on and off
2/15/2014	13:30	2.8/2.85	No		Very light rain on and off
2/15/2014	16:00	2.75	No		no rain
2/16/2014	8:30	2.55	No		Partially cloudy w/ patches of blue. ~40 F air temp.
2/16/2014	10:40	2.5	Yes		Round 5; GD1-05; MS/MSD w/ Equipment Blank.
2/16/2014	11:50	2.45	No		End Round 5. This is the last sample collected.

* water quality parameters measured using YSI 556; grab samples collected in sample cup & measured with YSI 556

Staff Gauge and Precipitation Data

Project: BBM

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Surface Water Station: FC1 Furnace Creek

Date	Time	Staff Reading (feet)	Sample Collected?[1]	Running Total of Precipitation (inches)	Comments/Notes *
2/13/2014	18:10	0.02	Yes	NM	Round 1 sampling (baseline); FC1-01; no rain
2/13/2014	19:00	0.02	No	NM	End Round 1 sampling; Turb=65.4 NTU; T=45.95oF; Cond=55us/cm; pH=7.48 su; DO=10.72 mg/L; ORP=129.1 mV (DO and ORP not calibrated)
2/14/2014	8:48	0.14	No	NM	Light rain; been moderate to heavy rain through night; water is moderately turbid.
2/14/2014	9:08	0.15	No	NM	YSI; 45.95 oF; 60 uS/cm; 10.54 mg/L DO; 7.42 su pH; 150.5 mV ORP
2/14/2014	10:15	0.12	Yes	NM	Round 2 sampling; FC1-02; rain started up at 10:10
2/14/2014	11:05	0.11	No	NM	End Round 2 Sampling; occasional light rain
2/14/2014	12:42	0.14	No	NM	Staff gauge measurement may have been effected by debris
2/14/2014	2:00	0.19	No	NM	Staff gauge measurement better than 1:00 (veg cleaned)
2/14/2014	3:00	0.19	No	NM	Staff Gauge
2/14/2014	4:00	0.16	No	NM	Staff Gauge
2/14/2014	5:00	0.14	No	NM	Staff Gauge
2/14/2014	17:30	0.15	No	NM	Staff Gauge
2/14/2014	18:00	0.14	Yes	NM	Round 3 sampling; FC1-03
2/14/2014	19:30	0.15	No	NM	YSI; Turb=284 NTU; Temp=46.9oF; Cond=54 uS/cm; DO=10.61 mg/L; pH=8.62 su; ORP=178.9 mV
2/15/2014	8:10	0.12	No	NM	
2/15/2014	9:30	0.09	Yes	NM	Round 4 Sampling; FC1-04

Date	Time	Staff Reading (feet)	Sample Collected?[1]	Running Total of Precipitation (inches)	Comments/Notes *
2/15/2014	10:00	0.08	No	NM	End Round 4 Sampling; YSI:Turb=76.8 NTU; Temp=47.97 oF; Cond=51 uS/cm; DO=15.8 mg/L; pH=8.33 su; 136.9 ORP.
2/16/2014	11:30	Below Gauge	Yes	NM	Round 5 Sampling; FC1-05; Note that stream has incises a channel next to the staff gauge, leaving staff gauge. Collected this sample at cascading pool approximately 8 feet downstream of weir location. All samples from Round 2 and Round 3 collected at wier; Round 1 samples collected at waterfall upstream of staff gauge.
2/16/2014	11:40	Below Gauge	No	NM	YSI: turb=30.2; temp=46.57 oF; Cond=45 uS/cm; ORP=220.6 mV; pH=8.1 su; DO=11.46 mg/L.
2/16/2014	12:25	Below Gauge	No	NM	End Round 5 Sampling; End of storm event, no more samples collected after Round 5.

* water quality parameters measured using YSI 556; grab samples collected in sample cup & measured with YSI 556

Staff Gauge and Precipitation Data

Project: BBM

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Surface Water Station: GU1 Upper Garoutte

Date	Time	Staff Reading (feet)	Sample Collected?[1]	Running Total of Precipitation (inches)	Comments/Notes *
2/13/2014	17:08	2.22	Yes	NM	Round 1 sampling; GU1-01
2/13/2014	18:15	2.18	No		End Round 1 sampling.
2/14/2014	8:45	2.85	No		Light rain; had heavy to moderate rain over night.
2/14/2014	9:10	3.05	Yes		Round 2 sampling; GU1-02
2/14/2014	10:15	3.05	No		End Round 2 sampling; Not raining
2/14/2014	11:10	3.05	No		Occasional light rain
2/14/2014	12:50	3.05	No		Staff Gauge Measurement - Intermittent Rain
2/14/2014	14:00	2.95	No		Staff Gauge Measurement - Intermittent Rain
2/14/2014	15:00	2.95	No		Staff Gauge Measurement - Intermittent Rain
2/14/2014	16:00	2.95	No		Staff Gauge Measurement - Intermittent Rain
2/14/2014	17:00	2.95	No		Staff Gauge Measurement - Intermittent Rain
2/14/2014	17:30	3	Yes		Round 3 sampling; GU1-03
2/14/2014	18:30	3	No		End Round 3 samling
2/14/2014	19:45	3	No		Rain Moderate; Leaving site for the day.
2/15/2014	8:10	2.65	Yes		Round 4 sampling; GU1-04; Occasional light rain.
2/15/2014	9:25	2.65	No		End Round 4 sampling
2/15/2014	10:25	2.6	No		Staff Gauge Measurement - Intermittent Rain
2/16/2014	10:30	2.29	Yes		Round 5 Sampling; GU1-05; Partly cloudy, windy, no rain.
2/16/2014	11:30	2.28	No		End Round 5 Sampling; weather is partly cloudy, breezy.

November 2013 Groundwater Sampling Records

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID _____ Well No. MW1

Project: BLACK BUTTE MINE Date: 11/11/2013

Project No.: _____ Sampled By: HOWARD YOUNG

Weather: CLOUDY, COLD = T = 45°F CALM Reviewed By: STEVE DENT

PURGING

Static Water Level (TOC) 9.35'	Time 15:25	Comments PUMP AT INTAKE	
Water Volume in Casing	Total Well Depth (TOC) 13'		
Volume Purged Before Sampling	Screened Interval (TOC) 8' - 13' bTOC		
Purging Method PERISTALTIC LOW-FLOW	Stabilized Flow Rate 180mL/MIN		

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
15:28	9.35'	0	BEGIN	LOW FLOW PURGING AT 180mL/MIN.				
15:40	10.06'	3160	11.27°	70	4.69	20.3	4.74	73.5
15:44	10.27'	3880	11.34	65	5.81	8.7	9.44	94.8
16.00	NM	6760	11.51	65	5.99	7.65	8.84	102.3
1610	NM	8560	11.32	72	6.08		9.07	102.3
1613	~~12.3'~~ DRY	9100	Well	went dry				
1643	NM	Pumped 100 mL		and well went		dry.		
16:55	12.78'	RECHARGING						

SAMPLING

Sampling Method NOT SAMPLED.

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled

Sample Container	Preserved By	At What pH	Filter Type	Cooled By

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID _____ Well No. MW2 ½

Project: BBM Date: 11/11/13
Project No.: _____ Sampled By: SD
Weather: Sunny / 50°F Reviewed By: HY

PURGING

Static Water Level (TOC) 7.77'	Time 11:50	Comments 10.8' depth to sample	
Water Volume in Casing	Total Well Depth (TOC)		
Volume Purged Before Sampling	Screened Interval (TOC)		
Purging Method Peristaltic Pump	Stabilized Flow Rate 200 mL/min		

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
11:50	Start Pump + Fill Flow Cell							
11:55	7.87	1 L	11.67	243	5.98	0.94	5.26	68.3
1200	7.87	2 L	11.71	256	5.99	0.69	3.57	77.7
1205		3 L	11.71	264	6.00	0.56	3.25	83.8
1210	7.88	4 L	11.78	272	6.01	0.35	2.96	86.2
1215	7.88	5 L	11.87	280	6.02	0.44	2.80	86.5
1220		6 L	11.86	281	6.02		2.82	81.3

SAMPLING

Sampling Method
Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 1225

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
4x 500mL FEP	HCL	≤ 2	0.45 mm	Ice
1-L HDPE	HNO_3	≤ 2	0.45 mm	Ice
1-L Wide Mouth	—	—	—	Ice
1-L HDPE	—	—	—	Ice

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

REV. 2012 low flow groundwater sampling record.pdf

Blank collected with MW-2 tubing trains prior to sample collection @ 11:45

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

2 of 2

Sample ID MW-2 | Well No. 2 2/2

Project: BRM | Date: 11/11/13

Project No.: | Sampled By: SD

Weather: | Reviewed By: HY

PURGING

Static Water Level (TOC)	Time	Comments
Water Volume in Casing	Total Well Depth (TOC)	
Volume Purged Before Sampling	Screened Interval (TOC)	
Purging Method	Stabilized Flow Rate	

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
1225		7L	11.89	281	6.03	0.34	2.74	81.0
1230		8L	11.93	282	6.04	0.33	2.65	79.1
1235		9L	11.94	281	6.05	0.30	2.74	75.0

SAMPLING

Sampling Method

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 1240

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
500 mL HDPE	—	—	—	Ice
500 mL HDPE	H_2SO_4	≤ 2	—	Ice

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID 1113B BM MW 13-GW | Well No. MW 3

Project: BBM | Date: 11/11/13
Project No.: 50898-92004 | Sampled By: HY
Weather: Clear + Sunny / Brisk | Reviewed By: SD

PURGING

Static Water Level (TOC) 11.32'	Time 0956	Comments Tubing Inlet @ 15'	
Water Volume in Casing	Total Well Depth (TOC) 17.7' btoc		
Volume Purged Before Sampling	Screened Interval (TOC) 12.7' - 17.7' btoc		
Purging Method PERISTALTIC LOW-FLOW	Stabilized Flow Rate 210 mL/MIN @ LOWEST PUMP SETTING		

Time	DTW	Cumulative Volume (mL)	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
9:57	11.32'	0	START PURGING @ 210 mL/MIN				—	—
10:06	11.89	660	10.75	262	6.71	9.29	0.96	29.9
10:07 ~~10:12~~	12.23	2100	11.13	239	~~8~~ 6.53	5.10	0.56	-48.2
10:10	12.36'	2760	11.17	236	6.53	3.27	0.43	-53.3
10:15	12.43'	3710	11.10	235	6.54	2.98	0.40	-63.7
10:20	12.48'	4760	11.07	235	6.56	1.78	0.35	-70.6
10:25	12.54	5810	11.09	235	6.58	1.16	0.33	-73.9

SAMPLING

Sampling Method PERISTALTIC, LOW FLOW

Analytical Matrix ☐Yes ☐No ☐Attached | Time Sampled 10:35

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
500mL FEP LINED	HCL	<2	5 µm	ICE
100mL HDPE	HNO_3	<2	45 µm	↓
~~250mL AMBER~~ 1000mL PLASTIC	—	—	—	↓
1000mL PLASTIC	—	—	—	↓

SAMPLE DATA

Appearance / Odor CLEAR WATER THROUGHOUT PURGE; NO ODOR.

pH (last stabilized) 6.60	Temperature (°C) 11.14
Eh (millivolts) —	Specific Conductance (microsiemens/cm) 235
OVM-PID Headspace (ppm) NM	ORP -72.4

DISPOSITION

Chain-of-Custody ☐Yes ☐No | Chain-of-Custody ID

Duplicate Sample ID | Replicate Sample Nos.

Analytical Lab: Lab Name | Date Sent to Lab
Shipment Method

Split with: Name (s)
Organization (s)

Other 500mL PLASTIC, NO PRESERVE, COOLED ICE

Comments 500mL PLASTIC, H_2SO_4, <2 pH, COOLED ICE

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID 1113BBM-MW3-GW- Well No. MW3

Project: BLACK BUTTE MINE Date: 11/11/2013

Project No.: Sampled By: HOWARD YOUNG

Weather: PARTLY CLOUDY, COLD T=45°F, CALM Reviewed By: STEVE DENT

PURGING

Static Water Level (TOC) 11.32	Time 0956	Comments SEE P1 OF 2	
Water Volume in Casing	Total Well Depth (TOC)		
Volume Purged Before Sampling	Screened Interval (TOC)		
Purging Method	Stabilized Flow Rate		

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
10:30	12:59	6860	11.14	235	6.60	0.83	0.33	-72.4

SAMPLING

Sampling Method

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 10:35

Sample Container	Preserved By	At What pH	Filter Type	Cooled By

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID 1113BBM-MW4-GW | Well No. MW4

Project: BLACK BUTTE MINE | Date: 11/10/13

Project No.: | Sampled By: HOWARD YOUNG

Weather: PARTLY CLOUDY, COOL - MILD, T = 50°F, CALM | Reviewed By:

PURGING

Static Water Level (TOC) 8.62'	Time 15:03	Comments SET PUMP INTAKE AT 13.3'	
Water Volume in Casing	Total Well Depth (TOC) 18.3'		
Volume Purged Before Sampling	Screened Interval (TOC) 8.3' - 18.3'		
Purging Method LOW-FLOW PERI.	Stabilized Flow Rate 300-333 mL/MIN		

Time	DTW	Cumulative Volume (mL)	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)
16:25	NM	0		START PURGING				
16:27	8.78'	600	11.01	183	6.86	NM	1.73	-5.8
16:30	8.78'	1500	11.06	155	6.70	7.61	1.42	2.7
16:35	8.77'	3000	11.19	99	6.29	6.20	1.10	59.1
16:40	8.78'	4500	11.24	70	5.97	5.29	1.53	79.1
16:45	8.78'	6000	11.24	68	5.93	5.34	1.53	81.0
16:50	NM	7500	11.22	66	5.90	5.61	1.50	89.2

SAMPLING

Sampling Method LOW-FLOW WITH PERISTALTIC

Analytical Matrix ☐Yes ☐No ☐Attached | Time Sampled 17:00

Sample Container	Preserved By	At What pH	Filter Type	Cooled By

SAMPLE DATA

Appearance / Odor	CLEAR WATER / NO ODOR		
pH (last stabilized)	5.87	Temperature (°C)	11.18
Eh (millivolts)	NM	Specific Conductance (microsiemens/cm)	65
OVM-PID Headspace (ppm)	NM	ORP	92.7 mV

DISPOSITION

Chain-of-Custody	☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID		Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab	
	Shipment Method		
Split with	Name (s)		
	Organization (s)		
Other			
Comments			

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID 1113BBM-MW4-GW- | Well No. MW4

Project: BLACK BUTTE MINE | Date: 11/10/2013

Project No.: | Sampled By: HOWARD YOUNG

Weather: PARTLY CLOUDY, COOL T=50°F, CALM | Reviewed By:

PURGING

Static Water Level (TOC) SEE P1	Time SEE P1	Comments SEE P1	
Water Volume in Casing SEE P1	Total Well Depth (TOC) SEE P1		
Volume Purged Before Sampling	Screened Interval (TOC) SEE P1		
Purging Method SEE P1	Stabilized Flow Rate SEE P1		

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)
16:55	NM	9000	11.20	66	5.88	5.04	1.55	91.5
17:00	8.78'	10500	11.18	65	5.87	5.00	1.55	92.7

SAMPLING

Sampling Method PERISTALTIC, LOW FLOW

Analytical Matrix ☐Yes ☐No ☐Attached | Time Sampled 17:00

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
SEE P1				

SAMPLE DATA

Appearance / Odor SEE P1	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID 1113BBM-MW5-GW | Well No. MW5

Project: BLACK BUTTE MINE | Date: 11/10/2013
Project No.: | Sampled By: HOWARD YOUNG
Weather: SUNNY, MILD T = 60°F CALM | Reviewed By:

PURGING

Static Water Level (TOC) 11.18'	Time 13:00	Comments PUMP INTAKE SET AT 13.8' BTOC	
Water Volume in Casing	Total Well Depth (TOC) 18.8'		
Volume Purged Before Sampling 10.2L	Screened Interval (TOC) 8.8' - 18.8'		
Purging Method LOW FLOW PERISTAL.	Stabilized Flow Rate ~~2.40 mL/MIN~~ HY 11/10 200 mL/MIN		

Time	DTW	Cumulative Volume mL	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen mg/L	Oxidation-Reduction Potential	
13:35	~~11.73'~~	0 mL	BEGIN	~~FLO~~ LOW FLOW	PURGE				
13:55	11.73'	4800 mL	11.71	290	7.23	6.76	~~3.14~~ 2.14	-92.3	TURN FLOW DOWN 2 L/m
14:00	11.77'	6000	11.78	288	7.21	6.52	0.72	-101.3	
14:05	11.70'	7200	11.69	288	7.20	NM	0.62	-95.8	TURN DOWN FLOW TO 2L/M
14:10	11.68'	8200	11.82	288	7.19	3.43	0.61	-103.1	
14:15	11.68'	9200	11.69	288	7.19	3.04	0.56	-107.2	
14:20	11.68'	10200	11.61	288	7.19	2.47	0.54	-102.2	

SAMPLING

Sampling Method
Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 14:20

Sample Container	Preserved By	At What pH	Filter Type	Cooled By	
500 mL	HCL	<2	45 µm	ICE	MERCURY
500 mL	HCL	<2	45 µm	↓	METHY MERCURY

SAMPLE DATA

Appearance / Odor CLEAR WATER THROUGHOUT PURGE; NO ODOR

pH (last stabilized)	7.19	Temperature (°C)	11.61
Eh (millivolts)	—	Specific Conductance (microsiemens/cm)	288
OVM-PID Headspace (ppm)	—	ORP	-102.2 mV

DISPOSITION

Chain-of-Custody ☐Yes ☐No Chain-of-Custody ID
Duplicate Sample ID Replicate Sample Nos. —
Analytical Lab: Lab Name Date Sent to Lab; Shipment Method
Split with: Name (s); Organization (s)
Other
Comments

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID MW-6 | Well No. 6

Project: BBM | Date: 11/10/13
Project No.: | Sampled By: SD
Weather: Clear Skies 55° | Reviewed By: KY

PURGING

Static Water Level (TOC) 6.14	Time 1720	Comments PUMP INTAKE SET AT 10.5' btoc	
Water Volume in Casing	Total Well Depth (TOC)		
Volume Purged Before Sampling	Screened Interval (TOC)		
Purging Method Peristaltic	Stabilized Flow Rate 200 ml/min		

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
17:30	6.14	Start Pump & fill flow through cell.						
17:35		1.0L	10.29	415	6.09		2.24	74
17:40	6.91	2.0L	10.29	417	6.06		1.58	66
17:45	7.01	3.0L	10.30	417	6.02	3.24	1.33	64.5
17:50	SD 11/10/13	4.0L	10.30	417	6.01	3.24 SD 11/10/13	1.20	63.8
17:55		5.0L	10.31	417	6.01	3.61	1.19	63.8
18:00	7.09	6.0L	10.31	417	6.00		1.18	62.9

SAMPLING

Sampling Method
Analytical Matrix ☐Yes ☐No ☐Attached | Time Sampled 1803

Sample Container	Preserved By	At What pH	Filter Type	Cooled By

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID _____ Well No. MW 7

Project: BLACK BUTTE MINE Date: 11/10/2013

Project No.: _____ Sampled By: HOWARD YOUNG

Weather: PARTLY CLOUDY, MILD T = 50°F, CALM Reviewed By: STEVE DENT

PURGING

Static Water Level (TOC) 14.38	Time 10:06	Comments SET PUMP INTAKE AT 16.0' BTOC	
Water Volume in Casing	Total Well Depth (TOC) 17.9'		
Volume Purged Before Sampling	Screened Interval (TOC) 7.9' - 17.9'		
Purging Method LOW FLOW PERISTALTIC	Stabilized Flow Rate 215 mL/MIN; 175 mL/MIN; 164 mL/MIN		

Time	DTW	Cumulative Volume mL	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)	
10:39	NM	0	BEGIN	LOW-FLOW	PURGE				
10:45	NM	1260	10.98	273	6.41	5.44	6.72	14.4	
10:50	NM	2335	11.03	205	6.44	3.60	5.92	1.3	
10:56	15.35'	3625	10.98	199	6.55	2.84	4.60	-14.0	REDUCE FLOW RATE
11:00	15.38'	4325	10.93	205	6.62	2.84	4.11	-15.4	
11:05	15.39'	5125	10.89	212	6.71	1.06	3.91	-37.7	
11:13	15.46'	6325	10.91	215	6.76	0.72	3.64	-61.0	

SAMPLING

Sampling Method LOW FLOW PERISTALTIC

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 11:25

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
500 mL FLUOR LINED	HCL	< 2	45 µm	ICE
500 mL FLUOR LINED	HCL	< 2	45 µm	ICE

SAMPLE DATA

Appearance / Odor CLEAR WATER THROUGHOUT; NO ODOR.	
pH (last stabilized) 6.77	Temperature (°C) 10.97
Eh (millivolts) NM	Specific Conductance (microsiemens/cm) 216
OVM-PID Headspace (ppm)	ORP -74.8

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID _____ Well No. MW7

Project: BLACK BUTTE MINE Date: 11/10/2013

Project No.: _____ Sampled By: HOWARD YOUNG

Weather: PARTLY CLOUDY, MILD, T=50°F, Reviewed By: STEVE DENT

PURGING

Static Water Level (TOC) 14.38		Time 10:06	Comments
Water Volume in Casing		Total Well Depth (TOC)	
Volume Purged Before Sampling		Screened Interval (TOC)	
Purging Method		Stabilized Flow Rate	

Time	DTW	Cumulative Volume (mL)	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
11:18	~~10.62~~ 14	7125	10.95	215	6.77	0.69	3.48	-67.1
11:23	15.42 15.42	7925	10.97	216	6.77	0.71	3.49	-74.8

SAMPLING

Sampling Method

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled

Sample Container	Preserved By	At What pH	Filter Type	Cooled By

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

CDM Smith

Sample

LOW FLOW GROUNDWATER SAMPLING RECORD

ID _____ Well No. MW8

Project: BLACK BUTTE MINE Date: 11/10/2013

Project No.: _____ Sampled By: HOWARD YOUNG

Weather: PARTLY CLOUDY, COOL, T=50°F, CALM Reviewed By: STEVE DENT

PURGING

Static Water Level (TOC) 3.55'	Time 10:50	Comments PUMP INTAKE SET AT 6.1' bTOC
Water Volume in Casing	Total Well Depth (TOC) 6.5' bTOC	
Volume Purged Before Sampling	Screened Interval (TOC) 6'-6.5' bTOC	
Purging Method PURGE DRY + SAMPLE	Stabilized Flow Rate 160 mL/MIN	

Time	DTW	Cumulative Volume mL	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
12:30	NM	0	BEGIN	PURGING LOWEST PUMP SETTING				
~~12:30~~ 12:30 Hx	NM	~~680~~ 0 ~~400mL~~	12.69	573	7.41	224	1.98	-142.5
~~12:34~~	~~NM~~	~~680mL~~	~~PURGED DRY, LET RECHARGE~~					
12:34	NM	680	12.63	200	6.95	444	5.36	-88.0
12:34	NM	680mL	WELL PURGED DRY, LET RECHARGE + START SAMPLE COLLECTION					

SAMPLING

Sampling Method Peristaltic Pump - ~~200~~ 200 mL sample after waiting 10 min. SD 11/10/13

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 12:34

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
500mL x2 FEP	HCl	≤2	0.45 µm	Ice
1-L HDPE	HNO_2	≤2	0.45 µm	Ice
250 mL Amber Glass	—	—	—	Ice
1-L HDPE	—	—	—	Ice

SAMPLE DATA

Appearance / Odor Orange/Brown tint (looks like Fe-Oxide) diminishing each 300 mL Batch

pH (last stabilized) 6.95	Temperature (°C) 12.63
Eh (millivolts)	Specific Conductance (microsiemens/cm) 200
OVM-PID Headspace (ppm)	ORP -88

DISPOSITION

Chain-of-Custody ☐Yes ☐No Chain-of-Custody ID

Duplicate Sample ID Replicate Sample Nos.

Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	

Other

Comments

REV. 2012

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Note - the low flow method for wells that pump dry is to purge then sample. However it was noted here that after the flush, there was still evidence of Fe-Oxides in the water. This may bias the first couple of samples (Hg samples) because the metal oxides can sequester Hg and would be filtered out.

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID mw-8 | Well No. 8 2/2

Project: BBM | Date: 11/10/13
Project No.: | Sampled By: SD
Weather: | Reviewed By: HY

PURGING

Static Water Level (TOC)	Time	Comments
Water Volume in Casing	Total Well Depth (TOC)	
Volume Purged Before Sampling	Screened Interval (TOC)	
Purging Method	Stabilized Flow Rate	

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential

SAMPLING

Sampling Method

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
500mL HDPE	—	—	—	Ice
500mL HDPE	H_2SO_4	≤2	—	Ice

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID ~~08~~ 1113BBM-MW-9-GW-

Well No. MW 9

Project: BLACK BUTTE MINE Date: 11/9/13

Project No.: 50898-92004 Sampled By: HX

Weather: PARTLY CLOUDY, COOL, T=50°F, CALM Reviewed By: SD

PURGING

Static Water Level (TOC) 8.15	Time 9:30	Comments PUMP INLET AT 9.0 bTOC	
Water Volume in Casing	Total Well Depth (TOC)		
Volume Purged Before Sampling 0.4L	Screened Interval (TOC)		
Purging Method PURGE DRY	Stabilized Flow Rate ≈100 mL/MIN		

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
11/9 9:30	*8.15'	0 L	BEGIN	—	—	—	—	—
9:32	DRY	0.2 L	WELL PURGED DRY; LET RECHARGE					—
9:38	9.71'	0.2 L	RECHARGING SLOWLY.		—	—	—	—
9:51	8.19	0.2L	RECHARGED		—	—	—	—
12:55	8.12	0.2L	RESUME PURGING + READ PARAMETERS IN SAMPLE CUP.					
13:06	~~NM~~ NM HX	0.3L	12.35	173	5.99	59.2	5.46	-1.1
13:08	NM	~~0.2L~~ HX 0.4L	11.43	153	6.04	27.6	5.11	-27.3

SAMPLING

Sampling Method PERISTALTIC 13:09 @ 0.4L WELL PURGED DRY.

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 13:15

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
500mL FEP LINED	HCl	<2	0.45 µm	ICE
1000mL HDPE	HNO_3	<2	0.45 µm	↓
100mL AMBER	—	—	HX ~~0.45 µm~~ NOT FILTER	
1000mL PLASTIC	—	—	—	

SAMPLE DATA

Appearance / Odor WATER IS CLEAR AFTER LETTING RECHARGE, WAS MODERATE TURBID ON FIRST PURGE

pH (last stabilized) 6.04	Temperature (°C) 11.43
Eh (millivolts) —	Specific Conductance (microsiemens/cm) 153
OVM-PID Headspace (ppm) NM	ORP -27.3 mV

DISPOSITION

Chain-of-Custody ☐Yes ☐No Chain-of-Custody ID

Duplicate Sample ID NONE Replicate Sample Nos. NONE

Analytical Lab: Lab Name CLP/MEL/AMTEST Date Sent to Lab

Shipment Method

Split with: Name (s)

Organization (s)

Other 500mL HDPE UNPRESERVED, ~~PACKED~~ COOLED HX W/ ICE

Comments 500mL HDPE H_2SO_4, <2; COOLED HX W/ ICE

* DEPTH TO WATER MEASURED ON 11/8/13 15:32

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID _____ Well No. MW10

Project: BLACK BUTTE MINE Date: 11/11/13

Project No.: _____ Sampled By: HOWARD YOUNG

Weather: PARTLY CLOUDY, COOL, T=50°F, CALM Reviewed By: _____

PURGING

Static Water Level (TOC) 16.07	Time 12:36	Comments PUMP INLET DEPLOYED AT 17.5' BTOC	
Water Volume in Casing ~~16.65~~	Total Well Depth (TOC)		
Volume Purged Before Sampling	Screened Interval (TOC) 8' - 18'		
Purging Method PERISTALTIC LOW FLOW	Stabilized Flow Rate		

Time	DTW	Cumulative Volume (mL)	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
13:31	16.09	0	CHECK STATIC WATER LEVEL					
13:34	16.09	0	BEGIN PURGING AT LOWEST PUMP SETTING					
13:35	NM	200	11.47	214	6.14	2.00	8.48	59.4
13:36	NM	400	11.37	160	5.97	NM	8.83	72.2
13:37	16.65	600	11.33	149	5.86	2.17	7.36	87.9
13:42	17.04	1600	11.21	153	5.84	1.57	7.60	93.8
13:45	17.27	2200	DEWATERED WELL TO 17.3', TUBING DEPTH; STOP PUMPING & LET RECHARGE					

SAMPLING

Sampling Method NOT SAMPLED

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled

Sample Container	Preserved By	At What pH	Filter Type	Cooled By

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

REV. 2012

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID _____ Well No. MW10

Project: BLACK BUTTE MINE Date: 11/11/2013

Project No.: _____ Sampled By: HOWARD YOUNG

Weather: PARTLY CLOUDY, COOL, T = 50°F, Reviewed By: _____

PURGING

Static Water Level (TOC)	Time	Comments
Water Volume in Casing	Total Well Depth (TOC)	
Volume Purged Before Sampling	Screened Interval (TOC)	
Purging Method	Stabilized Flow Rate	

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
13:53	17.23	RECHARGING WATER LEVEL						
14:30	17.21	SLOWLY RECHARGING, TOO SLOW TO ALLOW FOR SAMPLING.						

SAMPLING

Sampling Method NOT SAMPLED.

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled

Sample Container	Preserved By	At What pH	Filter Type	Cooled By

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID _____ Well No. MW11

Project: BLACK BUTTE MINE Date: 11/11/13

Project No.: PARTLY CLOUDY, COLD, T=45°F Sampled By: HOWARD YOUNG

Weather: PARTLY CLOUDY, COOL, T=50°F, CALM Reviewed By: _____

PURGING

Static Water Level (TOC) 16.11'	Time 12:48	Comments PUMP INLET AT ~~22.5'~~ 23' BTOC DEPLOYED	
Water Volume in Casing	Total Well Depth (TOC) 23'		
Volume Purged Before Sampling	Screened Interval (TOC) 18'-23'		
Purging Method LOW-FLOW PURGE PURGE DRY	Stabilized Flow Rate 180 mL/MIN		

Time	DTW	Cumulative Volume (mL)	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
14:02	16.11	0	BEGIN	PUMPING AT	200 mL/MIN.			
14:04	17.13	360	11.23	264	4.61	101	~~12.7~~ 3.70	-16.9
14:09	17.73	1260	11.32	181	~~4.00~~ 6.00	65.2	2.99	5.2
14:15	18.74	2340	11.46	167	6.00	10.2	2.52	39.7
14:21	19.51	3420	11.47	195	6.04	8.21	3.05	76.0
14:39	21.10	6650	11.58	159	6.11	66.6	2.68	99.8
14:44	21.52	7550	11.38	166	6.18	75.7	2.69	102.4

SAMPLING

Sampling Method NOT SAMPLED

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled

Sample Container	Preserved By	At What pH	Filter Type	Cooled By

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

REV. 2012

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID _____ Well No. MW 11

Project: BLACK BUTTE MINE Date: 11/11/13

Project No.: _____ Sampled By: HOWARD YOUNG

Weather: PARTLY CLOUDY, COOL, T = 50°F, CALM Reviewed By: _____

PURGING

Static Water Level (TOC)	Time	Comments
Water Volume in Casing	Total Well Depth (TOC)	
Volume Purged Before Sampling	Screened Interval (TOC)	
Purging Method	Stabilized Flow Rate	

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
14:56	22.56	9550	11.10	204	6.33	>1000 NTU	2.67	63.3
14:59	23.03							
15:01	DRY @ 23.02'	WELL PURGED	DRY - LET	RECHARGE				
15:09	23.01'	RECHARGING						
16:00	23.04	SLOWLY RECHARGING - TOO SLOW				TO SAMPLE		

SAMPLING

Sampling Method NOT SAMPLED

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled

Sample Container	Preserved By	At What pH	Filter Type	Cooled By

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID. 1113BBM-MW-12-GW | Well No. MW12

Project: BLACK BUTTE MINE | Date: 11/9/13
Project No.: | Sampled By: HY
Weather: PARTLY CLOUDY, COOL, TEMP: 50°F, CALM | Reviewed By: SD

PURGING

Static Water Level (TOC) 5.82	Time 10:15	Comments PUMP INTAKE = 7.49' BTOC.	
Water Volume in Casing	Total Well Depth (TOC)		
Volume Purged Before Sampling 13.8L	Screened Interval (TOC)		
Purging Method LOW-FLOW PERISTALTIC PUMP	Stabilized Flow Rate 180mL/MIN		

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)
10:38	5.82	0 L	—	—	—	—	—	—
10:42	NM	0.8 L	9.56	~~0.156~~ 156	7.34	>1000	2.58	-86.5
10:50	NM	2.1 L	9.61	~~0.101~~ 101	6.98	175	4.62	-11.4
10:55	NM	3.0 L	9.61	~~0.98~~ 98	6.91	53.8	4.85	-0.1
11:03	NM	4.5 L	9.63	~~0.97~~ 97	6.87	27.5	4.71	20.1
11:08	NM	5.4 L	9.55	~~0.97~~ 97	6.86	21.4	4.66	17.0
11:14	NM	5.8 L	9.61	~~0.96~~ 96	6.86	9.68	5.14	19.9

SAMPLING

Sampling Method LOW FLOW PERISTALTIC PUMP

Analytical Matrix ☐Yes ☐No ☐Attached | Time Sampled 11:54

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
500 mL FEP LINED	HCL	<2	0.45 MICRON	ICE
LTR HDPE	HNO_3	<2	0.45 MICRON	↓
100mL AMBER	HCL	<2	NOT FILTERED ~~0.45 MICRON~~	↓
LTR HDPE	—	—	—	↓

SAMPLE DATA

Appearance / Odor STARTED OFF A VERY VERY TURBID QUICKLY THEN CLEARED.

pH (last stabilized)	6.85	Temperature (°C)	9.86
Eh (millivolts)	97 mS/cm	Specific Conductance (microsiemens/cm)	97
OVM-PID Headspace (ppm)		ORP	-75.1 mV TURB = 2.50

DISPOSITION

Chain-of-Custody ☒Yes ☐No | Chain-of-Custody ID

Duplicate Sample ID NONE | Replicate Sample Nos. NONE

Analytical Lab	Lab Name CLP/MEL/AMTEST	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	

Other 500mL HDPE UNPRESERVED, ~~WORKED~~ COOLED IN W/ ICE

Comments 500mL HDPE H_2SO_4 <2; COOLED

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID 1113BBM-MW-12-GW- Well No. MW12 (Cont)

Project: BLACK BUTTE MINE Date: 11/9/13
Project No.: 50898-92004 Sampled By: HX
Weather: SEE P. 1 Reviewed By: SD

PURGING

Static Water Level (TOC) 5.82'	Time 10:15	Comments	
Water Volume in Casing	Total Well Depth (TOC)		
Volume Purged Before Sampling	Screened Interval (TOC)		
Purging Method LOW FLOW PERI	Stabilized Flow Rate 200 mL/MIN		

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
11:19	NM	6.8	9.65	11/9 ~~0.96~~ 96	~~6.86~~ 6.85	8.12	5.20	17.1
11:24	NM	7.8	9.65	96	11/x 6.85	7.03	5.02	-4.3
11:29	NM	8.8	9.69	95	6.85	4.72	5.04	-54.4
11:46	NM	12.2	9.80	96	6.92	4.72	5.49	-77.8
11:51	NM	13.2	9.85	97	6.86	3.6	5.16	-75.6
11:54	NM	13.8	9.86	97	6.85	2.6	5.09	-75.1
12:45	COLLECT SAMPLE 5.71	CHECKED WATER LEVEL.						

SAMPLING

Sampling Method SEE P. 1 of 2

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 11:54

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
SEE P. 1	OF 2			

SAMPLE DATA

Appearance / Odor STARTED OF VERY TURBID, CLEARED QUICKLY

pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No Chain-of-Custody ID

Duplicate Sample ID Replicate Sample Nos.

Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	

Other

Comments

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID MW-13 | Well No. 13

Project: BBM | Date: 11/9/13 1/2

Project No.: | Sampled By: SD

Weather: Overcast + 55 °F | Reviewed By: HY

PURGING

Static Water Level (TOC) 5.96	Time 3:30	Comments	
Water Volume in Casing	Total Well Depth (TOC)		
Volume Purged Before Sampling	Screened Interval (TOC)		
Purging Method Peristaltic Pump	Stabilized Flow Rate 200 mL/min		

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
3:34		200 mL	12.61	313	3.95	27.8	3.64	-43.8
3:39		1.4L	12.70	311	6.46	41.7	1.82	-106.2
3:44		2.4L	12.73	308	6.86	39.5	1.52	-113.0
3:49	6.67	3.4L	12.72	306	6.97	35.4	1.51	-113.2
3:54		4.4L	12.72	288	6.97	29.8	1.90	-107.8
3:59		5.4L	12.72	267	6.84	14.8	2.00	-104.0
4:04	6.67	6.4L	12.70	254	6.77	7.38	2.04	-95.5

200 mL/min

SAMPLING

Sampling Method

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
500mL HDPE	—	—	—	Ice
500 mL HDPE	H_2SO_4	<2	—	Ice

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID MW-13 | Well No. 13

Project: BBM | Date: 11/9/13 2/2

Project No.: | Sampled By:

Weather: | Reviewed By:

PURGING

Static Water Level (TOC)	Time	Comments
Water Volume in Casing	Total Well Depth (TOC)	
Volume Purged Before Sampling	Screened Interval (TOC)	
Purging Method	Stabilized Flow Rate	

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
4:09		7.4L	12.70	248	6.73	5.79	2.02	-93.6
4:14		8.4L	12.70	242	6.70	4.33	2.02	-92.2
4:19		9.4L	12.63	259	6.72	4.74	2.88	-86.4

Pre Flow through

SAMPLING

Sampling Method

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 16:15

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
500 mL FEP Lined (2)	HCL	≤ 2	0.43 um	Ice
1L HDPE	HNO_3	≤ 2	0.43 um	Ice
250mL Glass Amber	—	—	—	Ice
1-L HDPE	—	—	—	Ice

SAMPLE DATA

Appearance / Odor No odor, clear

pH (last stabilized) 6.70 | Temperature (°C) 12.70

Eh (millivolts) | Specific Conductance (microsiemens/cm) 242

OVM-PID Headspace (ppm) | ORP -92.2

DISPOSITION

Chain-of-Custody ☐Yes ☐No | Chain-of-Custody ID

Duplicate Sample ID | Replicate Sample Nos.

Analytical Lab: Lab Name | Date Sent to Lab

Shipment Method

Split with: Name (s)

Organization (s)

Other

Comments

May 2014 Groundwater and Surface Water Sampling Records

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID 0514BBM-MW-1-GW-~~010~~ 013.5 MIF

Well No. 1 MW-1

Project: Black Butte Mine

Date: 5/5/2014

Project No.: 50898-92004

Sampled By: SD/JS

Weather: Clear/Cool

Reviewed By:

PURGING

Static Water Level (TOC) 8.79		Time 17:30	Comments
Water Volume in Casing		Total Well Depth (TOC) 13.31	
Volume Purged Before Sampling		Screened Interval (TOC)	
Purging Method peristaltic pump		Stabilized Flow Rate	

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential	
			9.80	67	~~5.07~~	2.14	9.25	146	grab
	12.84 → Run Dry				6.89				

SAMPLING

Sampling Method peristaltic pump

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 40.0

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
3 250 ml	HCl	<2	0.45	ice
2 1-L	HNO3	<2	0.45	ice
1-L / 500mL	—	—	—	ice
500 m	—	—	—	

SAMPLE DATA

Appearance / Odor ~~6.89~~ clear, colorless, odorless

pH (last stabilized) 6.89 Temperature (°C) 9.80

Eh (millivolts) Specific Conductance (microsiemens/cm) 67

OVM-PID Headspace (ppm) ORP 146

DISPOSITION

Chain-of-Custody ☐Yes ☐No Chain-of-Custody ID

Duplicate Sample ID Replicate Sample Nos.

Analytical Lab: Lab Name CLP, Region 10, Anteal Date Sent to Lab

Shipment Method

Split with: Name (s)

Organization (s)

Other

Comments

CDM Smith

Sample

LOW FLOW GROUNDWATER SAMPLING RECORD

D514BBM - MW-2 - GW - ~~615~~ 617.9 MLF

ID SD & JS MLF

Well No. MW-2

Project: Black Butte Mine

Date: 5/8/2014

Project No.: 50898-92004

Sampled By: SD & JS

Weather: raining, cool ~50

Reviewed By:

PURGING

Static Water Level (TOC) 7.88'	Time 1520	Comments
Water Volume in Casing	Total Well Depth (TOC)	
Volume Purged Before Sampling	Screened Interval (TOC)	
Purging Method peristaltic pump	Stabilized Flow Rate ~250 mL/min	

1525 Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
1530	7.95	1.25L	9.95	151	6.11	2.84	3.61	70.0
1535	7.95		9.93	150	6.03	1.85	3.45	82.2
1540	7.95	2.5L	9.90		6.08	.86	3.24	87.2
1545	7.95		9.89		6.08		3.20	90.7

SAMPLING

Sampling Method peristaltic pump

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 1550

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
4x250mL	HCL	<2	2x.45um	ICE
3x 1000mL	2x HNO3	↓	1x ~~0~~.45um	↓
1x 500mL	H2SO4	↓		↓
1x 500mL				↓
1x 250mL				↓

SAMPLE DATA

Appearance / Odor clear, colorless, odorless

pH (last stabilized) 6.08	Temperature (°C) MLF ~~9.95~~ 9.89
Eh (millivolts)	Specific Conductance (microsiemens/cm) 150
OVM-PID Headspace (ppm)	ORP 90.7

DISPOSITION

Chain-of-Custody ☐Yes ☐No Chain-of-Custody ID

Duplicate Sample ID Replicate Sample Nos.

Analytical Lab	Lab Name CLP, Region 10, Antest	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	

Other

Comments

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID 0514BBM-MW-3-GW-018

Well No. MW-3

Project: Black Butte Mine

Date: 5/8/2014

Project No.: 50898-92004

Sampled By: SD & JS

Weather: raining, cool ~50°

Reviewed By:

PURGING

Static Water Level (TOC) 11.65	Time 1340	Comments	
Water Volume in Casing	Total Well Depth (TOC)		
Volume Purged Before Sampling	Screened Interval (TOC)		
Purging Method peristaltic pump	Stabilized Flow Rate 200 mL/min		

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
1345								
1350	12.50	1L	9.98	234	6.40	191	1.07	4.3
1355	12.62	–	9.94	233	6.27	86.0	.55	2.8
1400	12.70	3L	9.85	233	6.32	41.8	.51	-2.2
1405	12.74	–	9.81	233	6.41	24.0	.52	-9.9
1410	12.76	5L	9.73	233	6.47	11.0	.49	-18.8
1415	12.77		9.75	233	6.50	6.59	.49	-23.4
1420	12.76		9.74	232	6.52	4.38	.49	-27.4
1425	12.77		9.71	232	6.54	3.19	.50	-30.7

SAMPLING

Sampling Method peristaltic pump

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 1430

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
4x250 mL	HCL	<2	2x .45 um	ICE
3x1000 mL	2x HNO_3	↓	1x .45 um	↓
1x500mL	1x H_2SO_4	↓		↓
1x500mL				↓
1x 250 Amber				↓

SAMPLE DATA

Appearance / Odor	clear, colorless, odorless		
pH (last stabilized)	6.54	Temperature (°C)	9.71
Eh (millivolts)		Specific Conductance (microsiemens/cm)	232
OVM-PID Headspace (ppm)		ORP	-30.7

DISPOSITION

Chain-of-Custody	☒Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID		Replicate Sample Nos.	
Analytical Lab	Lab Name CLP, Region 10, Ardent	Date Sent to Lab	
	Shipment Method Fed Ex		
Split with	Name (s)		
	Organization (s)		
Other			
Comments			

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample

ID 0514BBM-MW-4-GW-018.5

Well No. MW-4

Project: Black Butte Mine

Date: 5/8/2014

Project No.: 50898-92004

Sampled By: S Dirt, J Stordahl

Weather: CLOUDS/WIND/DRIZZLE

Reviewed By:

PURGING

Static Water Level (TOC) 8.75'		Time 1150	Comments
Water Volume in Casing		Total Well Depth (TOC)	
Volume Purged Before Sampling		Screened Interval (TOC)	
Purging Method peristaltic pump		Stabilized Flow Rate ~200 ml/min	

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
1205								
1210	8.85	1L	10.19	332	7.20	2.79	.65	-97.1
1215	8.85	-	10.29	310	6.97	-	.59	-72.0
1220	8.86	3L	10.02	248	6.71	1.80	.50	-51.0
1225	8.86	-	10.10	148	6.36	4.66	1.08	-9.0
1230	8.87	4L	10.03	107	6.08	3.70	1.26	21.0
1235		-	10.00	90	5.96	3.45	1.45	40.5
1240	8.88		9.98	79	5.92	2.86	1.48	48.8
1245	8.87	5L	9.96	72	5.91		1.58	55.9

SAMPLING

Sampling Method peristaltic pump

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 1250

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
4x250mL	HCL	<2	2x.45um	ICE
3x1000mL	HNO3 x 2	↓	1 .45um	↓
1x500mL	H2SO4	↓		
1x500mL				
1x250mL AMBER				

SAMPLE DATA

Appearance / Odor clear, color less, odorless

pH (last stabilized) 5.91	Temperature (°C) 9.96
Eh (millivolts)	Specific Conductance (microsiemens/cm) 72
OVM-PID Headspace (ppm)	ORP 55.9

DISPOSITION

Chain-of-Custody ☐Yes ☐No Chain-of-Custody ID

Duplicate Sample ID Replicate Sample Nos.

Analytical Lab: Lab Name CLP 2nd Region 10 Northeast Date Sent to Lab

Shipment Method

Split with: Name (s)

Organization (s)

Other

Comments

REV. 2012

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID 0514BBM-MW-5-GW-0108 | Well No. MW-5

Project: Black Butte Mine | Date: 5/6/14

Project No.: 50898-92004 | Sampled By: MLF and JS

Weather: rainy, 50's | Reviewed By:

PURGING

Static Water Level (TOC) 10.18	Time 1356	Comments	
Water Volume in Casing	Total Well Depth (TOC)		
Volume Purged Before Sampling	Screened Interval (TOC)		
Purging Method peristaltic pump	Stabilized Flow Rate ~150 mL/min		

Time (1405)	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
1410	10.56		10.54	387	6.96	321	1.29	-87.9
1415	10.68	~1.5L	10.34	336	7.07	110	.76	-86.6
1420	10.68		10.44	306	7.09	47.8	.66	-88.0
1425	10.71	~3.0L	10.28	295	7.08	79.1	.74	-84.2
1430	10.77		10.24	290	7.09	30.[illegible]	.68	-84.1
1435	10.73	~4.5L	10.37	283	7.10	15.2	.59	-85.2
1440	10.72		10.41	281	7.12	10.0	.60	-86.3

SAMPLING

Sampling Method peristaltic pump 1.45

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 1450

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
250mL FLP (8)	HCl	<2	4-none 4-0.45µ	ice
Lt. HDPE	HNO_3	<2	~~4-none~~ 2-0.45µ	ice
~~Lt. HDPE~~ 500mL HDPE	—	—	—	ice
500mL HDPE ~~250mL amber glass~~	H_2SO_4	<2	—	ice
			—	ice

SAMPLE DATA

Appearance / Odor clear, colorless, odorless	
pH (last stabilized) 7.12	Temperature (°C) 10.41
Eh (millivolts)	Specific Conductance (microsiemens/cm) 281
OVM-PID Headspace (ppm)	ORP -86.3

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name CLP, Region 10, Antest	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments FIELD DUPLICATE COLLECTED		

CDM Smith

Sample

LOW FLOW GROUNDWATER SAMPLING RECORD

ID 0514BBM - MW-6-GW - 040013mw

Well No. MW-6

Project: Black Butte Mine

Date: 5/6/2014

Project No.: 50898-92004

Sampled By: SD & JS

Weather: cloudy, cool, 50's

Reviewed By:

PURGING

Static Water Level (TOC) 6.45	Time ~~6.45~~ 1650	Comments
Water Volume in Casing	Total Well Depth (TOC)	
Volume Purged Before Sampling	Screened Interval (TOC)	
Purging Method peristaltic pump	Stabilized Flow Rate ~200 mL/min	

1655 Time	DTW	Ltr. Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
1700	07.18	2	9.55	475	6.59	3.94	1.04	68.0
1705	07.35	3 Ltr.	9.51	460	6.47	1.76	.65	67.2
1710	07.40	4-L	9.43	441	6.42	2.20	.63	68.7
1715	07.46	5	9.40	396	6.19	8.45	.91	79.1
1720	07.50	6	9.41	390	6.11	6.15	.97	88.0
1725	- collect sample							

SAMPLING

Sampling Method peristaltic pump

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 1725

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
250mL FLP (2)	HCl	<2	1 none / 0.45μ	ice
Ltr. HDPE (2)	HNO_3	<2	—	ice
500mL HDPE	H_2SO_4	<2	—	ice
500mL HDPE / Ltr. HDPE	—	—	—	ice

250mL amber glass

SAMPLE DATA

Appearance / Odor

pH (last stabilized) 6.11	Temperature (°C) 9.41
Eh (millivolts)	Specific Conductance (microsiemens/cm) 390
OVM-PID Headspace (ppm)	ORP 880

DISPOSITION

Chain-of-Custody ☐Yes ☐No Chain-of-Custody ID

Duplicate Sample ID Replicate Sample Nos.

Analytical Lab	Lab Name CLP, Region 10, Amtest	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	

Other

Comments

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID 05/4BBM-MW-7-GW-018 Well No. MW-7

Project: Black Butte Mine Date: 5/5/2014

Project No.: 50898-92004 Sampled By: MLF & JS

Weather: Sunny, 50's, calm Reviewed By:

PURGING

Static Water Level (TOC) 14.18	Time 1525	Comments	
Water Volume in Casing	Total Well Depth (TOC)		
Volume Purged Before Sampling	Screened Interval (TOC)		
Purging Method peristaltic pump	Stabilized Flow Rate ~150 mL/min		

Time	DTW	Cumulative Volume (Ltr.)	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
1332	14.49	.8	10.60	74	5.93	7.96	8.65	136.4
1337	14.69	1.5	10.12	72	5.77	3.27	7.19	144.8
1341	14.85	2.2	10.03	80	5.83	1.11	7.10	148.1
1345	~~10.05~~	3	10.05	93	5.94	0.88	6.40	147.7
1349	14.98	3.7	10.05	117	6.17	0.84	6.11	148.0
1353	15.00	4.5	10.09	135	6.28	1.00	5.79	148.6
1357	14.95 / 15.00	5.3	10.05	147	6.36		5.51	148.6

SAMPLING

Sampling Method peristaltic pump

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 1700

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
250 mL FLP (4)	HCl	<2	2-none, 2-0.45µ	ice
Ltr. HDPE (2)	HNO_3	<2	1 none, 1 0.45µ	ice
Ltr. HDPE	—	—	—	ice
500 mL HDPE	—	—	—	ice

SAMPLE DATA

Appearance / Odor clear, colorless, odorless

pH (last stabilized) 6.49	Temperature (°C) 9.91
Eh (millivolts)	Specific Conductance (microsiemens/cm) 162
OVM-PID Headspace (ppm)	ORP 149.7

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name CLP Region 10, Anitest	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

2 of 2

Sample ID _____ Well No. MW-7

Project: Black Butte Mine Date: _____

Project No.: 50898-92004 Sampled By: MF [illegible]

Weather: _____ Reviewed By: _____

PURGING

Static Water Level (TOC)	Time	Comments
Water Volume in Casing	Total Well Depth (TOC)	
Volume Purged Before Sampling	Screened Interval (TOC)	
Purging Method peristaltic pump	Stabilized Flow Rate	

	Time	DTW	Cumulative Volume (L)	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
14	1601	15.04	6.4	10.00	153	6.43	0.66	5.33	148.8
14	1605	15.05	7.3	9.98	155	6.43	0.79	5.16	148.6
14	1609	15.08	8	9.89	158	6.44		4.99	149.1
14	1613	15.11	8.7	9.89	159	6.45	0.70	4.94	149.4
14	1617	15.14	9.5	9.90	161	6.47	0.50	4.84	149.7
14	1621	15.15	10.2	9.91	162	6.49		4.72	149.7
	MF								

SAMPLING

Sampling Method peristaltic pump

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 1700

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
500 mL HDPE	H_2SO_4	~2	—	ice
250 mL amber glass	—	—	—	ice

SAMPLE DATA

Appearance / Odor clear, colorless	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other purging at ~100 mL/min		
Comments		

CDM Smith

Sample

LOW FLOW GROUNDWATER SAMPLING RECORD

ID 0514BBM-MW-8-~~008~~ 009 MLF

Well No. MW-8

Project: Black Butte Mine

Date: 5/6/2014

Project No.: 50898-92004

Sampled By: MLF

Weather: sunny, warm, 50's

Reviewed By:

PURGING

Static Water Level (TOC) 3.05'	Time 0930	Comments PURGING UNTIL DRY
Water Volume in Casing	Total Well Depth (TOC) @0940, ~900mL	
Volume Purged Before Sampling	Screened Interval (TOC)	
Purging Method peristaltic pump	Stabilized Flow Rate	

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
1005	- purged ~750mL, water cleared after a couple hundred mL's							
1030	- purged ~750mL, cleared to a turbidity of 57.3							
1055			10.70	198	6.61		4.87	68.2
	Begin collecting sample							

SAMPLING

Sampling Method peristaltic pump

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 1215

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
250mL FLP/4	HCl	<2	2-none / 2-0.45μ	ice
Ltr. HDPE	HNO3	<2	1-none / 1-0.45μ	ice
Ltr. HDPE	—	—	—	ice
500mL HDPE	—	—	—	ice
500mL HDPE	H_2SO_4	<2		

SAMPLE DATA

Appearance / Odor clear after it clears as pumping each ~750mL volume

pH (last stabilized) 6.61	Temperature (°C) 10.70
Eh (millivolts)	Specific Conductance (microsiemens/cm) 198
OVM-PID Headspace (ppm)	ORP 68.2

DISPOSITION

Chain-of-Custody ☐Yes ☐No Chain-of-Custody ID

Duplicate Sample ID Replicate Sample Nos.

Analytical Lab	Lab Name CLP, Region 10, Amtest	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	

Other Reduced volumes collected for all analyses except Hg and MeHg

Comments

CDM Smith

Sample

LOW FLOW GROUNDWATER SAMPLING RECORD

ID 0514BBM-MW-9-GW-006009MP

Well No. MW-9

Project: Black Butte Mine

Date: 5/6/2014

Project No.: 50898-92004

Sampled By: SD - SS

Weather: partly Cloudy / 55

Reviewed By:

PURGING

Static Water Level (TOC)		Time	Comments
Water Volume in Casing		Total Well Depth (TOC)	
Volume Purged Before Sampling		Screened Interval (TOC)	
Purging Method	peristaltic pump	Stabilized Flow Rate	~200 mL/min

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
10:10	~6.5"	Pumped	9L	thinking it would go dry, only dropped 1'				
11:30	7.05	9.5L	10.88	65	6.14	11.2	3.86	124.3
1140	7.05	11.5L	10.87	62	6.13	9.28	3.86	124.4
1215	7.05	Finish	Full	Sample Set				

flow cell

SAMPLING

Sampling Method Low flow purge / peri pump

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 1145

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
Hg Dx2, Tx2	250mL HCl	<2	0.45	ice
Metals D, T	1-L HNO_3	<2	0.45	ice
500-mL	H_2SO_4	<2	—	ice
500 mL, 1-L,	—	—	—	ice

SAMPLE DATA

Appearance / Odor	Clear		
pH (last stabilized)	6.13	Temperature (°C)	10.87
Eh (millivolts)	124.4	Specific Conductance (microsiemens/cm)	62
OVM-PID Headspace (ppm)		ORP	

DISPOSITION

Chain-of-Custody	☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID		Replicate Sample Nos.	
Analytical Lab	Lab Name CLP Region 10, Anitest	Date Sent to Lab	
	Shipment Method		
Split with	Name (s)		
	Organization (s)		
Other			
Comments			

REV. 2012

low flow groundwater sampling record.pdf

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID 0514BBM-mw-10-018.5 | Well No. mw-10

Project: Black Butte Mine	Date: 5/5/2014
Project No.: 50898-92004	Sampled By: MLF, JS,
Weather: running 50's	Reviewed By:

PURGING

Static Water Level (TOC) 16.38	**Time** 1325	**Comments**	
Water Volume in Casing	**Total Well Depth (TOC)**		
Volume Purged Before Sampling	**Screened Interval (TOC)**		
Purging Method peristaltic pump	**Stabilized Flow Rate** —		

Time	DTW	Cumulative Volume (L)	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
1335	16.83		10.00	137	5.64	3.79	4.27	133.0
1339	17.15		9.57	129	5.56	2.26	4.11	141.3
1343	17.68		9.38	128	5.57	~~3.40~~ mv	3.90	145.0
1347	17.84		9.44	130	5.55	7.48	3.64	146.7
1351	18.07		9.47	132	5.56	25.9	3.65	149.4
1353	— well goes dry							

SAMPLING

Sampling Method peristaltic pump

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
250mL FLP	HCl	<2	—	ice
250mL FLP (approx. 1/5 full)		<2	0.45µ	ice
Sample collected on 5/8/2014				

SAMPLE DATA

Appearance / Odor clear, colorless, odorless	
pH (last stabilized) 5.56	Temperature (°C) 9.47
Eh (millivolts)	Specific Conductance (microsiemens/cm) 132
OVM-PID Headspace (ppm)	ORP 149.4

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID
Duplicate Sample ID	Replicate Sample Nos.
Analytical Lab	Lab Name CLP, Region 10, ~~Antest~~ mv Date Sent to Lab
	Shipment Method
Split with	Name (s)
	Organization (s)
Other purge rate ~100 mL/min	
Comments	

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID _____ Well No. MW-10

Project: Black Butte Mine Date: 3/8/2017
Project No.: 50898-92004 Sampled By: JDS
Weather: RAIN ~50F Reviewed By: _____

PURGING

Static Water Level (TOC)	Time	Comments
Water Volume in Casing	Total Well Depth (TOC)	
Volume Purged Before Sampling	Screened Interval (TOC)	
Purging Method peristaltic pump	Stabilized Flow Rate	

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential

SAMPLING

Sampling Method
Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 0845

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
1X250 mL	HCL	<2		ICE

SAMPLE DATA

Appearance / Odor
pH (last stabilized) Temperature (°C)
Eh (millivolts) Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm) ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No Chain-of-Custody ID
Duplicate Sample ID Replicate Sample Nos.
Analytical Lab: Lab Name Date Sent to Lab
Shipment Method
Split with: Name (s)
Organization (s)
Other
Comments ~20' WATER IN WELL, SAMPLED TIL DRY

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

0514BBM-MW-11-GW-0-20MF-623

Sample ID MW-11 | Well No. MW-11

Project: Black Butte Mine | Date: 5/5/2014

Project No.: 50898-92004 | Sampled By: MLF & JS

Weather: partly cloudy, 50's light rain | Reviewed By:

PURGING

Static Water Level (TOC) 16.32	Time 1024	Comments	
Water Volume in Casing	Total Well Depth (TOC)		
Volume Purged Before Sampling	Screened Interval (TOC)		
Purging Method peristaltic pump	Stabilized Flow Rate —		

Time	DTW	Ltr. Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	mg/L Dissolved Oxygen	Oxidation-Reduction Potential
1027	16.95	.3	10.75	541	6.82		4.60	89.7
1029	17.46	.5	11.07	344	6.40	1.67	2.89	118.5
1031	17.98	.8	10.78	222	6.23		3.14	149.6
1035	18.48	1.2	10.63	210	6.19	1.22	3.31	152.2
1039	18.82	1.6	10.45	197	6.16		3.32	167.6
1043	19.01	2	10.45	195	6.16		3.23	176.9
1047	19.22	2.4	10.42	184	6.16	1.90	3.22	187.5

SAMPLING

Sampling Method peristaltic pump

Analytical Matrix ☐Yes ☐No ☐Attached | Time Sampled 0815 on 5/8/14

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
250mL FLP (4)	HCl	<2	2-none 2-0.45µ	ice
Ltr. HDPE (2)	HNO_3	<2	none .45µ	ice

SAMPLE DATA

Appearance / Odor clear, colorless, odorless	
pH (last stabilized) 6.23	Temperature (°C) 11.59
Eh (millivolts)	Specific Conductance (microsiemens/cm) 164
OVM-PID Headspace (ppm)	ORP 166.7

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID
Duplicate Sample ID	Replicate Sample Nos.
Analytical Lab: Lab Name CLP, Region 10, Anteon	Date Sent to Lab
Analytical Lab: Shipment Method	
Split with: Name (s)	
Split with: Organization (s)	
Other purging at ~100mL/min	Limited volume for TAL metals
Comments NSI order 134100508	

MW-11 2 of 3

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID _____ Well No.

Project: Black Butte Mine Date: _____

Project No.: 50898-92004 Sampled By: _____

Weather: _____ Reviewed By: _____

PURGING

Static Water Level (TOC)	**Time**	**Comments**
Water Volume in Casing	**Total Well Depth (TOC)**	
Volume Purged Before Sampling	**Screened Interval (TOC)**	
Purging Method peristaltic pump	**Stabilized Flow Rate**	

Time	DTW	Cumulative Volume (Ltr.)	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
1058	19.47	2.8	10.52	165	6.09	4.46	3.00	203.7
1055	19.72	3.2	10.64	156	6.11	~~14.72~~ 7.22	2.73	207.1
1059	19.95	3.6	10.78	147	6.09	15.5	2.60	206.9
1103	20.26	4	10.69	141	6.03		2.47	204.9
1107	20.47	4.4	10.58	138	6.00	26	2.39	203.8
1111	20.75	4.8	10.44	136	5.99	~~20.75~~ 16	2.22	203.5
1115	21.63	5.2	10.36	140	6.02	34.5	2.19	201.5

SAMPLING

Sampling Method pc

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled

Sample Container	Preserved By	At What pH	Filter Type	Cooled By

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

JSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	

's

TIME	TEMP	SPEC. COND.	pH	TURBIDITY	DO	ORP
1315	10.80	82	6.67	4.61	5.89	17.5
1320	10.82	82	6.65	3.32	6.05	20.1

CDM Smith

Sample

LOW FLOW GROUNDWATER SAMPLING RECORD

ID 0514BBM-MW-12-GW-009.75

Well No. 12 MW-12

Project: Black Butte Mine

Date: 5/7/2014

Project No.: 50898-92004

Sampled By: SD & JS

Weather: sunny, warm, 50's

Reviewed By:

PURGING

Static Water Level (TOC) 5.95	Time 1230	Comments
Water Volume in Casing	Total Well Depth (TOC)	
Volume Purged Before Sampling	Screened Interval (TOC)	
Purging Method peristaltic pump	Stabilized Flow Rate ~100 ml/min	

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
1235								
1240	-		11.70	93	7.11	194	16.00	11.3
1245	-	1L	11.80	83	6.71	100	5.58	1.1
1250	-		10.96	82	6.71	62.4	5.47	.3
1255	-	2L	10.94	82	6.67	~~23.9~~ 43.9	5.79	.3
1300	-		10.85	82	6.67	27.0	5.92	5.3
1305	-	3L	10.80	82	6.67	13.1	5.85	10.6
~~1400~~ 1310	-		10.80	82	6.66	6.75	5.87	15.3

CONT'D ON BACK

SAMPLING

Sampling Method peristaltic

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 1325

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
2x 250mL	HCL	<2	1x .45 um	ICE
3x 1000mL	HNO3 x 2	↓	1x .45 um	↓
2x500mL	1x H2SO4	↓		↓
1x250mL AMBER	-	-		↓

SAMPLE DATA

Appearance / Odor ~~6.66~~ mcr	
pH (last stabilized) 6.66	Temperature (°C) 10.80
Eh (millivolts)	Specific Conductance (microsiemens/cm) 82
OVM-PID Headspace (ppm)	ORP 15.3

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name CLP, Region 10, Amtest	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		

Comments COULD NOT OBTAIN REPEATABLE DTW MEASUREMENTS (1" METAL CASING) KINKED CONCERNED ABOUT FeO FOULING CONTAMINATION

OVER →

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample ID _____ Well No. MW-11

Project: Black Butte Mine Date: _____
Project No.: 50898-92004 Sampled By: _____
Weather: _____ Reviewed By: _____

PURGING

Static Water Level (TOC)	**Time**	**Comments**
Water Volume in Casing	**Total Well Depth (TOC)**	
Volume Purged Before Sampling	**Screened Interval (TOC)**	
Purging Method peristaltic pump	**Stabilized Flow Rate**	

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
1125	21.52		10.33	141	6.06	47.8	1.95	197.5
1135	22.05		10.57	146	6.12	59.0	1.74	193.0
1145	22.47		10.85	151	6.17	63.1	1.49	186.8
1155	22.84		11.32	155	6.20	72.1	1.42	182.7
1205	23.23		11.59	164	6.23	86.0	1.27	166.7
	23.41							

SAMPLING

Sampling Method

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled

Sample Container	Preserved By	At What pH	Filter Type	Cooled By

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

CDM Smith

LOW FLOW GROUNDWATER SAMPLING RECORD

Sample

ID 05/4BBM-MW-13 GW - 618.5 MW -

Well No. 13

Project: Black Butte Mine

Date: 5/7/2014

Project No.: 50898-92004

Sampled By: SD & JS

Weather: Sunny, warm, 70's

Reviewed By:

PURGING

Static Water Level (TOC) 6.45	Time 1040
Water Volume in Casing	Total Well Depth (TOC)
Volume Purged Before Sampling	Screened Interval (TOC)
Purging Method peristaltic pump	Stabilized Flow Rate ~200 ml/min

Comments

Time (1050)	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
1055	7.49	1L	10.81	280	7.09	10.2	2.37	75.3
1100	7.67		10.74	276	7.00	20.4	2.05	79.8
1105	7.79	3L	10.76	270	6.92	12.8	1.93	79.3
1110	7.85		10.78	256	~~6~~6.82	8.35	2.16	79.9
1115	7.90		10.85	245	6.79	4.30	2.08	79.5
1120	7.93		10.62	238	6.77	3.19	2.03	78.8

SAMPLING

Sampling Method peristaltic pump

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 1125

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
2 X ~~500~~ 250 mL	HCL	<2	1@.45 um	ICE
3X1000 mL	2@ HNO3	↓	1 PRESERVED @.45 um	↓
2 X 500 mL	1@ H2SO4	↓	–	↓
1 X 250 mL AMBER	–	–	–	↓

SAMPLE DATA

Appearance / Odor clear, colorless, odorless

pH (last stabilized) 6.77	Temperature (°C) 10.62
Eh (millivolts)	Specific Conductance (microsiemens/cm) 238
OVM-PID Headspace (ppm)	ORP 78.8

DISPOSITION

Chain-of-Custody ☐Yes ☐No Chain-of-Custody ID

Duplicate Sample ID Replicate Sample Nos.

Analytical Lab: Lab Name CLP Region 10, Anitest Date Sent to Lab

Shipment Method

Split with: Name (s)

Organization (s)

Other

Comments

CDM Smith

Surface Water

~~LOW FLOW GROUNDWATER~~ SAMPLING RECORD

Sample ID 0514BBM - AS-SW - 000 Well No. ADIT

Project: Black Butte Mine Date: 5/7/14

Project No.: 50898-92004 Sampled By: SD & JS

Weather: Sunny, warm, 50's Reviewed By:

PURGING

Static Water Level (TOC)	Time 0930	Comments	
Water Volume in Casing	Total Well Depth (TOC)		
Volume Purged Before Sampling	Screened Interval (TOC)		
Purging Method peristaltic pump	Stabilized Flow Rate		

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
0930	-	-	6.51	169	7.29	.62	10.50	105.0

SAMPLING

Sampling Method

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 0935

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
4x250 mL	HCL	<2	2/0.45 µm	ICE
2x1000 mL	HNO_3	↓	1/0.45 µm	↓
1x500 mL	H_2SO_4	↓	-	↓
2x1000 mL	-	-	-	↓
1x 250 mL AMBER	-	-	-	↓

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments ADIT POND DISCHARGE ~ 5L/min		

CDM Smith

Sample

Surface Water

~~LOW FLOW GROUNDWATER~~ SAMPLING RECORD

Pooler Potable Supply

ID D5140BM - Pooler Potable Supply Well No. UPPER FURNACE

SW-050

Project: Black Butte Mine	Date: 5/7/14
Project No.: 50898-92004	Sampled By: SD & JS
Weather: Sunny warm 50's	Reviewed By:

PURGING

Static Water Level (TOC)		Time 1600	Comments
Water Volume in Casing		Total Well Depth (TOC)	
Volume Purged Before Sampling		Screened Interval (TOC)	
Purging Method peristaltic pump		Stabilized Flow Rate	

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
1600	-	-	9.69	70	6.91	3.80	11.57	171.5

SAMPLING

Sampling Method

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 1605

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
4x250 mL	HCL	< 2	2x .45 um	ICE
3x1000 mL	2x HNO3	↓	1x .45 um	↓
1x500 mL	H2SO4	↓	-	↓
1x250 mL AMISER	-		-	↓
1x1000 mL			-	

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No		Chain-of-Custody ID
Duplicate Sample ID		Replicate Sample Nos.
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

Surface Water

CDM Smith

Sample

~~LOW FLOW GROUNDWATER~~ mor- SAMPLING RECORD

ID 0514BBM-DC1-SW-000 | Well No. DC1

Project: Black Butte Mine | Date: 5/7/2014

Project No.: 50898-92004 | Sampled By: M.V.

Weather: Sunny, warm, 50's | Reviewed By:

PURGING

Static Water Level (TOC)	Time	Comments Field Blank for Hg collected
Water Volume in Casing	~~Total Well Depth (TOC)~~ Staff Gauge: ~~0.165~~ ft 0.76 ft SD	
Volume Purged Before Sampling	Screened Interval (TOC)	
Purging Method peristaltic pump	Stabilized Flow Rate	

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	* pH	Turbidity	mg/L Dissolved Oxygen	Oxidation-Reduction Potential
1515	—	—	8.93	116	5.25	4.05	9.94	148.8

SAMPLING

Sampling Method

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
250mL FLP				Ice
Ltr. HDPE				
Ltr. HDPE				
500mL HDPE				

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other Field duplicate collected		
Comments * possible issue with pH reading. SD & JS found pH at GD1 to be lower with this YSI than other YSI - they checked when they observed discrepancy between pH at GU1 and GD1 with different YSI's		

REV. 2012

low flow groundwater sampling record.pdf

CDM Smith

Sample

Surface

~~LOW FLOW GROUNDWATER~~ SAMPLING RECORD

ID 0514BBM-SW-SW-000 (GW1 / MW5) Well No. GARDUETTE CK (UPPER GW1)

Project: Black Butte Mine	Date: 5/7/2014
Project No.: 50898-92004	Sampled By: SD & JS
Weather:	Reviewed By:

PURGING

Static Water Level (TOC)		Time 1725	Comments
Water Volume in Casing		Total Well Depth (TOC) Staff Gauge: 1.14 ft	
Volume Purged Before Sampling		Screened Interval (TOC)	
Purging Method peristaltic pump		Stabilized Flow Rate	

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
1730			10.57	79	7.68		11.3	137.9

SAMPLING

Sampling Method

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 1735

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
8 x 250mL	HCL	<2	4 x .45 µm	ICE
3 x 1000mL	2 x HNO3		1 x .45 µm	
1 x 500mL	H_2SO_4			
1 x 500mL AMBER				

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No		Chain-of-Custody ID
Duplicate Sample ID		Replicate Sample Nos.
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments MS/MSD COLLECTED		

CDM Smith

Sample

Surface Water MW

~~LOW FLOW~~ GROUNDWATER SAMPLING RECORD

LOWER GD1

ID 0514BBM-GD1-SW-0814 Well No. GARDETTE CRK

Project: Black Butte Mine	Date: 5/7/2014
Project No.: 50898-92004	Sampled By: SD & JS
Weather: Sunny, 62°F	Reviewed By:

PURGING

Static Water Level (TOC)		Time 1815	Comments
Water Volume in Casing		Total Well Depth (TOC) Staff Gauge: 1.12 ft	
Volume Purged Before Sampling		Screened Interval (TOC)	
Purging Method peristaltic pump		Stabilized Flow Rate	

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
1819	-	-	10.59	78	7.63	3.71	11.66	122.9

SAMPLING

Sampling Method

Analytical Matrix ☐Yes ☐No ☐Attached Time Sampled 1823

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
4x250 mL	HCL	<2	2x .45 µm	ICE
3x100 mL	2x HNO3	↓	1x .45 µm	↓
1x500 mL	H_2SO_4	↓	↓	↓
1x1000 mL	-	-	↓	↓
1x500 mL Amber	-	↓	↓	↓

SAMPLE DATA

Appearance / Odor	
pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No	Chain-of-Custody ID	
Duplicate Sample ID	Replicate Sample Nos.	
Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	
Other		
Comments		

Surface

CDM Smith

Sample

~~LOW FLOW~~ GROUNDWATER SAMPLING RECORD

FC1

ID 0514BBM FC1-SW-000 | Well No. F 1

Project: Black Butte Mine | Date: 5/8/14

Project No.: 50898-92004 | Sampled By: SD

Weather: Cloudy / Incremental Showers | Reviewed By:

PURGING

Static Water Level (TOC)	Time 10:15	Comments
Water Volume in Casing	Total Well Depth (TOC) Staff Gauge: 0.16 ft	
Volume Purged Before Sampling	Screened Interval (TOC)	
Purging Method peristaltic pump	Stabilized Flow Rate	

Time	DTW	Cumulative Volume	Temp (°C)	Specific Conductance (microsiemens/cm)	pH	Turbidity	Dissolved Oxygen	Oxidation-Reduction Potential
10:15			9.87	55	7.14	8.12	10.18	173.5

SAMPLING

Sampling Method

Analytical Matrix ☐Yes ☐No ☐Attached | Time Sampled 1100

Sample Container	Preserved By	At What pH	Filter Type	Cooled By
250 x 4	HCL	<2	0.45 on 2	Ice
1-L	HNO_3	<2	0.45 on 2	Ice
1-L x 2 1 mode month	—	—	—	
500-mL	H_2SO_4	<2	—	Ice
Appearance / Odor 500-mL	—	—	—	Ice

SAMPLE DATA

pH (last stabilized)	Temperature (°C)
Eh (millivolts)	Specific Conductance (microsiemens/cm)
OVM-PID Headspace (ppm)	ORP

DISPOSITION

Chain-of-Custody ☐Yes ☐No | Chain-of-Custody ID

Duplicate Sample ID | Replicate Sample Nos.

Analytical Lab	Lab Name	Date Sent to Lab
	Shipment Method	
Split with	Name (s)	
	Organization (s)	

Other

Comments

Appendix B

Demonstration of Method Applicability Study

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Attachments

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Attachment B Estimation of the Relative Standard Deviation of the Fundamental Error and Development of Laboratory Subsampling Protocol

Appendix B

Demonstration of Methods Applicability Analysis

A Demonstration of Methods Applicability (DMA) analysis was conducted to provide for optimization of future sampling efforts at OU1. This study was conducted in accordance with guidelines of *Demonstration of Methods Applicability under a Triad Approach for Site Assessment and Cleanup* (EPA 2008) and recommendations of the project technical team. This memo addresses two study questions identified in the *Quality Assurance Project Plan for Black Butte Mine Phase 2 Remedial Investigation – Demonstration of Methods Applicability* (QAPP) (CDM Smith 2013):

- **Study Question 1:** Are the site-specific accuracy and precision of field portable X-ray diffraction (FPXRF) adequate to screen concentrations of mercury and other metals during the RI?
- **Study Question 2:** Are site-specific sampling and sample preparation procedures necessary to facilitate accurate and precise laboratory analyses of mercury and other metals in incremental samples (IS)

The QAPP recognized two target populations: General Site Soils (GSS) and Tailings and Mine Materials (TMM). The GSS target population consists of soils that may be affected by physical, hydrogeochemical or aerial dispersion of mercury or other contaminants of potential concern (COPCs), but that are less likely to contain significant concentrations of cinnabar (HgS) the primary ore mineral at the Black Butte Mine. The TMM target population includes mine tailings and waste rock. These materials are likely to contain cinnabar (or its high-temperature polymorph metacinnabar). The total mercury concentration of the TMM target population is likely to be significantly higher than the GSS target population, and the mineralogy of mercury contained in the TMM target population is expected to be different than the GSS target population. Therefore, these two target populations were addressed separately in the DMA.

The discussions in the following sections focus on mercury, the primary COPC at the Black Butte Mine. Data for additional COPCs were collected during the DMA as shown in Attachment A.

1.0 Study Question 1- Site-Specific Accuracy of FPXRF Analyses

FPXRF was recommended as a potential field-based method for analysis of mercury and other COPCs in the Optimization Review (EPA 2012), and EPA guidance (EPA 2000) recommends FPXRF as an appropriate field screening tool for abandoned mine sites. However, accuracy and precision of FPXRF are subject to some uncertainty, as are accuracy and precision of other laboratory methods. In particular, FPXRF is subject to potential site-specific interferences caused by physical and chemical characteristics of the sample (EPA 1998) including:

- Physical matrix effects, such as variations in particle size, uniformity of particles and surface condition
- Moisture content of greater than approximately 20 weight percent (%)

- Chemical matrix effects related to differences in concentration of interfering elements

Because these factors vary from site to site, it is useful to assess FPXRF performance on a site-specific basis. For example, the concentration and/or presence of potentially interfering elements are dependent on the site-specific mineralogy of the target populations. Similarly, the variations in particle size, uniformity of particles and surface condition are dependent on the historical mineral processing and tailings disposal methods employed at the Black Butte Mine (as well as other factors). This is particularly evident in the TMM target population, with mine tailings exhibiting a characteristic sandy gravel texture, which contrasts with the soil textures of the GSS target population (dominantly silt with clay and gravel).

Evaluation of FPXRF performance in the DMA included collection of paired field and laboratory samples to facilitate comparison of FPXRF data with standard laboratory methods. The DMA focused on collection of paired samples from the TMM target population, because paired samples of the GSS target population were collected in summer 2013, and these data were analyzed in the January 2014 *Black Butte Mine OU1 Data Summary Report* (CDM Smith 2014).

1.1 FPXRF Performance for Tailings and Mineralized Materials Target Population

FPXRF may be used in the future to characterize and/or delineate mercury source materials such as the Main Tailings, the Furnace Creek Tailings, and mine waste rock. This target population contains materials with mercury concentrations that are relatively higher than general site soils. Samples for this facet of the DMA were collected from three areas:

- 20 samples were collected from four transects in the Furnace Creek Tailings area
- 6 samples were collected from one transect in the Main Tailings area
- 4 opportunity samples were collected from a mine waste rock dump

Figure 1-1 shows the locations for these samples. The samples collected from the Furnace Creek area were within an area designated as Furnace Creek Tailings. Mine tailings were visually identified within a portion of this area, but mine tailings were not observed within the steep tributary area of Furnace Creek. It is thought that tailings originally present within the steep tributary portion of Furnace Creek eroded over time and were transported into the Garoutte Creek watershed. Samples collected in the Furnace Creek area are denoted on Table 1 as “Tailings (furnace)” and “Furnace Creek soil” based on the lithological descriptions. Two samples are classified as “Tailings (cover?)”, because they exhibit lithological characteristics indicative of tailings with very low mercury concentrations, which are a characteristic of the Main Tailings. Material from the Main Tailings pile with low mercury concentrations was used to cover portions of the Furnace Creek tailings during the EPA Removal Action (EPA 2006). The six samples collected from the Main Tailings area all exhibit lithological features characteristic of tailings with low mercury concentrations. Four opportunity samples were collected from a mine waste dump located adjacent to a large adit, which was observed during reconnaissance of that area.

Overall, the laboratory mercury concentrations of the samples ranged from 1.4 to 543 milligrams per kilogram (mg/kg), which provides a good range to support statistical evaluation of FPXRF performance. In general, the samples from Main Tailings exhibited the lowest mercury concentrations,

samples from soils in the Furnace Creek area and the mine waste dump exhibited intermediate mercury concentrations, and the Furnace Creek Tailings samples exhibited the highest mercury concentrations. The relatively lowery mercury concentrations in the Main Tailings as compared to the Furnace Creek tailings exhibits the higher efficiency of the rotary kiln used to produce the Main Tailings as compared to the older and less efficient technology used at the Old Furnace.

Each of the samples was analyzed using a range of FPXRF field sample preparation approaches, which supports evaluation of whether these additional sample preparation approaches are warranted at the site. These sample preparation approaches included:

- Collecting four FPXRF measurements through the plastic sample bag at the field moisture content and averaging (denoted as "FPXRF-Wet")
- Air drying the samples, and collecting four shots through the bag as described above (denoted as "FPXRF-Dry")
- Sieving the samples to -1.5 millimeter (mm) and analyzing a aliquot of the sample in a plastic FPXRF sample cup (denoted as "FPXRF-Sieved")

In general, these approaches range from the simplest (and most cost-efficient) method of field sample preparation to methods that would take relatively more time and effort to accomplish.

The paired FPXRF and laboratory dataset was evaluated using two statistical approaches: linear regression, and comparison of the percent difference with the laboratory mercury concentration. Regression analysis consisted of plotting the data on a scatter chart, calculating the best fit line using linear regression, and evaluating the equation of the best-fit line with respect to the regression coefficient (the slope of the line) and the y-intercept. For perfectly correlated data, the regression coefficient would be 1, and the y-intercept would be zero. Evaluation of the regression coefficient and intercept provides for assessment of potential high or low bias in the FPXRF data. The r-squared value is the square of the correlation coefficient between the laboratory and FPXRF values. An r-squared value of 1 indicates a perfect correlation, and values of less than 1 indicate relatively poorer correlation between the laboratory and FPXRF values. Evaluation of the r-squared value facilitates examination of how well-correlated the two datasets are.

The percent difference was calculated as follows:

$$Percent\ Difference = \frac{FPXRF\ Concentration - Laporatory\ Concentration}{Laboratory\ Concentration}$$

The calculation as performed in this manner because the laboratory value is assumed to be the true value for purposes of the statistical evaluation. The plot of percent difference versus laboratory concentration provides additional information to evaluate accuracy and potential high or low bias in FPXRF data in relation to the concentration range of the dataset.

In the data evaluations presented below, one sample (sample number 0214BB-SO19-00) was recognized as an outlier and was removed from the analysis. This sample was collected from the Furnace Creek area and was logged in the field as tailings. The FPXRF-Wet, FPXRF-Dry, and FPXRF-Sieved results for this sample were 391 mg/kg, 660 mg/kg and 607 mg/kg respectively, which is similar to other Furnace Creek tailings samples collected along that transect. However, the corresponding Contract Laboratory Program (CLP) laboratory analysis was only 1.8 mg/kg. The

reason for this apparent discrepancy in FPXRF versus laboratory concentrations is unknown. The sample data for sample 0214BB-SO19-00 are included in the complete data table presented as Attachment A, but those data are not included in Table 1 or in the statistical analyses presented below.

The linear regression and the plot of percent difference versus concentration for the FPXRF-Wet dataset are shown on figures 1-2 and 1-3 respectively. The r-squared value is 0.94, which indicates that the datasets are well-correlated. The regression coefficient is only 0.75, which indicates that the FPXRF data are biased low with respect to the laboratory data, and the y-intercept of 9.0 shows that this bias varies with concentration. This low-bias of the FPXRF-Wet data is also shown in Figure 1-3, the plot of percent difference versus concentration. The low bias is relatively independent of concentration over a concentration range of approximately 20 to 560 mg/kg. However, at concentrations of less than approximately 20 mg/kg, the percent difference of the FPXRF-Wet dataset is widely variable and biased high with a maximum percent difference of over 600 percent. The low bias of the FPXRF data at concentrations of greater than approximately 20 mg/kg may be related to the CLP laboratory reporting the concentrations in units of mg/kg of dry sample, whereas the FPXRF instrument is measuring total mercury concentrations within the wet sample (including both the solid sample and any entrained water).

The linear regression and the plot of percent difference versus concentration for the FPXRF-Dry dataset are shown on figures 1-4 and 1-5 respectively. The r-squared value is 0.94, which indicates that the data are well-correlated. The regression coefficient for the FPXRF-Dry dataset is 0.87 and the y-intercept is 8.7. The relatively higher regression coefficient as compared to the FPXRF-Wet dataset indicates that the low bias of the FPXRF-Wet dataset is relatively less-pronounced than the FPXRF-dry dataset, and the y-intercept also shows that this bias is not equally distributed with concentration. The comparison of percent difference to concentration shown in Figure 1-5 illustrates this relationship further. The FPXRF-Dry mercury concentrations are biased slightly low at concentrations of greater than approximately 20 mg/kg. In contrast, FPXRF-Dry mercury concentrations are quite variable and biased high at concentrations of less than 20 mg/kg.

The linear regression and the plot of percent difference versus concentration for the FPXRF-Sieved dataset are shown on figures 1-6 and 1-7 respectively. The r-squared value for the regression is 0.95, which indicates that the data are well-correlated. The regression coefficient of the FPXRF-Sieved dataset is 1.2, which is over one. This indicates that the FPXRF-Sieved data are biased high with respect to the paired laboratory data. The y-intercept value is 2.9 indicates that the bias is less variable with concentration as compared to the FPXRF-Wet and FPXRF-Dry datasets. The plot of percent difference versus concentration (Figure 1-7) illustrates this bias further. At low concentrations, the FPXRF-Sieved data are quite variable and biased high, which is similar to the FPXRF-Wet and FPXRF-Dry datasets. However, in contrast to the FPXRF-Wet and FPXRF-Dry datasets, at concentrations of greater than approximately 20 mg/kg, the FPXRF-Sieved data are biased high. The reason for this high bias is unknown.

Overall, the FPXRF-Wet, FPXRF-Dry, and FPXRF-Sieved data are well-correlated with the laboratory data, and although some bias is present in each of the datasets, the data show that FPXRF is a suitable field screening tool to identify materials with mercury concentrations of over approximately 20 mg/kg. At concentrations lower than approximately 20 mg/kg the correlation between laboratory and FPXRF data is poor, and the percent difference ranges from approximately 100 to over 600 percent. FPXRF is not suitable for field screening of total mercury concentrations of less than approximately 20 mg/kg.

In general, the FPXRF-Dry dataset is less biased than the FPXRF-Wet dataset at mercury concentrations over approximately 20 mg/kg, which shows that it is beneficial for the FPXRF samples to be as dry as possible. Therefore, if FPXRF surveys are planned during the wet season (November through May) or if inclement weather is present, provisions should be made to facilitate field drying of the samples. If FPXRF surveys are conducted during the dry season and in good weather, the simple field preparation method of placing the sample into a plastic sample bag, collecting multiple FPXRF measurements through the sample bag and averaging those measurements will provide a suitable rapid field method to identify source materials or contaminated soil containing elevated mercury concentrations. If field surveys are planned to be conducted using FPXRF during future remedial investigation, pre-design or remedial construction phases, it is recommend that field action levels be developed using the non-parametric statistical method described in *Demonstration of Methods Applicability under a Triad Approach for Site Assessment and Cleanup* (EPA 2008).

2.0 Study Question 2- Evaluation of Sampling and Sample Preparation Procedures for Incremental Sampling

The use of IS provides more reliable and reproducible sampling results and leads to better, more defensible decisions at contaminated sites (ITRC 2014; Envirostat 2007). EPA Region 10 has been implementing IS at numerous CERLA sites in the region to support sound remedial action decisions. Use of IS for future sampling activities at the site has been discussed by the project technical team, and therefore testing and optimization of an IS protocol was incorporated into the DMA study. Two primary issues associated with use of IS were assessed in the DMA analysis:

- Assessment of the required number of increments
- Assessment of site-specific sample preparation protocols

The required number of increments necessary to support IS is often assumed to be 30, which is based on the Central Limit Theorem. However, IS sampling guidance recommends that at least 30 samples be collected from each decision unit, with the number of increments in IS sampling programs generally ranging from 30 to 100 (ITRC 2014). However, collection of as many as 100 increments from each decision unit requires more effort than collection of 30 increments, so it is important to understand if this additional sampling effort is warranted based on the site-specific characteristics of the target populations. Therefore, one component of the DMA analysis focused on this issue.

The second component of the DMA analysis focused on assessment of sample preparation protocol. The IS method generates samples that are generally of relatively large mass (e.g. 1-2 kilograms [kg]). However, standard analysis for mercury under the EPA CLP methodology utilizes only 0.2 (g) of sample for mercury digestion, and standard analyses for samples collected using the IS method commonly includes analysis of 10 g laboratory subsamples (Envirostat 2008). It is necessary to carefully prepare the laboratory subsamples to provide representative subsamples of heterogeneous materials like mining-affected soils and naturally mineralized materials. Sieving, crushing and grinding are often necessary to generate representative subsamples of 0.2 to 10 grams mass for laboratory analysis from a field sample that may weigh 1 kg or more as described in *Guidance for Obtaining Representative Laboratory Analytical Subsamples from Particulate Laboratory Samples* (EPA 2003). However, the heat generated by the crushing and grinding of sample preparation may cause volatilization of mercury, thereby reducing the accuracy of the subsequent laboratory analysis. In addition, analysis of a 10 g mass of sample requires specialized laboratory procedures with associated

higher cost. Therefore, the DMA analysis also incorporated assessment of sample preparation procedures for incremental samples to optimize future IS programs.

2.1 Incremental Sampling: Required Number of Increments

The IS method is designed to facilitate accurate and precise measurement of the average contaminant concentration within a defined decision unit. The IS approach involves collecting numerous samples of equal mass from random points within the decision unit called "increments", and combining the increments into one sample for laboratory analysis. Generally, three incremental samples are collected from the decision unit (i.e. triplicate samples), and the results of chemical analyses of the triplicate incremental samples are averaged. This provides an approach to estimate the average concentration of the contaminant within the decision unit. This is essentially an average of an average, because combining the increments into one sample is a physical average of the increments as long as each sample has equal mass and the samples are subsampled properly prior to chemical analysis. Regardless of the underlying frequency distribution of the target population, the mean of sample means (e.g. the concentration of mercury in triplicate IS samples that have been physically averaged) is a measure of the mean of the target population (Koch and Link 1980).

One advantage of IS is that even if the underlying population is not normally distributed (which is common at abandoned mine sites), the distribution of the means of triplicate IS samples should be normally distributed as long as the number of increments is large enough as described by the Central Limit Theorem (Koch and Link 1980). The required number of increments necessary to ensure that the distribution of means is normally distributed is generally accepted to be at least 30, which is why many IS programs often include collection of 30 increments for each sample. However, in strongly non-normal populations, more than 30 increments may be necessary (ITRC 2014; Envirotech 2007). The DMA data provided a means to assess if 30 increments are sufficient for sampling of decision units established within the two target populations defined in the DMA Study.

2.1.1 Tailings and Mineralized Materials Target Population

Performance of IS for the Tailings and Mineralized Materials (TMM) target population was assessed by collecting triplicate IS samples from a decision unit that encompassed the reported area of the Furnace Creek Tailings, and preparing and analyzing 7 replicate samples from each of the triplicate IS samples. This decision unit was located within an area that was reported to contain tailings based on previous investigations. The perimeter of the decision unit is shown on Figure 1-1.

The TMM decision unit was collocated with the four sample transects completed for the evaluation of FPXRF performance described in Section 1. This provided for assessment of both the incremental sampling data and assessment of the frequency distribution of the underlying target population. This provides an opportunity to understand the underlying population sampled by the IS method, which is information not commonly available in IS data. Figure 2-1 shows normal and lognormal probability plots of this data, and shows that the underlying population of TMM within the IS decision unit is positively skewed with many samples exhibiting total mercury concentrations of less than 50 to 100 milligrams per kilogram (mg/kg) and a small number of samples exhibiting high total mercury concentration of up 543 mg/kg. The probability distribution of the TMM target population is better represented by the lognormal frequency distribution. This demonstrates that if a sufficient number of individual point samples (i.e. grab samples) were collected from the TMM decision unit, the frequency distribution of the underlying population could be assessed and the central tendency of the data could be represented by an appropriate estimator such as the geometric mean. However, if only a few point

samples were collected, any estimate of the central tendency of the data would be tenuous. It would be likely that estimation of the population mean based on a few point samples would result in underestimation of the mercury content of the target population, because there would be a higher probability that grab samples with low mercury concentrations would be collected because the population is positively skewed.

Based on the Central Limit Theorem, even though the TMM target population is not normally distributed, the mean of the sample means (e.g. the concentration of mercury in triplicate IS samples that have been physically averaged) would be expected to be normally distributed as long as enough increments were collected. Figure 2-2 shows probability plots of total mercury data from 6 replicate splits created from each of the three incremental samples collected from the TMM decision unit (n=18). The probability plots include total mercury analyses completed by a CLP laboratory using 0.2 g sample aliquots, and mercury analyses conducted by Manchester Environmental Lab (MEL) using a 10 g sample aliquots. The differences between the data provided by these two types of analyses will be discussed in a later section, but analysis of the probability distribution of this data provides information that can be used to asses if 30 increments are sufficient for IS programs conducted in tailings and mineralized materials. Analysis of the probability plots indicate that the lognormal distribution better represents the data as compared to the normal distribution, particularly in the case of the data set analyzed by MEL using 10 g aliquots.

However, comparison of the probability plots shown in Figure 2-2 with the probability plots for the replicate splits from the incremental samples shown in Figure 2-1 demonstrates that cumulative frequency distribution of the replicate splits from the incremental samples is significantly less skewed than the underlying population as predicted by the Central Limit Theorem. However, use of 30 increments in the IS program was not sufficient to result in a normal distribution of the means, which indicates that more than 30 increments should be collected during future IS programs.

2.1.2 General Site Soils Target Population

The IS method was also used to evaluate the second target population. Seven replicate splits were prepared from each of three 30-point incremental samples collected from a decision unit established within the GSS target population. A probability plot for the replicate splits is shown in Figure 2-3. Initial examination of this target population shows that the total mercury concentrations are much lower than mercury concentrations in the tailings and mineralized materials target population, which supports definition of general site soils as a separate target population. Analysis of the probability plots show that the lognormal distribution represents the target population relatively better than the normal population. Data from individual samples collected from the general site soils target population are not available. Therefore, comparison of the cumulative frequency distribution of the underlying target population for the general site soils cannot be conducted as was evaluated above for the tailings and mineralized materials target population. However, because the distribution of the replicate splits of the triplicate IS samples is not normally distributed, it can be concluded that future incremental sampling of the GSS target population should include more than 30 increments.

2.1.3 Conclusions of Assessment of Required Number of Increments

Use of IS data for estimation of the average mercury concentration of the decision units would provide for better characterization of the material. In particular, given the strongly non-normal distribution of the underlying data for the TMM target population, use of a small number of discrete point samples (or "grab" samples) to characterize the average concentration of these materials would be likely to cause errors, because the probability of collecting a low concentration "grab" sample is higher than

collecting a high concentration sample. For example, based on the probability plots shown in Figure 2-1, there would be a 50% probability of collecting a "grab" sample with a total mercury concentration of less than 29 mg/kg from the decision unit. In contrast, the average mercury concentration of the decision unit is 176 mg/kg based on the arithmetic mean 18 MEL analyses of 10 g sample IS aliquots and 148 mg/kg based on the arithmetic mean of 18 CLP analyses of 0.2 gram IS aliquots. This demonstrates the importance of utilizing a sampling method such as IS, which has a higher probability of identifying "hot spots" within the decision unit (Envirostat 2007). The use of a small quantity of "grab" samples to characterize this population would be likely to underestimate the average concentration of the decision unit.

In the case of both the TMM and GSS target populations, the replicate data from the incremental samples is not normally distributed. This is most evident in the data from replicate samples of the TMM target population analyzed by MEL using 10 g aliquots. However, use of 30-point incremental samples to characterize average concentrations of these materials would provide better data for decision-making purposes as compared to use of a small number of "grab" samples. It would be helpful to increase the number of increments within each incremental sample to facilitate a normal distribution of the IS sampling data, which would provide for more accurate estimation of the average concentration of the decision unit. Therefore, it is recommended that future IS programs at the site include a minimum of 60 increments per sample.

2.2 Assessment of Site-Specific Sample Preparation Protocols

2.2.1 Background

All incremental samples were sieved to 100 percent passing a 1.5 millimeter sieve (-1.5 mm) prior to generating probabilistic splits of the samples to create replicate laboratory subsamples. Selection of a 1.5 mm sieve size was based on evaluation of the fundamental sampling error using a simplified method described by Envirostat (2008). The fundamental error is a concept developed by Pierre Gy (1982) and described in *Guidance for Obtaining Representative Laboratory Analytical Subsamples from Particulate Laboratory Samples* (EPA 2003). It is the minimum sampling error that can be achieved with a given laboratory subsampling process, and is dependent only on inherent constitutional heterogeneity of the sample—not the field sampling or subsampling process. The fundamental error cannot be reduced through homogenization of the field sample prior to splitting, and is dependent on the particle size, subsample size and other inherent characteristics of the particles that make up the sample.

The simplified estimate of the relative standard deviation of the fundamental error can be expressed as follows (Envirostat 2007):

$$\sigma FE = \sqrt{\frac{20d^3}{m}}$$

Where:

σFE = Relative standard deviation of the fundamental error

d = the maximum particle size (centimeters [cm])

m = mass of the sample (g)

The constant value 20 is a generalized estimate of the sampling constant, which is dependent on inherent characteristics of particles in the sample including the mineralogical factor, the liberation factor, the shape factor, and the granulametric factor. Generally, a relative standard deviation of the fundamental error (σFE) of 15 percent is considered acceptable for granular media such as soils or mine tailings (Pitard 1993). Assuming a sample mass of 10 g, a particle size diameter of 1.5 mm and the simplified equation described above, the estimated σFE is approximately 8 percent. Considering a sample mass of only 0.2 g, as utilized in the standard CLP mercury analysis, the estimated relative standard deviation of the fundamental error increases to 58 percent.

The assumed sampling constant value of 20 in the equation described above is a simplification that is adequate for sampling of many soils (Envirostat 2007). This constant assumes an average density for soil, and it assumes that the constituent of concern is not liberated the TMM target population, which may contain particles of cinnabar or metacinnabar (HgS), these assumptions are tenuous.

The following equation more fully describes estimation of σFE (EPA 2003; Pitard 1993):

$$\sigma FE = \sqrt{\left(\frac{1}{M_S} - \frac{1}{M_L}\right) cflgd^3}$$

Were:

σFE = Relative standard deviation of the fundamental error

M_S = Mass of the sample (g)

M_L = Mass of the lot (g)

c =mineralogical factor (g/cm^3)

l =liberation factor (dimensionless number between 0 and 1)

g =granulametric factor (a dimensionless particle size range factor)

d= the maximum particle size (cm)

Details regarding estimation of σFE are provided in *Guidance for Obtaining Representative Laboratory Analytical Subsamples from Particulate Laboratory Samples* (EPA 2003); however, this equation is presented here to illustrate several factors:

- If particles containing the constituent of concern (e.g. cinnabar) are liberated (i.e. a higher liberation factor), the estimated value of the σFE increases
- If the mineralogical factor increases, the estimated value of the σ^2FE increases

For the TMM target population, it is likely that cinnabar and/or metacinnabar may be liberated from the soil particles. During mineral processing at the Black Butte Mine, the cinnabar ore was crushed specifically to liberate and/or expose cinnabar so it would be efficiently volatilized during roasting in the furnaces. Although this process volatilized cinnabar, the efficiency of the process was not 100 percent and cinnabar and/or metacinnabar may be present in the mine tailings. Therefore, a

liberation factor of 1 should be assumed to be conservative, which would increase the estimated σFE as compared to use of the simplified expression.

For environmental samples containing trace concentrations of contaminants, the mineralogical factor is estimated by:

$$c = \frac{\gamma_M}{a_L}$$

Where:

γ_M = Density of particles containing the contaminant (g/cm^3)

a_L = Decimal proportion of contaminant in the sample

The density of cinnabar is 8.2 g/cm^3, which is higher than common soil particles with a density of approximately 2.6 g/cm^3. Therefore, the mineralogical factor for mercury contained in cinnabar is higher than the assumed value used in the simplified equation.

Accordingly, the relative standard deviation of the fundamental error was estimated using the following data:

- A liberation factor of 1
- A concentration of mercury in the sample of 176 mg/kg, which is the mean of mercury concentrations from replicate splits of incremental samples collected from the tailings and mineralized materials target population during the DMA based on 10g MEL analyses
- A density of the particles containing mercury of 8.2 g/cm^3

The details of this calculation are shown in Attachment B.

Using the detailed equation for estimation of σFE and the more conservative assumptions described above, the estimated value of σFE is 215 percent for the Tailings and Mineralized Materials target population based on the sample preparation protocol utilized in the DMA followed by analysis of a 10 g sample aliquot. The estimated σFE increases to over 1,000 percent for analysis of a 0.2 g sample aliquot. This shows that for the tailings and mineralized materials target population, the DMA sample preparation procedure of sieving to -1.5mm followed by splitting to either 10 g or 0.2 g sample aliquot for analysis may create significant error. Given the strongly non-normal, positively skewed frequency distribution of the Tailings and Mineralized Materials target population discussed in the previous section, splitting the sample to 10 g or 1.5 g sample aliquots prior to additional particle size reduction would be likely to cause underestimation of the mercury concentration of the samples, because, given the positively skewed distribution of the underlying target population, is more likely that sample particles containing relatively lower mercury concentrations would be selected when a 10 g or 0.2 g subsample is split from the sieved sample.

2.2.2 Analysis of DMA Data for Replicate Splits Sieved to -1.5 mm

The DMA included collection of triplicate incremental samples from the two target populations: TMM and GSS. Three (triplicate) incremental samples were collected from each decision unit. These samples were then prepared in the CDM Smith Sample Preparation Laboratory by sieving the samples to -1.5 mm and splitting the samples into representative sample aliquots. Seven replicate splits were

prepared for each incremental sample. These samples were submitted to a CLP laboratory for analysis using 0.2 g sample aliquots. Additional replicate splits of larger mass (10 g) were prepared from each of the three incremental samples collected from the Tailings and Mineralized Materials Target Population to provide for investigation of the effects of analyzing 10 g versus 0.2 sample aliquots. The sample splitting protocol is illustrated in Figures 2-4 and 2-5. The DMA data from the TMM target population will be discussed first, followed by discussion of the DMA data from the GSS target population.

The mercury concentrations of replicate splits from the Tailings and Mineralized Materials target population are shown in Table 1. The probability plot for these samples was shown previously in Figure 2-2. Several features of the two data sets are evident on Figure 2-2. The data from the 10g mercury analyses exhibit a wider range of values along with a relatively higher median value. Summary statistics of the replicate sample data set are shown in Table 2.

Table 2 Summary Statistics of Replicate Data Set

Summary Statistics of Replicate Data Set							
	Units	TMM1		TMM2		TMM3	
		0.2 g Aliquot	10 g Aliquot	0.2 g Aliquot	10 g Aliquot	0.2 g Aliquot	10 g Aliquot
Arithmetic Mean	mg/kg	139.9	224.2	153.7	171.8	149.9	131.3
Geometric Mean	mg/kg	136.2	216.6	151.8	163.8	146.7	124.3
Median	mg/kg	137	221	155	149.5	149	118.6
Kurtosis	--	-1.70	-0.12	3.1	-0.30	-0.35	1.18
Standard Deviation	--	34.0	64.2	27.3	60.8	33.2	49.9
Relative Standard Deviation	%	24	29	18	35	22	38
Skewness	--	-0.26	0.52	1.54	1.0	0.17	1.23
Range	mg/kg	84.4	178	81	150	99	130.4
Minimum	mg/kg	91.6	147	128	121	103	88.6
Maximum	mg/kg	176	325	209	271	202	219
Number of Replicates	--	7	6	7	6	7	6

The data show a fairly wide range in reported mercury concentrations. The minimum and maximum values of the 0.2 g replicate samples were 91.6 mg/kg and 209 mg/kg. For the 10 g analyses, the range in concentrations is even wider with minimum and maximum values of 88.6 and 325 mg/kg respectively. Based on the standard approach to analysis of IS data, the reported laboratory concentrations of subsamples prepared from each of the three incremental samples would be averaged to estimate the concentration of the decision unit. Given the wide range in reported concentrations from the replicate splits of the incremental samples, this approach could cause significant error in estimating mercury concentrations of decision units within the TMM target population. This wide range in reported concentrations of the replicate samples is thought to be

related to the high σFE estimated above based on guidance presented in *Guidance for Obtaining Representative Laboratory Analytical Subsamples from Particulate Laboratory Samples* (EPA 2003).

The parried 0.2g and 10g laboratory data were compared in a scatter plot to evaluate if there is obvious high or low bias in either the 0.2 g or 10 g sample data. This scatter plot is shown as Figure 2-6. The scatter plot shows that there is essentially no correlation between the 0.2 g and 10 g sample data, which suggests that the difference in the 0.2 versus 10 g data sets is not related to a high or low bias of the laboratory analyses. The 10 g data exhibit a wider range of concentrations and a higher maximum concentration. Based on the strongly non-normal, positively skewed frequency distribution of the TMM target population, sample particles of relatively lower concentration would be more likely to be selected during splitting of a 0.2 g sample aliquot. This is attributed to the higher likelihood that relatively infrequent cinnabar or metacinnabar particles with high mercury concentrations would be included in a 10 g sample aliquot compared to the a 0.2 g sample aliquot. Therefore, the 10g data set is thought to be relatively more representative than the 0.2 g dataset.

The mercury concentrations from replicate splits of the GSS target population are shown in the following table. In general, mercury concentrations in all samples were quite low, will all total mercury concentrations lower than 15.6 mg/kg. A probability plot of the combined total mercury data from all replicates was shown previously in Figure 2-3. Table 3 provides summary statistics of the data from the three incremental samples.

Table 3 Summary Statistics for Incremental Samples

Summary Statistics for Incremental Samples				
	Units	**GSS1**	**GSS2**	**GSS3**
Arithmetic Mean	mg/kg	12.2	11.8	10.9
Geometric Mean	mg/kg	12.1	11.6	10.8
Median	mg/kg	13.2	11.8	10.0
Kurtosis	--	2.2	1.4	3.7
Standard Deviation	--	1.9	2.2	1.9
Relative Standard Deviation	%	16	19	17
Skewness	--	-0.36	0.48	1.9
Range	mg/kg	4.5	7.1	5.5
Minimum	mg/kg	9.8	8.5	9.4
Maximum	mg/kg	14.3	15.6	14.9
Number of Replicates	--	7	7	7

Overall, the summary statistics from each set of replicate samples is very similar, with the arithmetic and geometric mean of the sample data ranging only over a few tenths of a unit. Based on discussion presented in the previous section, the estimated σFE is 58 percent for the General Site Soil target population. However, the relative standard deviation of the replicate data is relatively low, ranging from 16 to 19 percent, which suggests that the assumptions inherent in estimation of σFE for the GSS target population may have overestimated the σFE.

2.2.3 Recommend Sample Preparation Protocol for Future Incremental Samples

A sampling nomograph is included in Attachment B. It was constructed based on the DMA data for the TMM target population to develop a sample preparation protocol that would provide an acceptable σFE of less than 15 percent in accordance with guidelines presented in *Guidance for Obtaining Representative Laboratory Analytical Subsamples from Particulate Laboratory Samples* (EPA 2003). The sampling nomograph is a two-dimensional representation of the relationship between the relative variance of the fundamental error (σ^2FE), the sample mass, and the particle size diameter. The nomograph allows graphical analysis of various sample preparation protocols to facilitate identification of a protocol that will maintain the σFE to less than the 15 percent goal. The sampling nomograph displays the recommended crushing and grinding steps that would achieve the 15 percent σFE goal.

For preparation and analysis of 10 g sample aliquots, these crushing and grinding steps include the following:

- Sieve the entire sample to -1.5 mm
- Crush the entire sample to -60 mesh
- Split the sample to a aliquot of 10 g mass

Sample preparation for the GSS target population is simpler, because the samples are less likely to contain significant cinnabar or metacinnabar. The GSS decision unit assessed in the DMA study exhibited low total mercury concentrations and the variability of the replicate data is relatively low. However, when sampling in the field, it will not be known whether the GSS target population contains liberated particles of cinnabar or metacinnabar. Therefore, the sample preparation protocol defined for the TMM target population is also recommend for the GSS target population. This will be conservative for the GSS target population, but it will reduce the likelihood that the total mercury concentration of the decision unit would be underestimated as a result of splitting of sample aliquots for analysis prior to adequate particle size reduction.

3.0 References

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Table 1
DMA Analysis of FPXRF Performance: Tailings and Mine Materials Target Population
Laboratory and FPXRF Mercury Concentrations

Sample Date	Sample ID	Lithology	Laboratory		XRF Dry		XRF Wet		XRF Sieved		Percent Difference		
			Result	Q	Result	Q	Result	Q	Result	Q	Lab vs XRF Dry	Lab vs XRF Wet	Lab vs XRF Sieved
2/12/2014	0214BB-SO1-00	Tailings (cover?): Sandy gravel, reddish-brown	1.8		12	U	13		15		nc	622%	733%
2/11/2014	0214BB-SO2-00	Furnace Creek Soil: Silty clay with gravel, orange-brown	118		119		96		122		1%	-19%	3%
2/11/2014	0214BB-SO3-00	Furnace Creek Soil: Silt with clay and gravel, brown, local tailings particles	9.8		9.3		7		15		-5%	-29%	53%
2/11/2014	0214BB-SO4-00	Soil: Sandy silt with gravel, brown	22.4		20		18		25		-11%	-20%	12%
2/11/2014	0214BB-SO5-00	Furnace Creek soil Soil: Silty sand with gravel, brown	8		14		9.5		19		75%	19%	138%
2/11/2014	0214BB-SO6-00	Tailings (cover?): gravel with sand, red-brown (may be reclamation cover materials)	2.5		7		8.5		16		180%	240%	540%
2/11/2014	0214BB-SO7-00	Furnace Creek Soil: Sandy silt with gravel, yellow-brown	28.5		32		23		40		12%	-19%	40%
2/11/2014	0214BB-SO8-00	Furnace Creek Soil: Silt, yellow-brown	3.7		6	U	8		8		nc	116%	116%
2/11/2014	0214BB-SO9-00	Furnace Creek Soil: Sandy silt with gravel, yellow-brown	52		32		7		42		-38%	-87%	-19%
2/11/2014	0214BB-SO10-00	Tailings? (furnace): Gravelly sand, red-brown	130		101		85.3		186		-22%	-34%	43%
2/11/2014	0214BB-SO11-00	Tailings (furnace): Sandy gravel, red-brown	265		306		237		341		15%	-11%	29%

Sample Date	Sample ID	Lithology	Laboratory		XRF Dry		XRF Wet		XRF Sieved		Percent Difference		
			Result	Q	Result	Q	Result	Q	Result	Q	Lab vs XRF Dry	Lab vs XRF Wet	Lab vs XRF Sieved
2/11/2014	0214BB-SO12-00	Furnace Creek Soil: silt with gravel, yellow-brown, local tailings particles	55.5		65		59		65		17%	6%	17%
2/11/2014	0214BB-SO13-00	Soil:Sandy silt with gravel, yellow-brown	56.1		52		36		47		-7%	-36%	-16%
2/11/2014	0214BB-SO14-00	Furnace Creek Soil: Sandy silt with gravel, brown	192		171		134		179		-11%	-30%	-7%
2/11/2014	0214BB-SO15-00	Furnace Creek Soil: Silty sand, brown	138		185		157		193		34%	14%	40%
2/11/2014	0214BB-SO16-00	Tailings (furnace): Sandy-gravel, red-brown	526		425		421		600		-19%	-20%	14%
2/11/2014	0214BB-SO17-00	Tailings (furnace): Sandy-gravel, red-brown	543		507		379		687		-7%	-30%	27%
2/11/2014	0214BB-SO18-00	Tailings: (furnace) Sandy-gravel, red-brown	401		429		372		661		7%	-7%	65%
2/11/2014	0214BB-SO20-00	Furnace Creek Soil: Silty-sand with gravel, oragne-brown	39.8		43		121		42		8%	204%	6%
2/12/2014	0214BB-SO21-00	Waste Dump: Sandy gravel, pink-brown	325		178		191		260		-45%	-41%	-20%
2/12/2014	0214BB-SO22-00	Waste dump: sandy gravel, beige	77.9		93.3		68		83		20%	-13%	7%
2/12/2014	0214BB-SO23-00	Waste Dump: Sandy gravel, brown to beige to red-brown	3		14		18		12		367%	500%	300%
2/12/2014	0214BB-SO24-00	Waste dump: Sandy gravel, beige to brown	140		104		87		208		-26%	-38%	49%
2/12/2014	0214BB-SO25-00	Tailings (main): Sandy gravel, pink	3.2		20		17		26		525%	431%	713%
2/12/2014	0214BB-SO26-00	Tailings (main): Sandy gravel, pink	7.1		12		7	U	26		69%	nc	266%

Sample Date	Sample ID	Lithology	Laboratory		XRF Dry		XRF Wet		XRF Sieved		Percent Difference		
			Result	Q	Result	Q	Result	Q	Result	Q	Lab vs XRF Dry	Lab vs XRF Wet	Lab vs XRF Sieved
2/12/2014	0214BB-SO27-00	Tailings (main): Sandy gravel, pink	5		12		10		19		140%	100%	280%
2/12/2014	0214BB-SO28-00	Tailings (main): Sandy gravel, pink	21.8		35		27		30		61%	24%	38%
2/12/2014	0214BB-SO29-00	Tailings (main) and soil: sandy gravel, brown to pink	1.4		11		8.5	U	13		686%	nc	829%
2/12/2014	0214BB-SO30-00	Tailings (main) and soil: sandy gravel, brown to pink	13.2		19		13		19		44%	-2%	44%

Notes: U qualified values are less than the detection level
% = percent

Figure 1-1

Black Butte Mine
Sampling Location Map

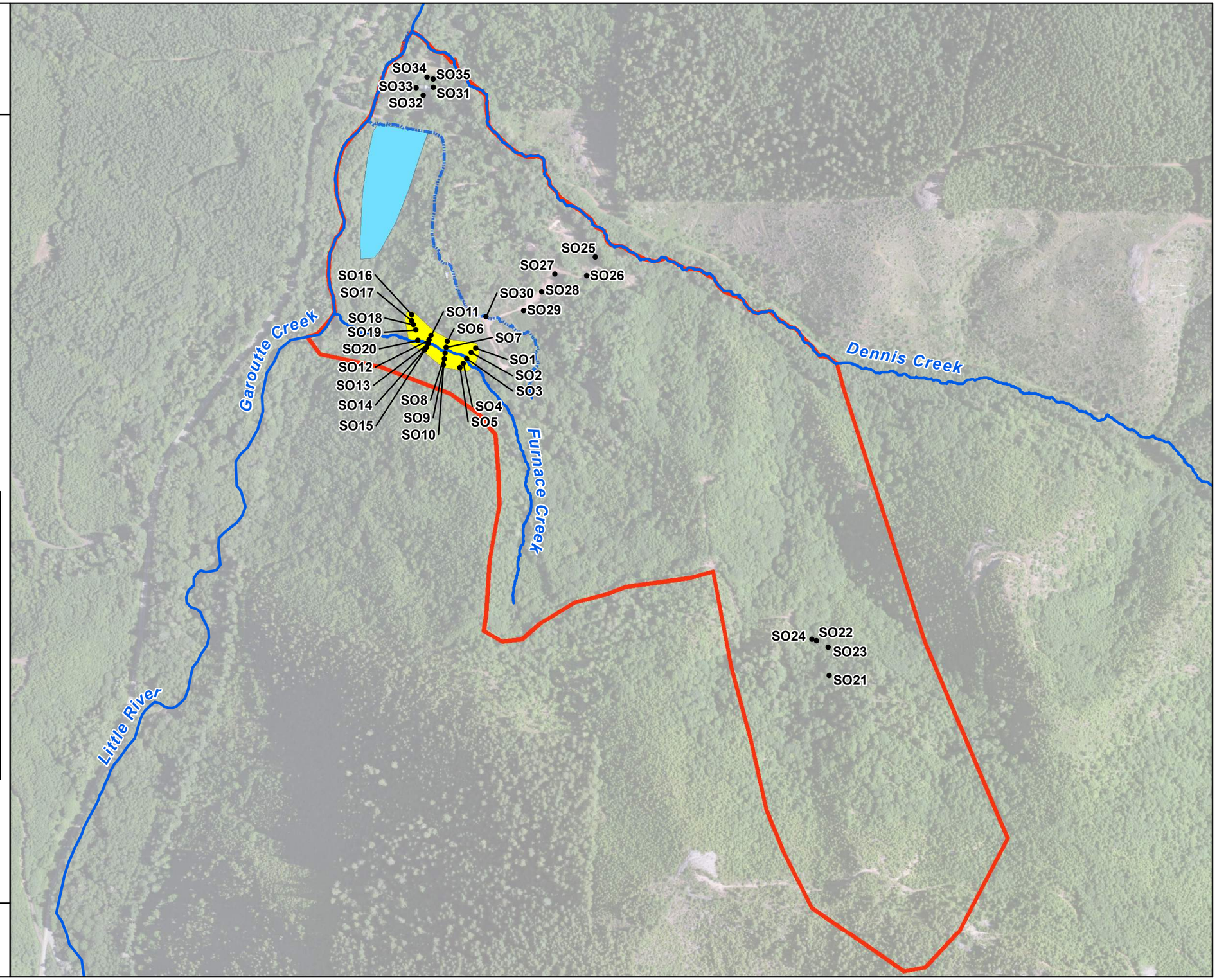
Legend

- Location of Discrete Point Samples
- Creek/Stream/Drainage
- Intermittent Creek/Stream/Drainage
- General Site Soils Incremental Sampling Decision Unit
- Tailings and Mineralized Materials Incremental Sampling Decision Unit
- OU1 Boundary

N

0 250 500 1,000
Feet
1 inch = 500 feet

CDM Smith



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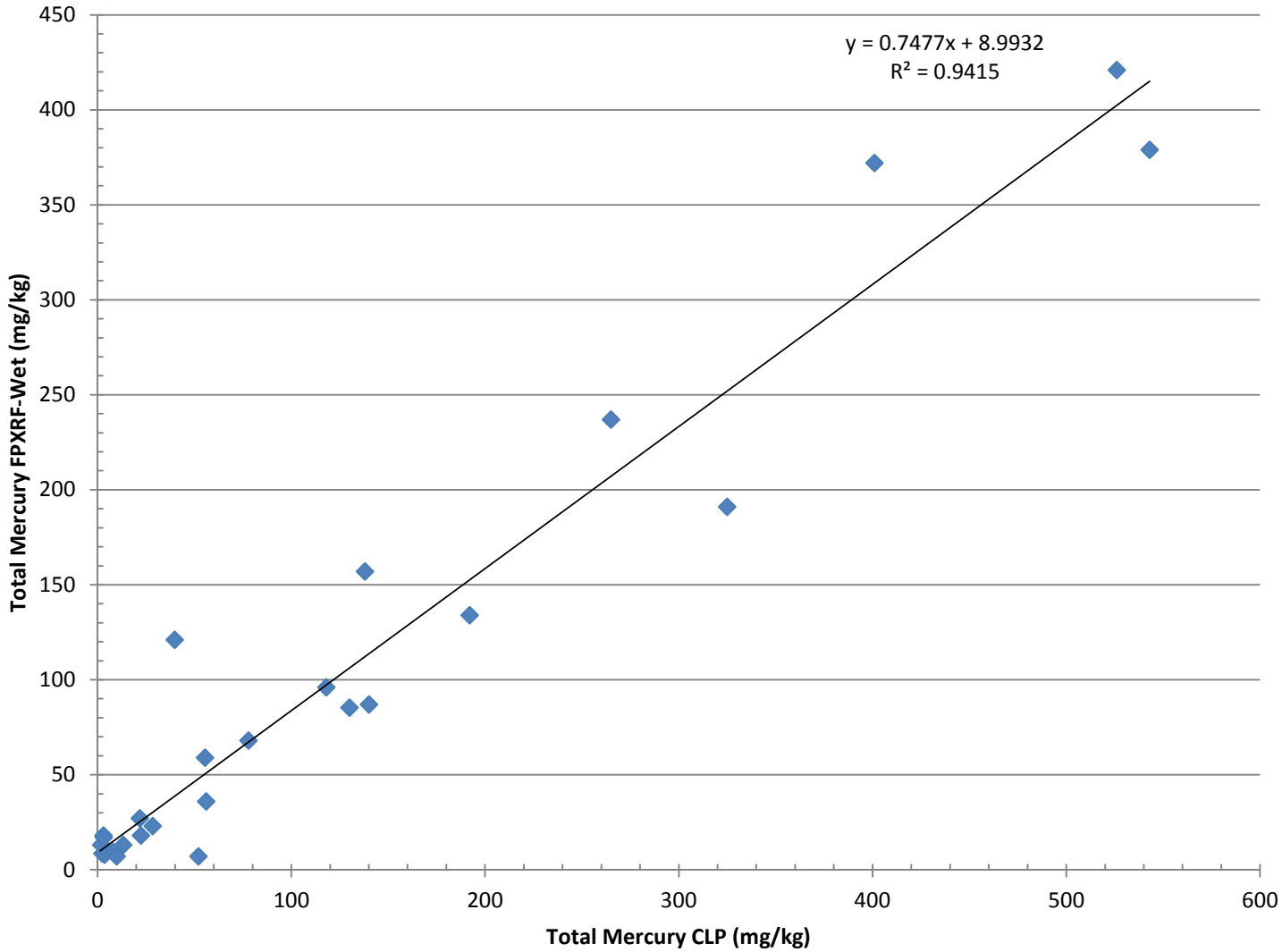


Figure 1-2. Linear regression of paired CLP total mercury data and FPXRF-Wet dataset.

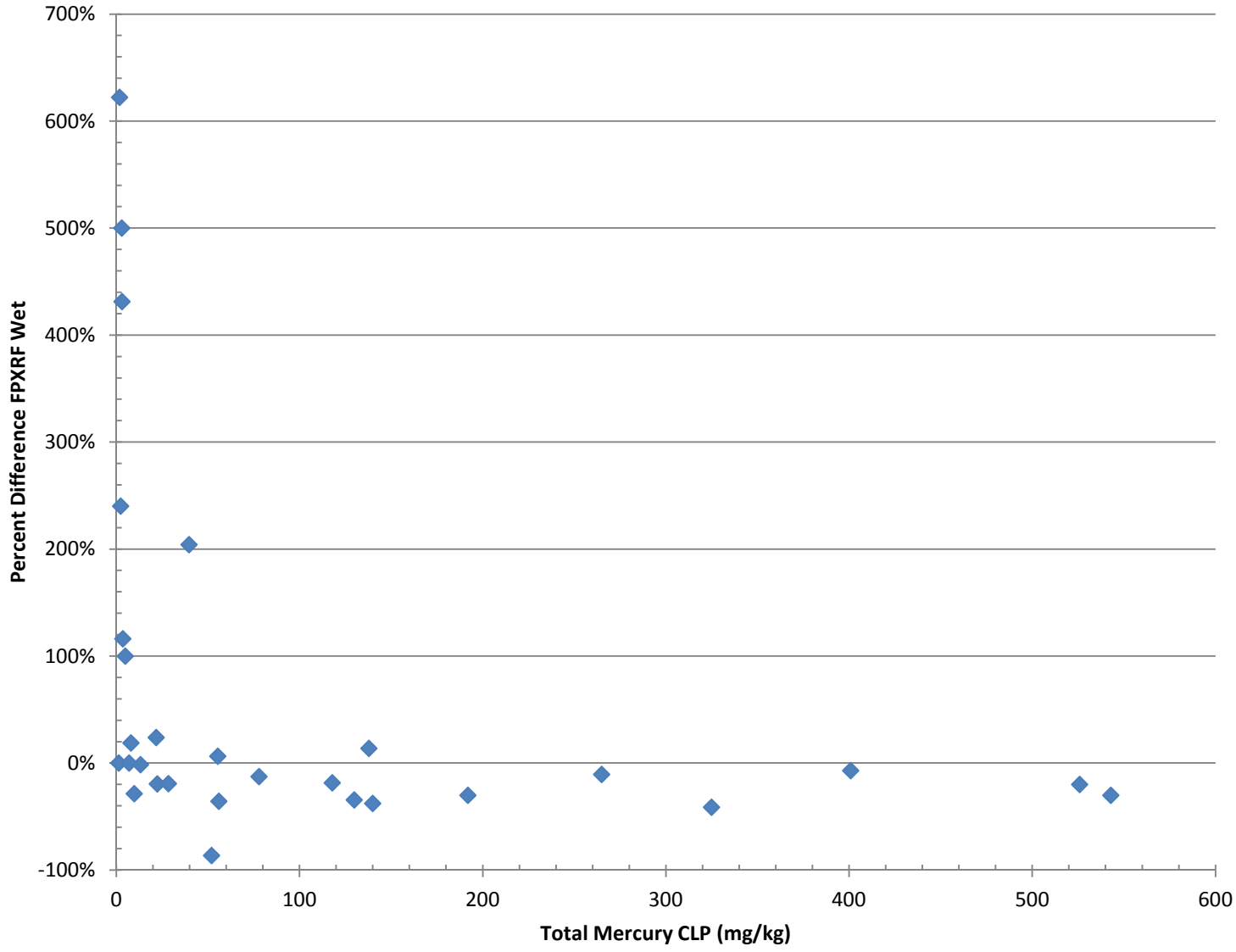


Figure 1-3. Comparison of percent difference to CLP laboratory mercury concentrations for FPXRF-Wet dataset.

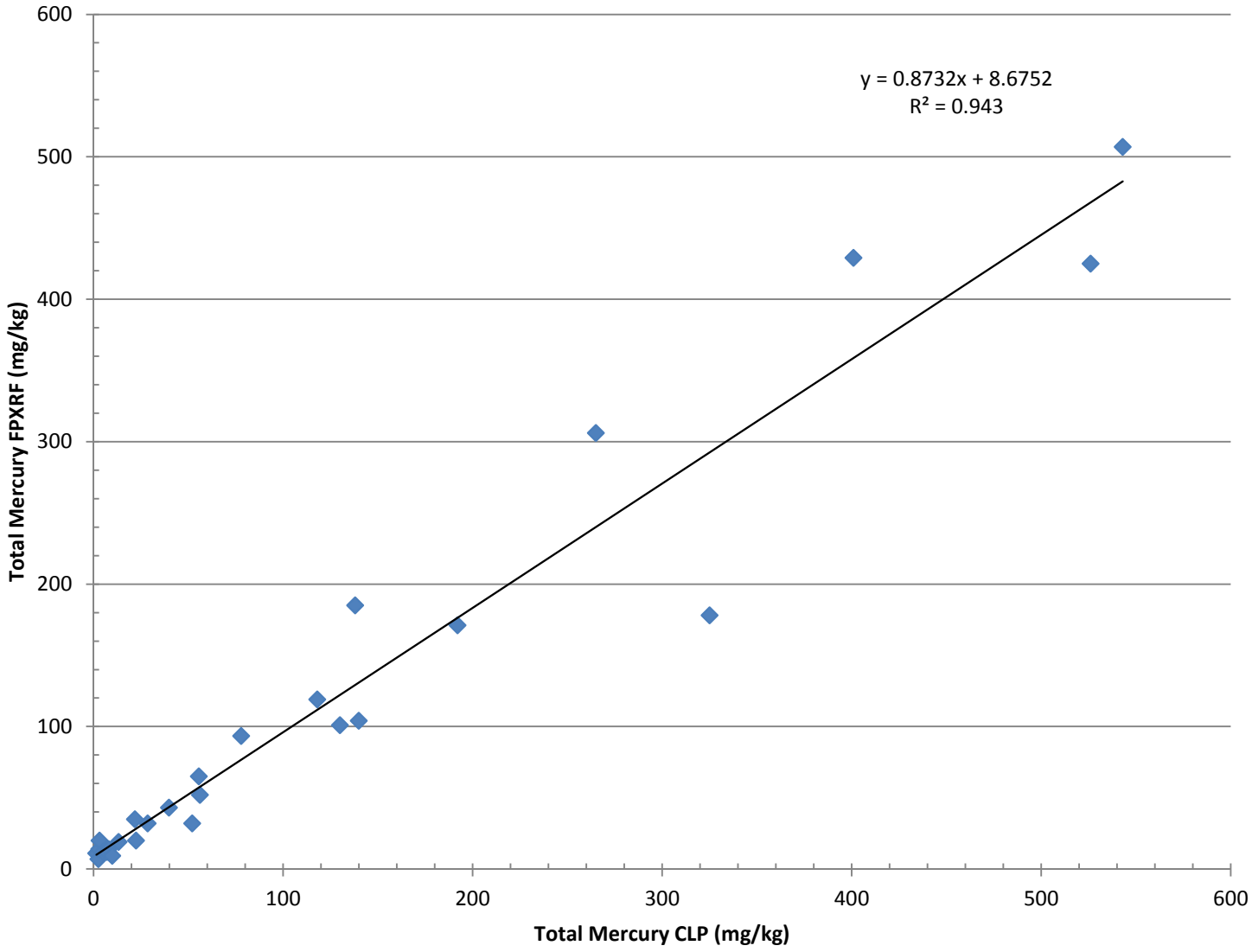


Figure 1-4. Linear regression of paired CLP total mercury data and FPXRF-Dry dataset.

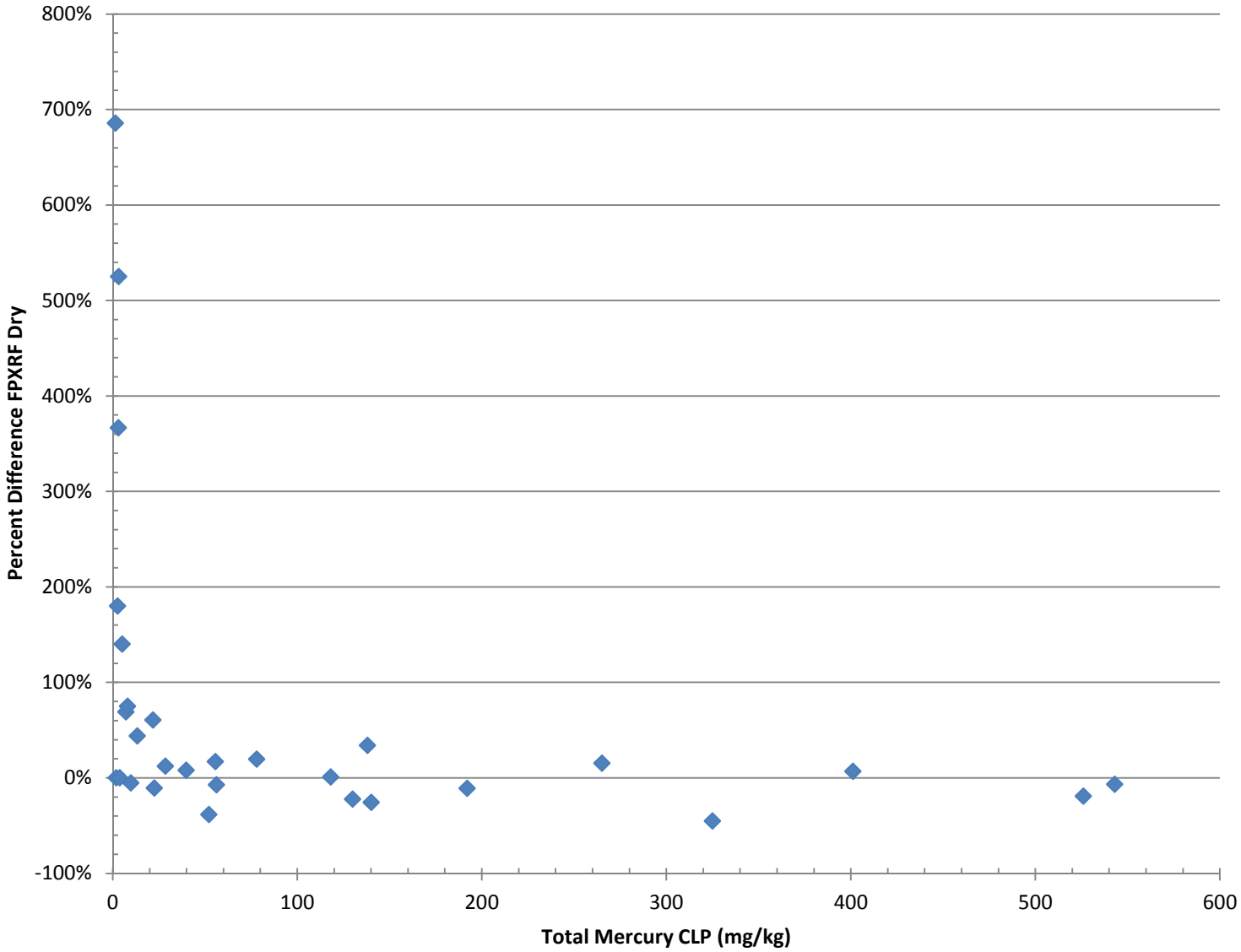


Figure 1-5. Comparison of percent difference to CLP laboratory mercury concentrations for FPXRF-Dry dataset.

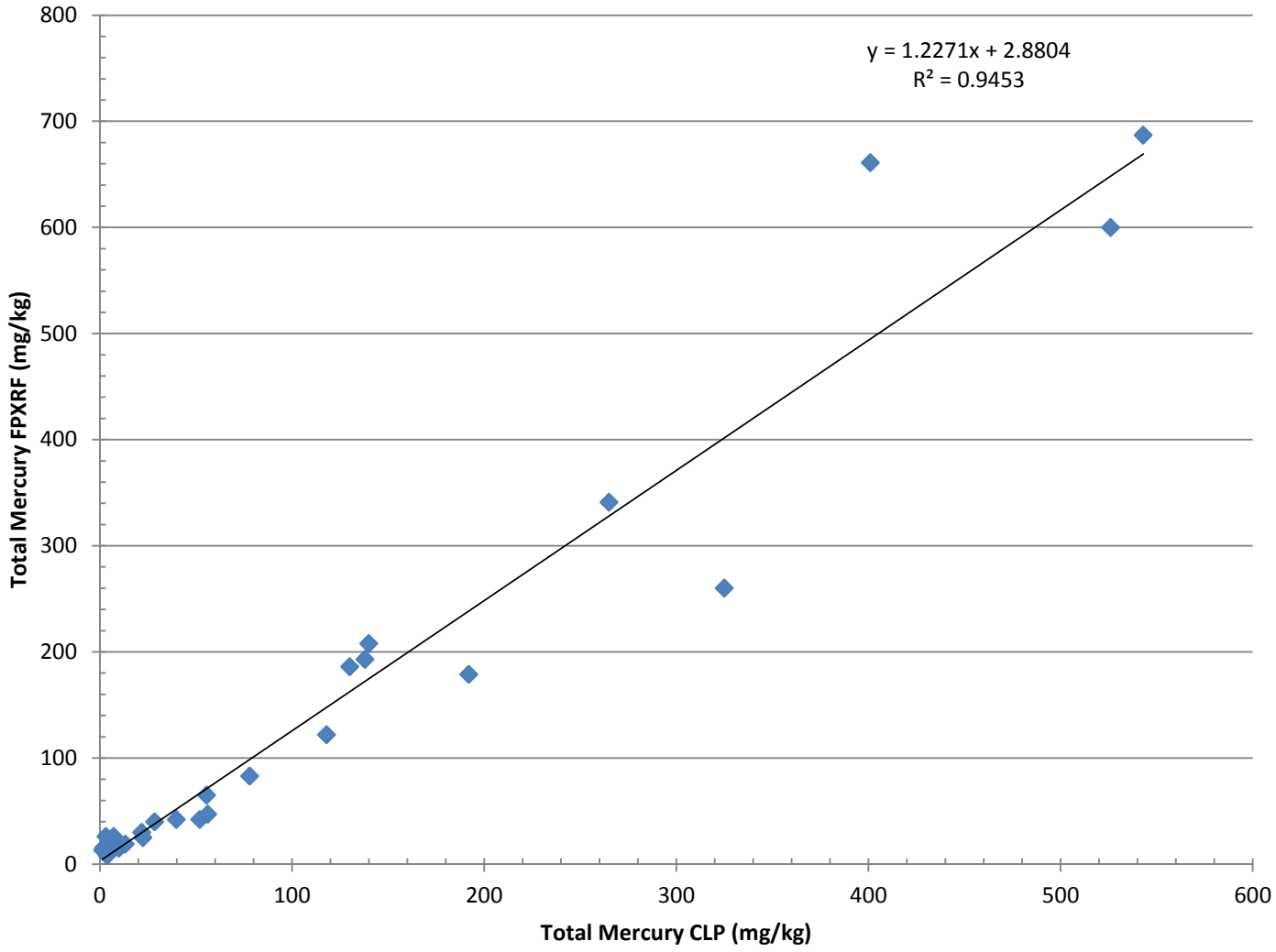


Figure 1-6. Linear regression of paired CLP total mercury data and FPXRF-Sieved dataset.

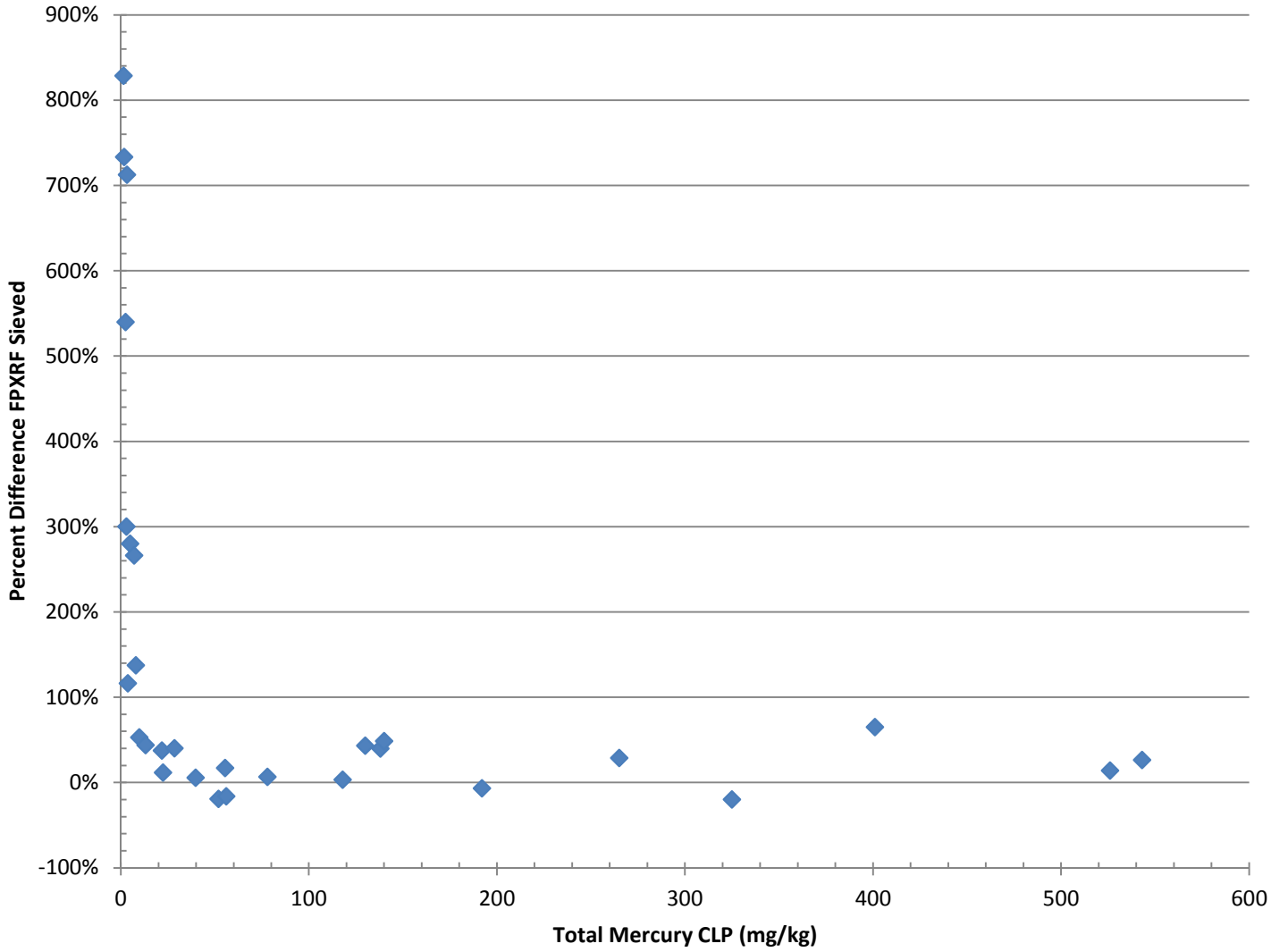
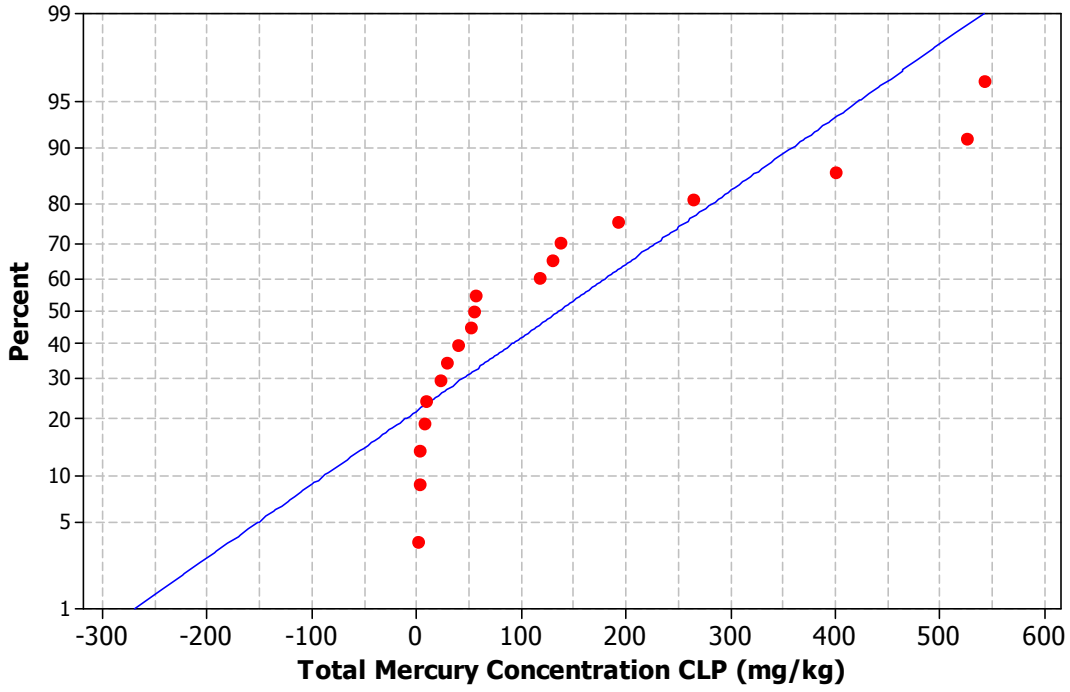


Figure 1-7. Comparison of percent difference to CLP laboratory mercury concentrations for FPXRF-Sieved dataset



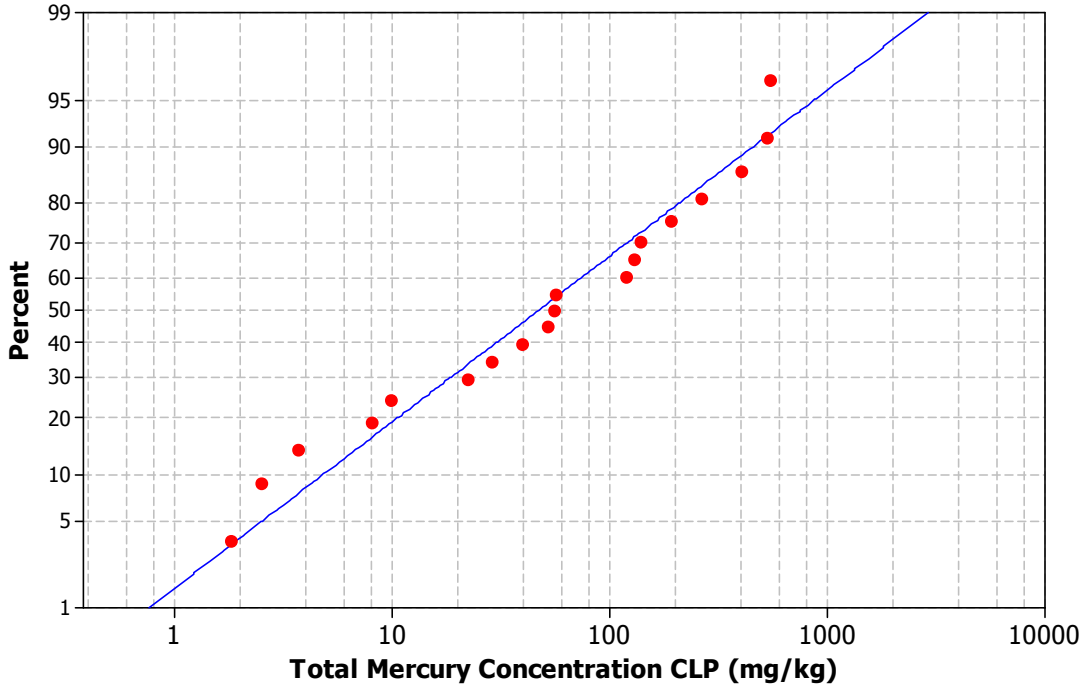


Figure 2-1. Normal and lognormal probability plots of individual grab samples collected from the Furnace Creek Decision Unit (n=19).

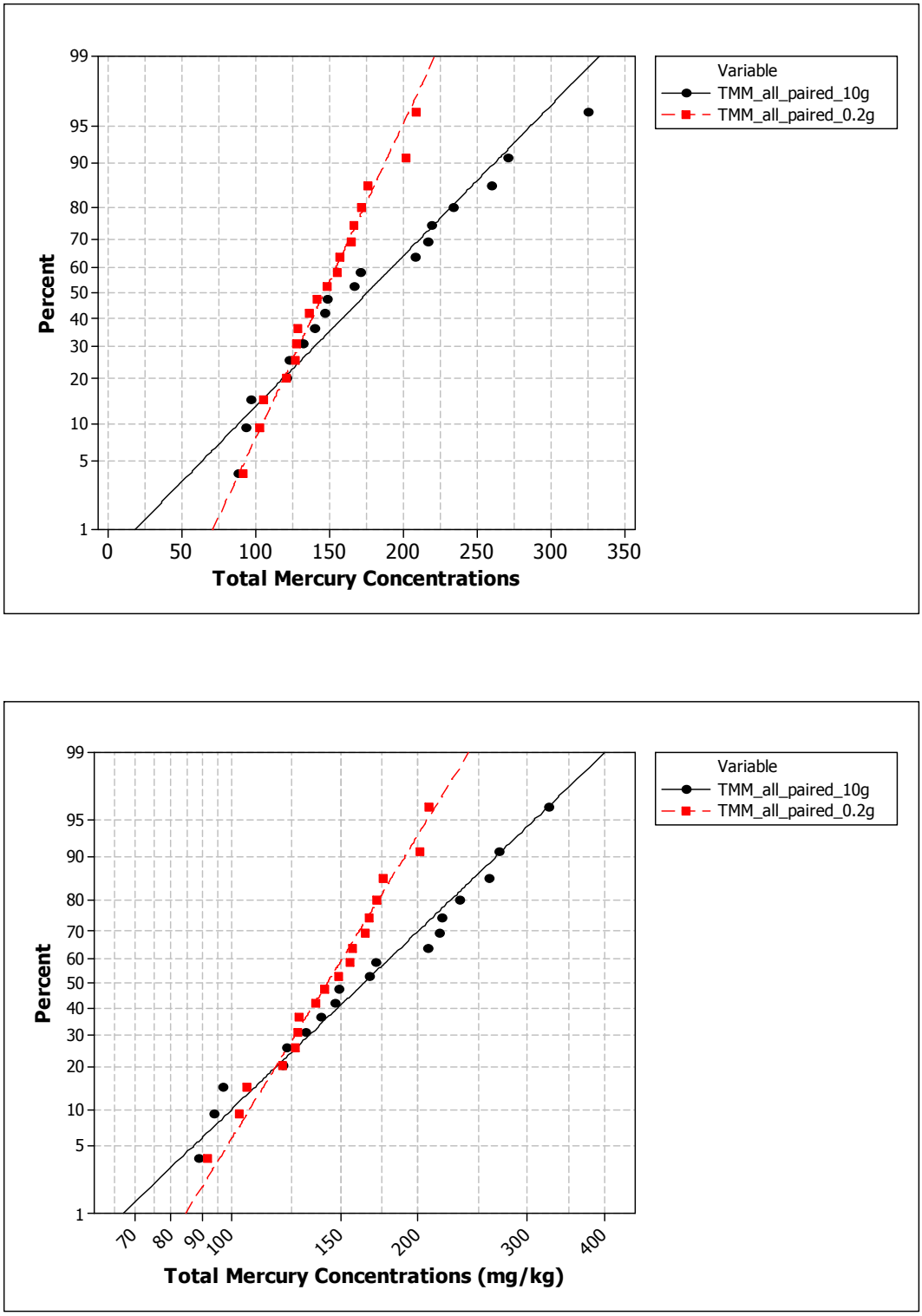
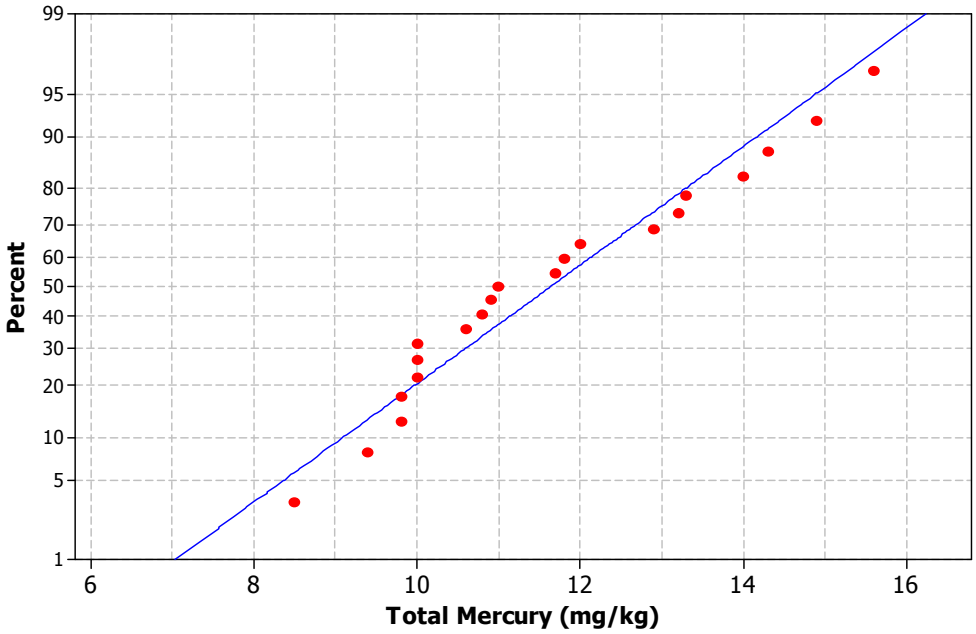


Figure 2-2. Normal and lognormal probability plots of 6 replicate splits produced from three incremental samples collected within a decision unit established within the Tailings and Mineralized Materials target population (18 samples total)



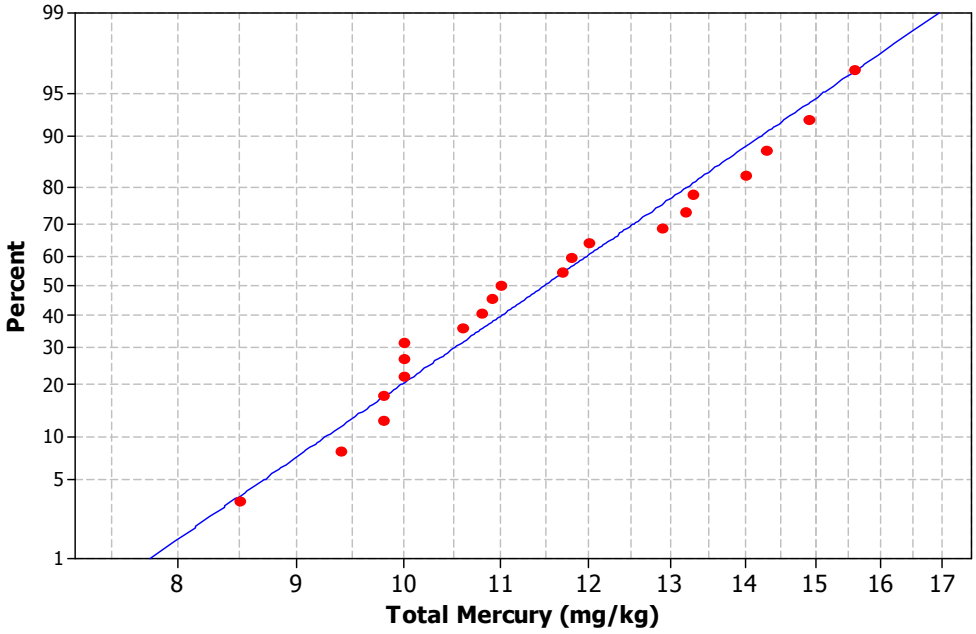


Figure 2-3. Probability plots of 7 replicate splits produced from three incremental samples collected within a decision unit established within the General Site Soils target population (21 samples total)

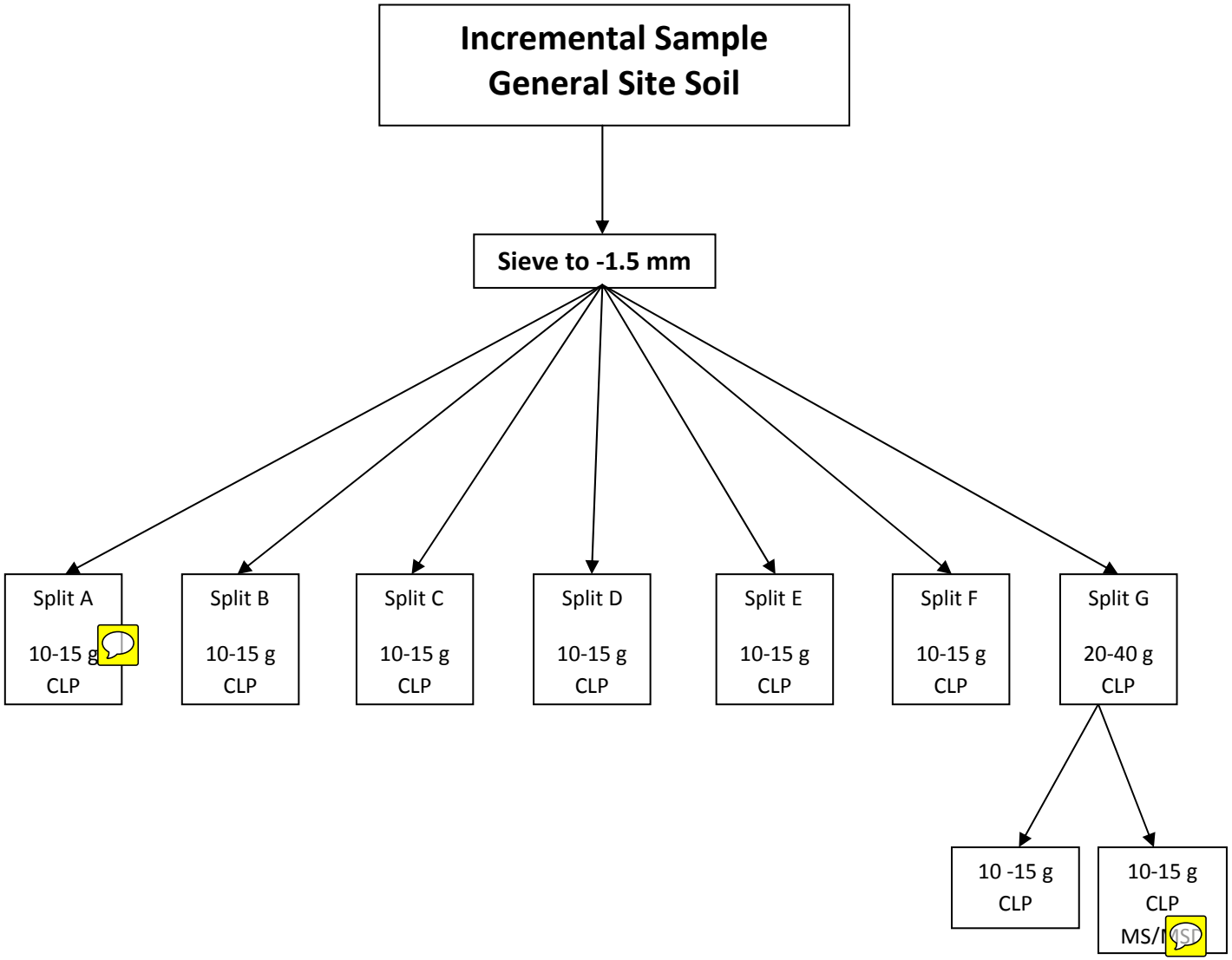


Figure 2-4. Incremental Sample General Site Soil

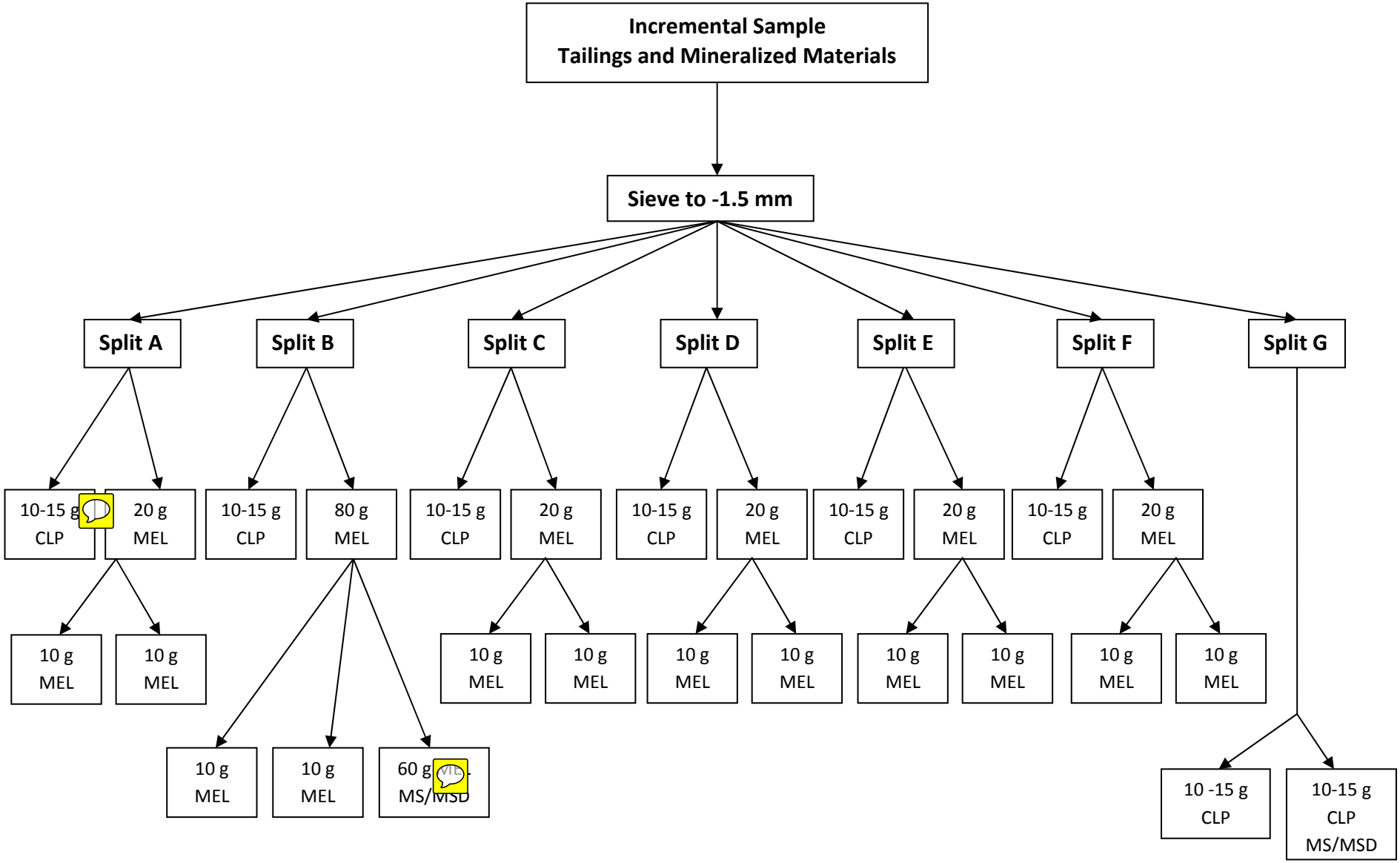


Figure 2-5. Incremental Sample Tailings and Mineralized Materials

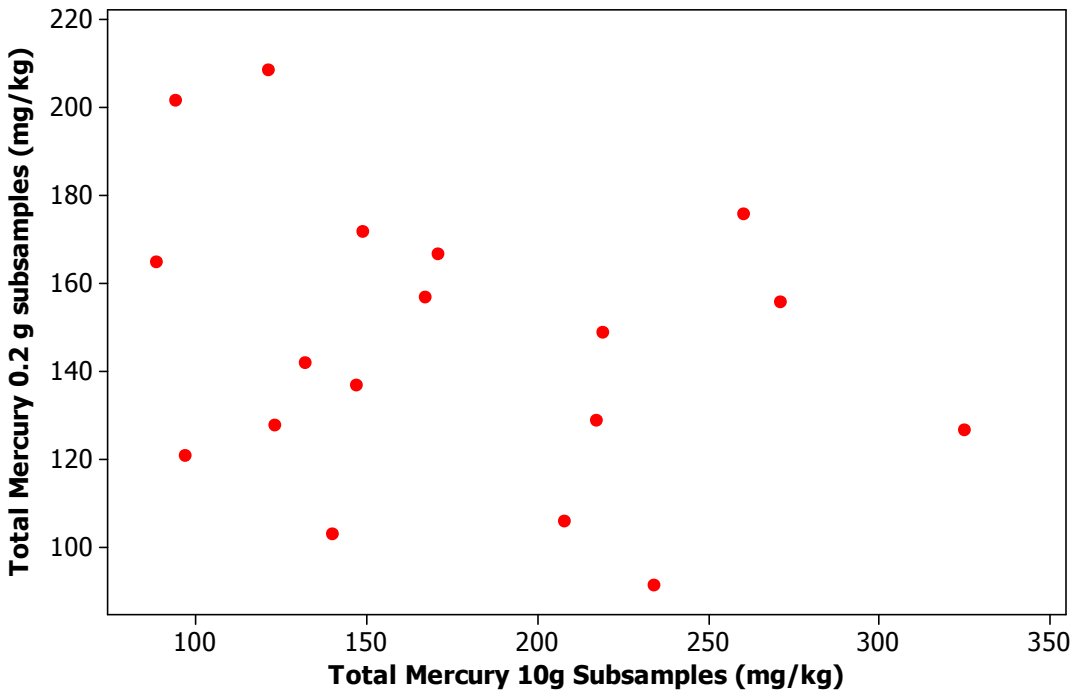


Figure 2-6. Scatter plot of paired replicate splits prepared from incremental samples of Tailings and Mineralized Material target population (n=18).

Attachment A
DMA Laboratory and FPXRF Data

Analytical Method / Laboratory		CLP																							
Chemical Name		ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	MAGNESIUM	MANGANESE	MERCURY	NICKEL	POTASSIUM	SELENIUM	SILVER	SODIUM	THALLIUM	VANADIUM	ZINC
Sample Date	Sample ID	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q
2/11/2014	0214BB-SO2-00	24300 J	22.8 UJ	38.5	180 J	0.63	0.47 U	5040 J	25.3 J	14.4	99.4 J	46300 J	8.8 J+	2530 J	883 J	118	14.6	945	57.1 U	11.4 U	159 J	11.4 U	170 J+	64
2/11/2014	0214BB-SO3-00	39200 J	22.4 UJ	10.5 J	214 J	0.78	0.47 U	2530 J	23.4 J	30.8	120 J	51700 J	3.5 J+	12800 J	1060 J	9.8	31.7	665	55.9 U	11.2 U	247 J	11.2 U	133 J+	67.2
2/11/2014	0214BB-SO4-00	44200 J	22.7 UJ	11.2 J	206 J	0.75	0.46 U	3740 J	23.3 J	32.5	118 J	52200 J	3.4 J+	15600 J	1120 J	22.4	33.4	879	56.7 U	11.3 U	249 J	11.3 U	130 J+	64.4
2/11/2014	0214BBM-SO5-00	24400 J	19.5 UJ	27	137 J	0.58	0.41 U	2960 J	19.8 J	16.7	67.9 J	44700 J	4.2 J+	1450 J	1180 J	8	9.8	644	48.7 U	9.7 U	145 J	9.7 U	116 J+	39.3
2/11/2014	0214BB-SO10-00	25600 J	22.7 UJ	32.9	303 J	0.59	0.45 U	3460 J	21.3 J	15.8	45.3 J	42800 J	11.8 J+	1140 J	4900 J	130	13.8	1130	56.8 U	11.4 U	153 J	11.4 U	114 J+	102
2/11/2014	0214BB-TMM1-SO-A	33900 J	19 UJ	90.3	140 J	0.71	0.4 UJ	2350 J	35 J	23.5	110 J	51900 J	6.3	6890 J	1010 J	167	25.3	570	47.4 U	9.5 U	227 J	9.5 U	130 J	59.2 J
2/11/2014	0214BB-TMM1-SO-B	33100 J	19.8 UJ	104	134 J	0.67	0.38 UJ	2080 J	37.3 J	23.6	122 J	50200 J	8	6840 J	1000 J	176	23.8	573	49.6 U	9.9 U	217 J	9.9 U	127 J	57.1 J
2/11/2014	0214BB-TMM1-SO-C	33000 J	18.7 UJ	65.3	144 J	0.55	0.4 UJ	2560 J	30 J	23.2	101 J	49100 J	5.9	7420 J	918 J	106	24	599	46.7 U	9.3 U	201 J	9.3 U	122 J	56.1 J
2/11/2014	0214BB-TMM1-SO-D	33800 J	18.7 UJ	98.9	147 J	0.73	0.39 UJ	2400 J	36.5 J	25	106 J	50100 J	6.3	7030 J	1050 J	127	24.7	601	46.6 U	9.3 U	201 J	9.3 U	126 J	62 J
2/11/2014	0214BB-TMM1-SO-E	33300 J	19 UJ	103	131 J	0.63	0.37 UJ	2460 J	32.1 J	21.8	102 J	47000 J	6.5	5960 J	851 J	137	22.3	524	47.6 U	9.5 U	197 J	9.5 U	114 J	52.1 J
2/11/2014	0214BB-TMM1-SO-F	34600 J	19.2 UJ	77.3	151 J	0.7	0.4 UJ	2560 J	32.5 J	26.6	109 J	49200 J	5.3	7870 J	1030 J	91.6	26.5	647	48 U	9.6 U	209 J	9.6 U	119 J	57.9 J
2/11/2014	0214BB-TMM1-SO-G	33700 J	18.9 UJ	123	131 J	0.67	0.39 UJ	2140 J	36.7 J	21.1	114 J	50700 J	7.8	6210 J	891 J	175	23.6	552	47.2 U	9.4 U	217 J	9.4 U	129 J	52.5 J
2/11/2014	0214BB-TMM2-SO-A	32400	19.4 UJ	98.2	136	0.5	1.1 J	2780 J	31.5 J	21.5	103 J	47000 J	6.7 J	6400 J	899 J	129	20.8	422	48.4 U	9.7 U	206 J	9.7 U	119 J	62.2 J
2/11/2014	0214BB-TMM2-SO-B	32700	20.1 UJ	112	139	0.52	1.3 J	2640 J	34.2 J	23.9	108 J	51200 J	9.5 J	6590 J	995 J	157	21.4	474	50.2 U	10 U	216 J	10 U	130 J	59.6 J
2/11/2014	0214BB-TMM2-SO-C	30500	20.5 UJ	97.6	136	0.45	1.3 J	2690 J	34.5 J	22.9	114 J	49300 J	6.5 J	7200 J	941 J	209	21.8	500	51.2 U	10.2 U	206 J	10.2 U	130 J	59.2 J
2/11/2014	0214BB-TMM2-SO-D	31600	19.6 UJ	107	133	0.48	1.3 J	2470 J	35.6 J	21.4	111 J	49100 J	9.8 J	6370 J	927 J	156	21.2	448	49 U	9.8 U	209 J	9.8 U	131 J	57.7 J
2/11/2014	0214BB-TMM2-SO-E	33000	18.9 UJ	107	134	0.48	1.2 J	2570 J	33.2 J	21.5	102 J	47400 J	10.7 J	5900 J	833 J	128	20	403	47.4 U	9.5 U	215 J	9.5 U	120 J	54.3 J
2/11/2014	0214BB-TMM2-SO-F	32400	19.3 UJ	97.8	134	0.52	1.2 J	2620 J	33.7 J	21.8	105 J	47600 J	7.6 J	6330 J	906 J	142	22.2	446	48.2 U	9.6 U	217 J	9.6 U	123 J	54.7 J
2/11/2014	0214BB-TMM2-SO-G	32100	19.7 UJ	112	124	0.45	1.2 J	2460 J	37.6 J	21.5	105 J	49300 J	6.7 J	6660 J	869 J	155	23	481	49.2 U	9.8 U	221 J	9.8 U	127 J	60.1 J
2/11/2014	0214BB-TMM3-SO-A	34600	19.1 UJ	76.4	144	0.55	1.4 J	2910 J	34.9 J	23.8	104 J	50700 J	5.6 J	7550 J	943 J	121	23.8	516	47.6 U	9.5 U	219 J	9.5 U	130 J	62.1 J
2/11/2014	0214BB-TMM3-SO-B	37100	19.5 UJ	97.4	159	0.59	1.5 J	3070 J	39.3 J	26	126 J	53900 J	8.8 J	7780 J	1060 J	149	25.7	581	48.8 U	9.8 U	257 J	9.8 U	141 J	72.4 J
2/11/2014	0214BB-TMM3-SO-C	35200	19.1 UJ	116	140	0.5	1.5 J	2720 J	37.8 J	26.3	119 J	55500 J	8.1 J	6990 J	1060 J	172	25.9	517	47.8 U	9.6 U	234 J	9.6 U	137 J	64.7 J
2/11/2014	0214BB-TMM3-SO-D	30600	18.8 UJ	61.9	137	0.49	1.2 J	2840 J	30.2 J	24	94.8 J	46100 J	5.5 J	7060 J	954 J	103	21.6	465	47.1 U	9.4 U	198 J	9.4 U	117 J	58.3 J
2/11/2014	0214BB-TMM3-SO-E	32100	18.6 UJ	122	129	0.47	1.4 J	2600 J	36.2 J	21.7	111 J	51200 J	8.2 J	6430 J	866 J	202	21.4	464	46.4 U	9.3 U	217 J	9.3 U	132 J	59.3 J
2/11/2014	0214BB-TMM3-SO-F	31200	18.9 UJ	100	135	0.43	1.3 J	2560 J	35 J	22	108 J	48000 J	7.4 J	6750 J	884 J	165	22	463	47.2 U	9.4 U	209 J	9.4 U	128 J	59.8 J
2/11/2014	0214BB-TMM3-SO-G	34800	18.7 UJ	73.7	148	0.52	1.4 J	2960 J	35.9 J	25.9	108 J	48300 J	6.7 J	7510 J	1020 J	137	24.9	526	46.9 U	9.4 U	222 J	9.4 U	124 J	63.2 J
2/11/2014	0214BB-SO6-00	37800 J	20.6 UJ	80.6	112 J	0.88	0.38 U	876 J	82.8 J	36.2	130 J	58400 J	3.2 J+	7710 J	1340 J	2.5	45.4	370 J	51.6 U	10.3 U	222 J	10.3 U	126 J+	77.6
2/11/2014	0214BB-SO7-00	29600 J	22 UJ	13.5	200 J	0.66	0.46 U	2500 J	27.4 J	29.2	97.9 J	51300 J	4.2 J+	9760 J	1080 J	28.5	27.3	969	54.9 U	11 U	199 J	11 U	145 J+	73.8
2/11/2014	0214BB-SO8-00	39700 J	21.3 UJ	5.9 J	226 J	1	0.45 U	2320 J	23.5 J	30.5	115 J	49300 J	3.6 J+	17900 J	711 J	3.7	37.4	920	53.1 U	10.6 U	191 J	10.6 U	122 J+	71
2/11/2014	0214BB-SO9-00	45400 J	23.9 UJ	10.1 J	220 J	0.75	0.48 U	3300 J	23.9 J	30.6	127 J	52000 J	3 J+	16800 J	909 J	52	35.8	1190	59.6 U	11.9 U	230 J	11.9 U	127 J+	66.4
2/11/2014	0214BB-SO11-00	44900 J	20.8 UJ	254	32.8 J	0.7	0.43 U	428 UJ	54.9 J	14.8	157 J	60900 J	10.4 J+	428 UJ	886 J	265	16.4	51.5 J	52 U	10.4 U	216 J	10.4 U	156 J+	37.5
2/11/2014	0214BB-SO12-00	33000 J	19.7 UJ	16.3	208 J	0.75	0.41 U	1780 J	24.6 J	26.9	108 J	50300 J	3.7 J+	11500 J	781 J	55.5	29.5	365 J	49.3 U	9.9 U	193 J	9.9 U	135 J+	61.6
2/11/2014	0214BB-SO13-00	36600 J	21.4 UJ	11.8	197 J	0.71	0.44 U	2400 J	23.5 J	29.2	114 J	49700 J	3.6 J+	13600 J	895 J	56.1	31.7	539	53.4 U	10.7 U	209 J	10.7 U	129 J+	64.8
2/11/2014	0214BB-SO14-00	30100 J	20.7 UJ	30.3	187 J	0.65	0.43 U	4190 J	27.9 J	27.5	106 J	52200 J	4.5 J+	8690 J	1180 J	192	26.1	819	51.8 U	10.4 U	210 J	10.4 U	146 J+	78.1
2/11/2014	0214BB-SO15-00	19400 J	21.7 UJ	21.4	131 J	0.71	0.45 U	4460 J	6.1 J	28.1	52 J	37800 J	6.3 J+	1190 J	1860 J	138	4.8	471	54.4 U	10.9 U	136 J	10.9 U	47 J+	42.4
2/11/2014	0214BB-SO16-00	37500 J	19.5 UJ	307	77.9 J	0.6	0.4 U	400 UJ	50.7 J	6.4	108 J	59400 J	14.9 J+	400 UJ	305 J	526	14.3	63 J	48.8 U	9.8 U	261 J	9.8 U	149 J+	27.2
2/11/2014	0214BB-SO17-00	26400 J	21.4 UJ	299	43.5 J	0.62	0.4 U	423 J	39.6 J	10.9	197 J	50400 J	13.7 J+	479 J	763 J	543	18.7	119 J	53.5 U	10.7 U	179 J	10.7 U	138 J+	36.5
2/11/2014	0214BB-SO18-00	28100 J	19.2 UJ	373	31.7 J	0.47	0.39 U	392 UJ	42.6 J	7.7	91.3 J	59500 J	17.1 J+	392 UJ	891 J	401	14.3	73.2 J	48 U	9.6 U	203 J	9.6 U	123 J+	23
2/11/2014	0214BB-SO19-00	33900 J	20.1 UJ	341	49.9 J	0.57	0.4 UJ	401 UJ	48.2 J	13.3	211 J	73200 J	10.5	468 J	669 J	1.8	16.9	114 J	50.2 U	10 U	223 J	10 U	174 J	41.2 J
2/11/2014	0214BB-SO20-00	32400 J	20.6 UJ	35.6	86.1 J	0.72	0.42 UJ	1290 J	24.6 J	21	140 J	62200 J	3.1	5970 J	752 J	39.8	18.7	573	51.5 U	10.3 U	215 J	10.3 U	136 J	51.1 J
2/11/2014	0214BB-GSS1-SO-A	35900	21.2 UJ	27.9	182	0.7	1.4 J	5650 J	50.1	29.3	91.4	58000 J	4.5	5350	1610 J	13.3	24	569	53 U	10.6 U	289 J	10.6 U	148 J	109 J
2/11/2014	0214BB-GSS1-SO-B	33300	22.4 UJ	29.3	168	0.59	1.4 J	5180 J	53.5	27.5	84.9	56000 J	4.8	5100	1520 J	10	24.3	452	56 U	11.2 U	275 J	11.2 U	136 J	100 J
2/11/2014	0214BB-GSS1-SO-C	31700	21.6 UJ	29.3	161	0.59	1.3 J	4970 J	43.8	26.2	80.2	51800 J	4	4860	1450 J	13.2	20.7	481	54.1 U	10.8 U	235 J	10.8 U	131 J	92.7 J
2/11/2014	0214BB-GSS1-SO-D	32100	20.7 UJ	22.4	169	0.63	1.3 J	5290 J	41.7	26.3	81.6	52500 J	3.8	4970	1480 J	9.8	20.6	496	51.7 U	10.3 U	259 J	10.3 U	135 J	97.8 J
2/11/2014	0214BB-GSS1-SO-E	31100	21.1 UJ	23.3	159	0.59	1.2 J	4980 J	44.2	26.3	78.1	50500 J	3.7	4750	1470 J	14.3	21.3	477	52.9 U	10.6 U	251 J	10.6 U	128 J	92.4 J
2/11/2014	0214BB-GSS1-SO-F	29200	21.7 UJ	27.2	150	0.65	1.3 J	4680 J	45.6	25.9	74.5	49100 J	4.3	4430	1340 J	14	20.4	479	54.2 U	10.8 U	244 J	10.8 U	126 J	87.2 J
2/11/2014	0214BB-GSS1-SO-G	35600	21.6 UJ	28.2	181	0.69	1.4 J	5540 J	48.3	28.4	86.6	56600 J	4.5	5330	1610 J	11	23.3	559	54 U	10.8 U	284 J	10.8 U	145 J	105 J
2/11/2014	0214BB-GSS2-SO-A	33900	22.2 UJ	30	171	0.7	1.3 J	5170 J	50.6	28.1	83.6	54800 J	5.1	4900	1570 J	11.8	23.5	500	55.4 U	11.1 U	281 J	11.1 U	138 J	98.2 J
2/11/2014	0214BB-GSS2-SO-B	33200	22.2 UJ	26.2	172	0.65	1.4 J	5250 J	48.5	28.2	82.1	53000 J	4.7	4970	1580 J	15.6	22.8	513	55.6 U	11.1 U	269 J	11.1 U	138 J	98.4 J
2/11/2014	0214BB-GSS2-SO-C	31000	21.6 UJ	30.7	159	0.56	1.2 J	4960 J	42	26.3	77.5	51700 J	3.9	4720	1470 J	10.9	19.8	461	54 U	10.8 U	261 J	10.8 U	132 J	91.9 J
2/11/2014	0214BB-GSS2-SO-D	33000	21.4 UJ	24.7	171	0.68	1.3 J	5290 J	45	26.7	83.7	53800 J	4.2	5070	1500 J	8.5	21.5	533	53.4 U	10.7 U	279 J	10.7 U	137 J	99.6 J
2/11/2014	0214BB-GSS2-SO-E	33000	21.6 UJ	21	179	0.6	1.4 J	5270 J	45.8	27.6	81.6	51400 J	3.8	5120	1580 J	10.6	22.5	510	54.1 U	10.8 U	267 J	10.8 U	132 J	98.9 J
2/11/2014	0214BB-GSS2-SO-F	33000	20.3 UJ	24.4	169	0.63	1.4 J	5220 J	56.2	27.4	82.9	53000 J	4.2	4980	1520 J	12	26.2	540	50.8 U	10.2 U	276 J	10.2 U	138 J	95.8 J
2/11/2014	0214BB-GSS2-SO-G	33200	20.9 UJ	23.2	169	0.64	1.4 J	5210 J	46.4	28.3	83.5	53500 J	4.2	4980	1570 J	12.9	22.5	550	52.3 U	10.5 U	268 J	10.5 U	139 J	98.7 J
2/11/2014	0214BB-GSS3-SO-A	29500	20.2 UJ	8.9 J	196	0.76	1.6 J	5930 J	42.8	29.7	86.4	56000	5.1	5210 J	1760 J	9.8	19.6	542	50.6 U	10.1 U	249 J	10.1 U	137	101
2/11/2014	0214BB-GSS3-SO-B	25100	21.6 UJ	23.2	173	0.62	1.4 J	5390 J	37.5	26.6	78.4	50200	4.4	4530 J	1540 J	10	17.3	488	54 U	10.8 U	235 J	10.8 U	121	90.3
2/11/2014	0214BB-GSS3-SO-C	25000	21.6 UJ	24.6	164	0.58	1.3 J	5170 J	38.3	24.4	75	48300	4.2	4430 J	1450 J	9.4	17	444	54.1 U	10.8 U	218 J	10.8 U	119	87
2/11/2014	0214BB-GSS3-SO-D	25600	21.2 UJ	24.9	170	0.66	1.3 J	5310 J	39.5	25.2	77	49300	4.7	4540 J	1510 J	11.7	17.3	476	53 U	10.6 U	229 J	10.6 U	121	93.8
2/11/2014	0214BB-GSS3-SO-E	25900	21.2 UJ	24.7	173	0.6	1.4 J	5400 J	38.8	27.2	78.6	50900	4.5	4640 J	1560 J	10	17.7	478	53 U	10.6 U	236 J	10.6 U	126	93.3
2/11/2014	0214BB-GSS3-SO-F	28400	20.7 UJ	24.4	185	0.65	1.5 J	5610 J	41.9	27.3	84.2	54100	4.7	4900 J	1590 J	10.8	18.8	528	51.9 U	10.4 U	247 J	10.4 U	133	94.4
2/11/2014	0214BB-GSS3-SO-G	27600	22.3 UJ	23.3	183	0.65	1.5 J	5670 J	42.1	27.5	83	53300	4.9	4830 J	1620 J	14.9	18.1	519	55.8 U	11.2 U	238 J	11.2 U	133	95.1
2/12/2014	0214BB-SO21-00	2740 J	18.6 UJ	54.6	26.1 J	0.54	1.1	1580 J	73.9 J	30.2	201 J	86000 J	27.6 J+	617 J	2050 J	325	32.9	380 U	46.6 U	9.3 U	213 J	9.3 U	159 J+	111
2/12/2014	0214BB-SO22-00	4360 J	19 UJ	134	16.3 UJ	0.41	0.41 UJ	2640 J	30.9 J	26.9	117 J	47000 J	3.2	1110 J	1330 J	77.9	34.8	408 U	47.4 U	9.5 U	150 J	9.5 U	65.8 J	58.1 J
2/12/2014	0214BB-SO23-00	25300 J	22.2 UJ	67.6	41.2 J	0.62	0.44 UJ	4220 J	64.7 J	29	67.2 J	60700 J	1.1	2040 J	1130 J	3	29.5	162 J	55.6 U	11.1 U	328 J	11.1 U	134 J	77.7 J
2/12/2014	0214BB-SO1-00	38200 J	21.9 UJ	98.3	85.3 J	0.8	0.45 U	950 J	80.2 J	39.9	125 J	59200 J	3.6 J+	6700 J	1710 J	1.8	44.2	609	54.8 U	11 U	239 J	11 U	123 J+	79.9
2/12/2014	0214BB-SO1-30	39400 J	21.3 UJ	121	76.5 J	0.74	0.4 U	852 J	81.7 J	33.2	121 J	57300 J	4 J+	6450 J	1330 J	1.7	44	529	53.2 U	10.6 U	219 J	10.6 U	122 J+	73.6
2/12/2014	0214BB-SO24-00	8240 J	19.2 UJ	104	25.6 J	0.46	0.4 UJ	2610 J	43 J	33.6	106 J	51100 J	4.6	996 J	1470 J	140	41.1	23.6 J	48 U	9.6 U	171 J	9.6 U	95.8 J	72 J
2/12/2014	0214BB-SO25-00	54900 J	20 UJ	195	15.4 J	0.42	1.4 J	1520 J	99.2 J	25.1	119 J	63200 J	4.9	840 J	797 J	3.2	39.4	406 U	50.1 U	10 U	381 J	10 U	119 J	58.7 J
2/12/2014	0214BB-SO26-00	39000 J	20.4 UJ	95.6	70.6 J	0.64	0.42 UJ	2310 J	76.5 J	33.6	118 J	67100 J	3.2	4120 J	1290 J	7.1	39.2	365 J	51 U	10.2 U	287 J	10.2 U	138 J	78.7 J
2/12/2014	0214BB-SO27-00	16900 J	20 UJ	50.2	32.6 J	0.66	0.41 UJ	1920 J	43.9 J	39.5	67.9 J	73300 J	4.4	1630 J	772 J	5	13.6	185 J	49.9 U	10 U	406 J	10 U	164 J	68.4 J
2/12/2014	0214BB-SO28-00	27800 J	19.4 UJ	88.3	59.3 J	0.65	0.41 UJ	1050 J	56.5 J	27.8	84 J	78500 J	5.4	1680 J	1010 J	21.8	24.5	192 J	48.5 U	9.7 U	291 J	9.7 U	158 J	83.3 J
2/12/2014	0214BB-SO28-30	29900 J	20.1 UJ	99.1	61.3 J	0.69	0.41 UJ	1060 J	58.8 J	27.1	85 J	82000 J	4.4	1560 J	1060 J	15.5	25.8	187 J	50.2 U	10 U	334 J	10 U	163 J	84.7 J
2/12/2014	0214BB-SO29-00	43900 J	21.1 UJ	101	94 J	0.86	0.46 UJ	808 J	81.7 J	35.5	130 J	61400 J	2.9	6180 J	1300 J	1.4	46.1	378 J	52.8 U	10.6 U	234 J	10.6 U	122 J	72.9 J
2/12/2014	0214BB-SO30-00	29700 J	22.1 UJ	72.7	69.5 J	0.63	0.44 UJ	2290 J	50 J	29.8	97.9 J	66200 J	14.4	2340 J	1260 J	13.2	25.2	234 J	55.2 U	11 U	362 J	11 U	148 J	87.7 J
2/15/2014	0214BB-SO31-00	36100	21.1 UJ	52.8	140	0.42 J	1.5 J	5550 J	68.5	31.7	111	53000 J	236	6480	1500 J	13.3	34.2	698	52.6 U	10.5 U	455	10.5 U	163 J	202 J
2/15/2014	0214BB-SO35-30	35800	22.3 UJ	59.4	143	0.43 J	1.4 J	5740 J	65.1	30.5	118	51800 J	223	6370	1470 J	12.3	33.3	734	55.6 U	11.1 U	448	11.1 U	159 J	236 J
2/15/2014	0214BB-SO32-00	28400	21.9 UJ	34.5	151	0.47	1.3 J	6930 J	63.1	21.3	296	51000 J	23.5	4380	1100 J	31.9	22.8	684	54.7 U	10.9 U	327 J	10.9 U	155 J	117 J
2/15/2014	0214BB-SO33-00	24900	22 UJ	39.5	130	0.53	1.4 J	9870 J	63.6	21	69.8	48100 J	44.8	4390	1100 J	27.7	24.1	893	55 U	11 U	319 J	11 U	139 J	477 J
2/15/2014	0214BB-SO34-00	29700	22.9 UJ	36.2	137	0.5	1.3 J	6610 J	45.2	26.2	87.3	48300 J	8	5120	1080 J	9.2	25.2	1210	57.1 U	11.4 U	352 J	11.4 U	132 J	104 J
2/15/2014	0214BB-SO35-00	37800	22.7 UJ	55.1	142	0.45 J	1.3 J	4570 J	83.4	30	103	51700 J	27.4	5770	1370 J	22.4	41.4	625	56.7 U	11.3 U	447 J	11.3 U	152 J	139 J

* ***Notes:***

- CLP: contract laboratory program
- ID: identification
- J: estimated
- MEL: Manchester Environmental Laboratory
- mg/kg: milligram per kilogram
- -- : Analyte not measured
- Q: qualifier
- SO: soil
- U: not detected
- FPXRF: Field portable X-ray fluorescence

	Analytical Method / Laboratory	MEL	FPXRF WET																					
	Chemical Name	MERCURY	ANTIMONY	ARSENIC	BARIUM	CADMIUM	CHROMIUM	COBALT	COPPER	Iron	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	Rubidium	SELENIUM	SILVER	STRONTIUM	TIN	TITANIUM	ZINC	ZIRCONIUM
Sample Date	Sample ID	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q
2/11/2014	0214BB-SO2-00	--	40 U	5 U	139 U	21 U	49 U	17 U	170	115	14	27 U	96	12	20 U	4.58	11	15 U	12.2	35 U	275 U	8 U	25
2/11/2014	0214BB-SO3-00	--	46 U	9.055 U	282	25 U	0.813 U	2.92 U	14.25 U	368.25	6	33.505	7	3.57	0.44 U	4.72	0.13 U	3.84 U	10.32	43 U	17.51 U	67.298	11.77
2/11/2014	0214BB-SO4-00	--	45 U	243	270 U	25 U	77.5 U	113	1046	20779	5	3056.8	18	12 U	27 U	115	4 U	20 U	221	42 U	2196	1974	132
2/11/2014	0214BBM-SO5-00	--	47 U	27	282	25 U	62 U	383	72	27937	6 U	410	9.5	9.8	26 U	10	2 U	17 U	94.3	43 U	3429	46	79
2/11/2014	0214BB-SO10-00	--	81 U	30	372	23 U	81 U	344	91	36258	8.3	313	85.3	6	32 U	38.3	2 U	21 U	88.5	40 U	4019	113	113
2/11/2014	0214BB-TMM1-SO-A	171	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-B	260	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-C	208	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-D	325	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-E	147	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-F	234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM2-SO-A	217	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM2-SO-B	167	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM2-SO-C	121	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM2-SO-D	271	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM2-SO-E	123	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM2-SO-F	132	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM2-SO-G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM3-SO-A	97.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM3-SO-B	219	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM3-SO-C	149	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM3-SO-D	140	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM3-SO-E	94	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM3-SO-F	88.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM3-SO-G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO6-00	--	51	12 U	385	26 U	69 U	395 U	71.5 U	31533	5 U	355	8.5	6 U	28 U	40	2 U	19 U	106	44 U	4157	35	78
2/11/2014	0214BB-SO7-00	--	44 U	34	287 U	24 U	73 U	391	72.3	35102	7	495	23	7 U	29 U	14	2 U	20 U	80	40 U	5466	47	123
2/11/2014	0214BB-SO8-00	--	50 U	247	381	27 U	94.8 U	236	838.5	40429	5 U	3215	8	8.5 U	33 U	65.5	4 U	21 U	185	47 U	4410	1941	143
2/11/2014	0214BB-SO9-00	--	46 U	380	362	25 U	80.8 U	267 U	893.3	33853	5 U	3133.3	7	9	31 U	63.3	4 U	20 U	258	42 U	4536	1968	155
2/11/2014	0214BB-SO11-00	--	168	304	272 U	23 U	80.5 U	246 U	847.8	31202	9.5	3070	237	9	30 U	90	4 U	21 U	237	40 U	3748	1952	155
2/11/2014	0214BB-SO12-00	--	46 U	107	445	25 U	76 U	496	113	47049	7 U	270	59	6	31 U	9.8	2 U	19 U	88.5	42 U	5692	37	114
2/11/2014	0214BB-SO13-00	--	47 U	189	413	25 U	72 U	328	109	32089	5 U	502	36	8.5	28 U	31	2 U	19 U	233	43 U	4507	98.5	159
2/11/2014	0214BB-SO14-00	--	43 U	169	270	24 U	71 U	378	116	35731	6	431	134	10	28 U	6.8	2 U	18 U	166	40 U	5162	29	108
2/11/2014	0214BB-SO15-00	--	43 U	257	263 U	23 U	83 U	202	909.3	29901	9.5	3214	157	9.8	31 U	91.8	4 U	22 U	215	40 U	3539	2097	133
2/11/2014	0214BB-SO16-00	--	219	19	414	25 U	72 U	419	87.5	38375	13	419	421	6.8	29 U	12	2 U	19 U	70	42 U	4796	41	74
2/11/2014	0214BB-SO17-00	--	134	240	293	24 U	81.5 U	410	836	39073	13	3570.8	379	12	32 U	65	4 U	20 U	176	41 U	3410	1994	164
2/11/2014	0214BB-SO18-00	--	174	13	284 U	24 U	74 U	478	96	38881	13	379	372	6	30 U	15	2 U	20 U	60	41 U	4162	38	72
2/11/2014	0214BB-SO19-00	--	129	5 U	341	24 U	58 U	55 U	12 U	7869	10	113	391	4 U	21 U	119	2 U	19 U	168	41 U	1784	13	96
2/11/2014	0214BB-SO20-00	--	65.8	280	289 U	25 U	81 U	273 U	834.8	32562	6	4343	121	13	30 U	39.5	3 U	20 U	325	43 U	4314	1929	118
2/11/2014	0214BB-GSS1-SO-A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS2-SO-A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS2-SO-B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS2-SO-C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS2-SO-D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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2/11/2014	0214BB-GSS3-SO-F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS3-SO-G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/12/2014	0214BB-SO21-00	--	68	238	369 U	27 U	79 U	282	546.9	32391	15	2001.4	191	7.4	29 U	56.1	3 U	20 U	251	46 U	4181	1154	144
2/12/2014	0214BB-SO22-00	--	98.5	77	268 U	25 U	76	382	77.8	36313	6	1151	68	10	29 U	11	2 U	18 U	74	43 U	3873	52	96
2/12/2014	0214BB-SO23-00	--	64	230	308 U	25 U	84	251	856.3	32956	5 U	3182.3	18	9.5 U	31 U	90.3	4 U	21 U	218	44 U	3769	1994	148
2/12/2014	0214BB-SO1-00	--	55	231	339	24 U	74 U	387	87.5	36060	5	327 U	13	6 U	28 U	4	3	19 U	269	42 U	5663	24	151
2/12/2014	0214BB-SO1-30	--	47 U	66	340	25 U	100	577	110	52332	6 U	817	37	6 U	33 U	18	2 U	19 U	77	43 U	6135	64	107
2/12/2014	0214BB-SO24-00	--	78.3	91.8	326	26 U	92	210	70	19101	6	410	87	7 U	26 U	3	2 U	19 U	118	45 U	4235	22	106
2/12/2014	0214BB-SO25-00	--	115	258	383	25 U	82.3 U	179	871.3	29717	6 U	3203	17	11 U	30 U	91	4 U	21 U	216	42 U	3097	2046	141
2/12/2014	0214BB-SO26-00	--	60 U	78	310	25 U	91.3	278	78.5	27063	5	533	7 U	6	28 U	29.5	2 U	19 U	153	43 U	3777	109	144
2/12/2014	0214BB-SO27-00	--	54 U	118	566	29 U	78 U	375	91.8	34579	20	446	10	6	30 U	3	2 U	20 U	110	50 U	4734	35	114
2/12/2014	0214BB-SO28-00	--	74	234 U	480 U	27 U	79.3 U	256 U	839.8 U	30403	6 U	2956.5	27	9.8	30 U	91.5	4 U	20 U	201	47 U	2977	1936	144
2/12/2014	0214BB-SO28-30	--	60	81	563	28 U	88.8	595	89	55425	7 U	492	25	7.8 U	35 U	8.5	2 U	20 U	70	48 U	5615	47	117
2/12/2014	0214BB-SO29-00	--	65	248	426	26 U	82.5 U	256	846.8	36649	5 U	3041	8.5 U	8.3	32 U	92	4 U	21 U	222	44 U	4542	1989	157
2/12/2014	0214BB-SO30-00	--	57	106	392	26 U	94.5 U	537	74	59713	11	502	13	5 U	36 U	6	2 U	21 U	108	44 U	7692	53	151
2/15/2014	0214BB-SO31-00	--	50 U	263	326	23 U	107 U	289	874.5	41084	118	3224.5	18	11	33 U	66.3	4 U	21 U	181	40 U	4391	1996	150
2/15/2014	0214BB-SO35-30	--	42 U	31	270 U	23 U	66 U	390	49	28791	122	464	13	8 U	26 U	11	2 U	18 U	98.5	39 U	3950	224	87
2/15/2014	0214BB-SO32-00	--	44 U	89.8	283	24 U	100 U	387	95	45673	10	663	24	7	33 U	10	2 U	20 U	120	40 U	5576	63	122
2/15/2014	0214BB-SO33-00	--	42 U	243	251	23 U	81.3 U	298 U	845.5	32432	24	3152.8	19	8.8	31 U	65	4 U	20 U	207	39 U	2916	1987	132
2/15/2014	0214BB-SO34-00	--	44 U	43	311	24 U	68 U	404	88.8	32099	7	599	9	6	26 U	12	2 U	17 U	109	41 U	3875	99.3	87.3
2/15/2014	0214BB-SO35-00	--	44 U	243	363	24 U	79.5 U	257	832.3	33094	18	3073.8	19	8.8 U	30 U	65.5	4 U	20 U	189	41 U	3749	2075	143

* ***Notes***:
- CLP: contract laboratory program
- ID: identification
- J: estimated
- MEL: Manchester Environmental Laborator
- mg/kg: milligram per kilogram

Analytical Method / Laboratory		FPXRF DRY																				
Chemical Name		ANTIMONY	ARSENIC	BARIUM	CADMIUM	CHROMIUM	COBALT	COPPER	Iron	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	Rubidium	SELENIUM	SILVER	STRONTIUM	TIN	TITANIUM	ZINC	ZIRCONIUM
Sample Date	Sample ID	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q
2/11/2014	0214BB-SO2-00	48 U	48	466	26 U	77 U	410	77	33185	9	763	119	5 U	27 U	12	2 U	18 U	134	44 U	3314	95.8	80
2/11/2014	0214BB-SO3-00	48 U	37	518	26 U	71	413	71	31264	7	666	9.3	7	26 U	11	2 U	18 U	114	44 U	2979	141	68
2/11/2014	0214BB-SO4-00	49 U	241	483	27 U	77.5 U	145 U	838	25365	8	2986.5	20	9.3	29 U	116	4 U	21 U	242	46 U	2882	1952	178
2/11/2014	0214BBM-SO5-00	52	63	498	28 U	80 U	458	110	41370	8	549	14	6	31 U	36.3	2 U	20 U	162	46 U	5791	131	153
2/11/2014	0214BB-SO10-00	74	218	602	29 U	90.5 U	441	877.5	47150	11	3002.5	101	9 U	35 U	72.3	4 U	22 U	174	50 U	5197	1941	138
2/11/2014	0214BB-TMM1-SO-A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM2-SO-A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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2/11/2014	0214BB-TMM3-SO-A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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2/11/2014	0214BB-TMM3-SO-G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO6-00	53	208	432	27 U	83 U	341	858.8	40673	5 U	3090.3	7	11	32 U	72.8	4 U	20 U	167	47 U	4890	1910	107
2/11/2014	0214BB-SO7-00	58	39	483	26 U	86 U	438	105	47930	7	648	32	6 U	34 U	41	2 U	21 U	142	44 U	6138	122	135
2/11/2014	0214BB-SO8-00	49 U	89.8	414	26 U	101	383	124	51875	6	894.8	6 U	5 U	36 U	43	2 U	21 U	137	45 U	6570	140	165
2/11/2014	0214BB-SO9-00	48 U	42.8	478 U	26 U	102 U	509	119	53281	7.5	703	32	5	34 U	17	2 U	20 U	75	44 U	6751	57	103
2/11/2014	0214BB-SO11-00	230	16	299	25 U	81 U	611	111	50653	9.8	524	306	6	33 U	18	2 U	20 U	93.3	42 U	5978	50	89
2/11/2014	0214BB-SO12-00	50 U	139	552	27 U	75 U	328	107	33131	9.8	1627	65	10	28 U	11	2 U	19 U	161	46 U	6812	68.8	193
2/11/2014	0214BB-SO13-00	81 U	45	477	28 U	77 U	410	76	35375	7	1624	52	8.5	30 U	36	2 U	20 U	110	48 U	4619	120	197
2/11/2014	0214BB-SO14-00	50 U	205	570	27 U	82.3 U	289	842	35188	8	3026	171	9	32 U	94.5	4 U	21 U	207	46 U	4348	1937	149
2/11/2014	0214BB-SO15-00	47 U	110	383	25 U	105 U	751.8	84	62683	6	2894	185	12	40 U	40.8	3 U	23 U	168	43 U	7137	182	170
2/11/2014	0214BB-SO16-00	193	35	580	26 U	91 U	653	132	65132	15	593	425	6	36 U	19	2 U	20 U	85	45 U	8429	61	123
2/11/2014	0214BB-SO17-00	149	17	391 U	27 U	78 U	477	99.5	46034	15	441	507	6	32 U	45	2 U	20 U	101	46 U	6404	48	102
2/11/2014	0214BB-SO18-00	160	338	406	28 U	88.8	237 U	867.3	37727	15	2915	429	9 U	33 U	61.5 U	4 U	21 U	338	48 U	5087	1958	180
2/11/2014	0214BB-SO19-00	183	228	482	27 U	91 U	316	855.5	43771	15	3204.5	660	10 U	35 U	68	4 U	22 U	199	46 U	5980	1976	141
2/11/2014	0214BB-SO20-00	52 U	80.8	568	28 U	99 U	463	107	53672	6	868	43	6	36 U	15	2 U	21 U	89.3	48 U	7929.3	68	116
2/11/2014	0214BB-GSS1-SO-A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS2-SO-A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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2/11/2014	0214BB-GSS2-SO-G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS3-SO-A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS3-SO-B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS3-SO-C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS3-SO-D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS3-SO-E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS3-SO-F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS3-SO-G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/12/2014	0214BB-SO21-00	74	209	484	31 U	84.3 U	307	517.8	45426	17	2027.4	178	8	34 U	51.9	3 U	21 U	171	54 U	6167.9	999.8	165
2/12/2014	0214BB-SO22-00	105	345	329	29 U	103 U	675	207	67853	7	508	93.3	7	37 U	9.3	3 U	21 U	240	50 U	10598	53	170
2/12/2014	0214BB-SO23-00	61 U	220	316 U	25 U	101 U	195	819.3	35371	5 U	3147	14	10 U	35 U	89.5	4 U	23 U	250	44 U	4324	1910	171
2/12/2014	0214BB-SO1-00	76	47	378 U	28 U	110 U	505	115	56461	6 U	703.3	12 U	8	35 U	18	2 U	20 U	75	48 U	7040	62	104
2/12/2014	0214BB-SO1-30	69 U	306	373	27 U	86 U	402	154	44023	6 U	535	11	8.3	33 U	5	3 U	21 U	291	47 U	6912	36	160
2/12/2014	0214BB-SO24-00	80.3	57	417	32 U	126 U	313	85.5	49995	6 U	1339	104	6	41 U	3 U	3 U	26 U	193	54 U	7466	41	124
2/12/2014	0214BB-SO25-00	140	214	329 U	27 U	83 U	202 U	807	31682	6	2945	20	8.5	30 U	90.3	4 U	20 U	220	47 U	3509	1932	179
2/12/2014	0214BB-SO26-00	68	74	456	30 U	92.8	350	60	44601	6 U	606	12	7	34 U	3	2 U	22 U	133	52 U	4845	43	116
2/12/2014	0214BB-SO27-00	70 U	262	632	33 U	94.5 U	320	843.5	34654	7 U	2910	12	10	32 U	89.8 U	4 U	21 U	216	58 U	4201	1938	190
2/12/2014	0214BB-SO28-00	69	171	542	29 U	151	347	115	48499	7	345	35	5 U	35 U	4	2 U	21 U	80.3	50 U	7330	41	140
2/12/2014	0214BB-SO28-30	73	217 U	659	28 U	95 U	274 U	818.8 U	38000	8	2911	23	10 U	36 U	92	4 U	23 U	211	48 U	4569	1906	185
2/12/2014	0214BB-SO29-00	105 U	117	515	28 U	131	615	99	77870	7	641	11	6	41 U	7	2 U	22 U	120	48 U	10376	64	170
2/12/2014	0214BB-SO30-00	60 U	117	576	28 U	150	548	136	57813	11	886	19	6	37 U	15	2 U	21 U	86.3	47 U	6876	65	125
2/15/2014	0214BB-SO31-00	49	74	568	26 U	109 U	487	99	49637	189	990	20	7 U	34 U	5 U	2 U	21 U	190	45 U	6650	63	134
2/15/2014	0214BB-SO35-30	57 U	50	472	27 U	111 U	450	128	47484	289	702	16	5 U	34 U	15	2 U	21 U	138	47 U	7066	94.8	133
2/15/2014	0214BB-SO32-00	49 U	233 U	370	27 U	80.8 U	205 U	819 U	30392	18	3034.3	34	9.5 U	30 U	96	4 U	21 U	218	46 U	3729	2020	156
2/15/2014	0214BB-SO33-00	55 U	244	352 U	30 U	105 U	363	847	44333	31	3516.5	27	11	37 U	59.8	4 U	23 U	232	50 U	4649	1928	152
2/15/2014	0214BB-SO34-00	51 U	48	504	27 U	96	349	68.8	42079	8	776.3	11	7	35 U	15	2 U	23 U	127	47 U	5570	357	108
2/15/2014	0214BB-SO35-00	45 U	229	408	25 U	81.3 U	215 U	846	27784	21	2927.3	24	9.3	30 U	92	4 U	21 U	222	42 U	3395	1912	158

* ***Notes***:
- CLP: contract laboratory program
- ID: identification
- J: estimated
- MEL: Manchester Environmental Laborator
- mg/kg: milligram per kilogram

Analytical Method / Laboratory		FPXRF SIEVED																				
	Chemical Name	ANTIMONY	ARSENIC	BARIUM	CADMIUM	CHROMIUM	COBALT	COPPER	Iron	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	Rubidium	SELENIUM	SILVER	STRONTIUM	TIN	TITANIUM	ZINC	ZIRCONIUM
Sample Date	Sample ID	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q
2/11/2014	0214BB-SO2-00	44 U	96	678	24 U	77 U	239	107	26754	10	431	122	6	29 U	112	3 U	20 U	253	40 U	3250	328	250
2/11/2014	0214BB-SO3-00	49 U	62	519	26 U	98	483	101	51439	8	1195	15	6	35 U	15	2 U	20 U	235	44 U	6139	126	106
2/11/2014	0214BB-SO4-00	47 U	51	681	25 U	75 U	283	79	39786	7	912	25	11	28 U	14	2 U	18 U	170	43 U	4581	107	87
2/11/2014	0214BBM-SO5-00	47 U	25 U	671	25 U	167 U	2260	111	187951	7	781	19	17	63 U	14	4 U	26 U	132	43 U	5133	992	69
2/11/2014	0214BB-SO10-00	43 U	66	459	23 U	108	387	102	45620	14	1076	186	5 U	32 U	13	2 U	19 U	246	40 U	5497	200	115
2/11/2014	0214BB-TMM1-SO-A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM2-SO-A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM2-SO-B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM2-SO-C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM2-SO-D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM2-SO-E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM2-SO-F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM2-SO-G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM3-SO-A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM3-SO-B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM3-SO-C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM3-SO-D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM3-SO-E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM3-SO-F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM3-SO-G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO6-00	49 U	66	777	26 U	112	383	100	45009	6	1129	16	4 U	31 U	14	2 U	19 U	162	45 U	5050	177	106
2/11/2014	0214BB-SO7-00	47 U	78	762	25 U	94 U	522	118	56824	6	1267	40	11	35 U	19	2 U	20 U	217	43 U	5749	251	112
2/11/2014	0214BB-SO8-00	47 U	68	675	25 U	101	466	104	48495	10	1220	8	5 U	33 U	13	2 U	19 U	153	43 U	5365	193	114
2/11/2014	0214BB-SO9-00	47 U	73	600	25 U	86 U	393	106	46443	7	1047	42	5	32 U	13	2 U	20 U	246	43 U	5292	199	119
2/11/2014	0214BB-SO11-00	259	5 U	376	24 U	63 U	67 U	13 U	11939	12	134	341	5	22 U	123	2 U	19 U	173	42 U	3043	18	196
2/11/2014	0214BB-SO12-00	49 U	725	652	26 U	105 U	156 U	3160	42598	12	10785	65	21	39 U	135	7 U	24 U	350	45 U	3434	7440	121
2/11/2014	0214BB-SO13-00	48 U	84	623	25 U	74 U	233	106	26205	10	378	47	5 U	29 U	108	4	20 U	251	44 U	2787	331	248
2/11/2014	0214BB-SO14-00	48 U	125	674	26 U	153	593	139	60545	10	1111	179	5 U	36 U	18	2 U	20 U	80	45 U	7295	78	132
2/11/2014	0214BB-SO15-00	44 U	47	274	24 U	73 U	463	111	42200	5	664	193	4 U	29 U	9	2 U	18 U	126	41 U	5760	70	104
2/11/2014	0214BB-SO16-00	235	20	679	27 U	83 U	679	123	51505	21	561	600	5 U	33 U	20	2 U	19 U	79	47 U	6345	55	93
2/11/2014	0214BB-SO17-00	168	401	330	23 U	60 U	456	205	56228	17	503	687	6	30 U	6	2 U	18 U	280	38 U	10701	48	161
2/11/2014	0214BB-SO18-00	185	20	659	26 U	81 U	544	131	55451	21	659	661	5 U	33 U	17	2 U	19 U	109	45 U	6726	54	95
2/11/2014	0214BB-SO19-00	214	111	638	27 U	167	698	156	70375	18	1251	607	5 U	37 U	23	2 U	20 U	97	47 U	7947	85	141
2/11/2014	0214BB-SO20-00	50 U	29	889	26 U	84 U	678	127	61243	6	679	42	5 U	34 U	23	2 U	19 U	76	46 U	8227	64	102
2/11/2014	0214BB-GSS1-SO-A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS2-SO-A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS2-SO-B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS2-SO-C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS2-SO-D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS2-SO-E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS2-SO-F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS2-SO-G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS3-SO-A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS3-SO-B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS3-SO-C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS3-SO-D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS3-SO-E	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS3-SO-F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS3-SO-G	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/12/2014	0214BB-SO21-00	88	34	351 U	27 U	82 U	674	116	54526	35	622	260	5 U	33 U	23	2 U	19 U	88.5	47 U	8316	60	150
2/12/2014	0214BB-SO22-00	115	139	263 U	25 U	181	716	149	64423	6	1016	83	5 U	36 U	18	2 U	19 U	76	43 U	7907	85	129
2/12/2014	0214BB-SO23-00	48 U	21	308	25 U	88 U	700	131	61143	5 U	627	12	5 U	35 U	20	2 U	19 U	89	44 U	8163	62	105
2/12/2014	0214BB-SO1-00	52	774	376	26 U	106 U	160 U	3206	44544	7	11061	15	21	39 U	133	7 U	24 U	351	45 U	3687	7538	126
2/12/2014	0214BB-SO1-30	48	134	489	23 U	111	520	139	66466	9	1342	11	4 U	33 U	18	2 U	18 U	82	40 U	8523	86	130
2/12/2014	0214BB-SO24-00	69	51	312	25 U	90 U	688	120	66260	6	899	208	5	36 U	19	2 U	20 U	127	43 U	11027	81	122
2/12/2014	0214BB-SO25-00	160	33	395	26 U	73 U	458	61	39477	8	1521	26	5	28 U	12	2 U	18 U	63	45 U	5557	52	185
2/12/2014	0214BB-SO26-00	67	454	507	27 U	94	566	101	57947	7	142	26	5 U	34 U	2 U	3	19 U	429	46 U	10941	24	177
2/12/2014	0214BB-SO27-00	53 U	361	941	28 U	83 U	446	224	48029	9	542	19	5 U	32 U	6	3 U	19 U	270	48 U	8854	57	152
2/12/2014	0214BB-SO28-00	51 U	474	577	26 U	94 U	604	114	57226	14	73 U	30	6	35 U	2 U	3 U	20 U	448	46 U	10446	25	173
2/12/2014	0214BB-SO28-30	62	491	518	27 U	91 U	626	122	68677	10	1248	30	5 U	36 U	3	3 U	19 U	395	47 U	9525	22	158
2/12/2014	0214BB-SO29-00	53	88	320 U	26 U	130	679	135	63399	8	1453	13	7	36 U	2	2 U	20 U	219	45 U	8603	78	140
2/12/2014	0214BB-SO30-00	76	105	369	23 U	61 U	385	90	64457	14	951	19	5	32 U	9	2 U	18 U	206	40 U	9984	84	153
2/15/2014	0214BB-SO31-00	47 U	5 U	531	25 U	63 U	64 U	13 U	10825	184	189	18	5 U	23 U	120	2 U	19 U	174	43 U	2545	21	180
2/15/2014	0214BB-SO35-30	47 U	226	400	25 U	188	494	145	61976	185	587	19	5 U	35 U	3	2 U	20 U	80	43 U	8163	50	152
2/15/2014	0214BB-SO32-00	47 U	742	732	25 U	104 U	154 U	3099	41736	21	10871	51	20	39 U	130	7 U	23 U	344	43 U	3381	7309	120
2/15/2014	0214BB-SO33-00	46 U	92	488	24 U	75 U	189	96	25895	36	376	28	5 U	30 U	110	3 U	20 U	246	42 U	2682	329	239
2/15/2014	0214BB-SO34-00	46 U	76	341	24 U	83 U	405	59	53758	8	628	17	5 U	33 U	3	2 U	19 U	113	42 U	5094	45	111
2/15/2014	0214BB-SO35-00	46 U	115	535	25 U	110	349	99	39555	24	781	30	5 U	31 U	3	2 U	19 U	170	43 U	6362	58	133

* ***Notes***:
- CLP: contract laboratory program
- ID: identification
- J: estimated
- MEL: Manchester Environmental Laboratory
- mg/kg: milligram per kilogram

Analytical Method / Laboratory		FPXRF Replicate Splits from Incremental Samples																				
Chemical Name		ANTIMONY	ARSENIC	BARIUM	CADMIUM	CHROMIUM	COBALT	COPPER	Iron	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	Rubidium	SELENIUM	SILVER	STRONTIUM	TIN	TITANIUM	ZINC	ZIRCONIUM
Sample Date	Sample ID	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q	Result (mg/kg) Q
2/11/2014	0214BB-SO2-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO3-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO4-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BBM-SO5-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO10-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-TMM1-SO-A	78	136	763	23 U	63 U	587	136	66645	12	1105	216	7	32 U	19	2 U	18 U	144	40 U	9135	71	148
2/11/2014	0214BB-TMM1-SO-B	60	122	640	23 U	61 U	436	128	62051	10	826	268	5	30 U	16	2 U	17 U	142	39 U	8757	65	150
2/11/2014	0214BB-TMM1-SO-C	151	107	546	28 U	183	526	155	63755	13	808	228	5 U	36 U	16	2 U	19 U	87	47 U	7105	73	134
2/11/2014	0214BB-TMM1-SO-D	54	146	695	23 U	61 U	607	153	66757	13	656	264	4	32 U	18	2 U	18 U	144	39 U	9372	68	149
2/11/2014	0214BB-TMM1-SO-E	50 U	5 U	334 U	27 U	64 U	64 U	13 U	10572	14	141	184	5 U	23 U	126	2 U	19 U	183	46 U	2137	25	159
2/11/2014	0214BB-TMM1-SO-F	61	744	471	26 U	105 U	154 U	3153	41916	9	10832	228	23	38 U	134	7 U	23 U	346	45 U	3528	7376	121
2/11/2014	0214BB-TMM1-SO-G	72	125	477	23	57 U	481	123	56546	14	726	171	6	30 U	16	2 U	17 U	148	39 U	8872	64	147
2/11/2014	0214BB-TMM2-SO-A	50 U	113	690	27 U	166	583	134	63984	13	912	192	5 U	37 U	15	2 U	20 U	91	46 U	8104	72	136
2/11/2014	0214BB-TMM2-SO-B	62	138	459	27 U	103 U	867	107	82316	7	894	176	5 U	40 U	9	2 U	20 U	119	46 U	11307	74	182
2/11/2014	0214BB-TMM2-SO-C	43 U	130	462	23 U	62 U	519	146	66474	15	1161	211	6	32 U	19	2 U	18 U	146	40 U	10109	72	142
2/11/2014	0214BB-TMM2-SO-D	44 U	131	595	23 U	61 U	542	141	67097	14	1156	220	8	33 U	20	2 U	18 U	145	40 U	9962	68	148
2/11/2014	0214BB-TMM2-SO-E	51	111	789	23 U	59 U	646	155	63160	8	703	195	4 U	31 U	18	2 U	18 U	145	39 U	9006	65	148
2/11/2014	0214BB-TMM2-SO-F	67	109	648	23 U	58 U	585	137	63087	16	696	188	6	32 U	17	2 U	18 U	143	39 U	8980	72	151
2/11/2014	0214BB-TMM2-SO-G	62	126	547	23 U	56 U	563	147	56102	14	744	174	4 U	29 U	15	2 U	17 U	147	39 U	8637	64	150
2/11/2014	0214BB-TMM3-SO-A	82	92	469	27 U	88 U	481	114	58119	8	828	146	5 U	34 U	9	2 U	19 U	170	46 U	8568	79	142
2/11/2014	0214BB-TMM3-SO-B	48	115	464	23 U	59 U	550	133	60991	10	759	174	4 U	32 U	18	2 U	17 U	152	39 U	8916	63	141
2/11/2014	0214BB-TMM3-SO-C	69	114	558	23 U	57 U	612	121	62159	11	743	185	7	31 U	20	2 U	18 U	151	39 U	9019	72	143
2/11/2014	0214BB-TMM3-SO-D	56	109	564	23 U	62 U	498	144	62885	12	757	181	5	31 U	18	2 U	18 U	144	40 U	8697	63	141
2/11/2014	0214BB-TMM3-SO-E	82	112	735	23 U	62 U	441	142	62929	10	775	192	6	32 U	19	2 U	18 U	140	40 U	8475	69	144
2/11/2014	0214BB-TMM3-SO-F	83	111	428	26 U	181	624	150	63053	11	819	168	5 U	36 U	16	2 U	19 U	89	46 U	8050	68	131
2/11/2014	0214BB-TMM3-SO-G	67	116	472	23 U	58 U	460	133	58096	7	767	179	6	30 U	16	2 U	18 U	213	40 U	8231	59	153
2/11/2014	0214BB-SO6-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO7-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO8-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO9-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO11-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO12-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO13-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO14-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO15-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO16-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO17-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO18-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO19-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-SO20-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/11/2014	0214BB-GSS1-SO-A	52 U	53	640	28 U	81 U	430	221	45796	5 U	647	12	4 U	30 U	15	2 U	19 U	145	48 U	7231	93	124
2/11/2014	0214BB-GSS1-SO-B	51 U	44	614	27 U	80 U	441	91	47945	6	703	11	4 U	31 U	14	2 U	18 U	138	47 U	6997	82	115
2/11/2014	0214BB-GSS1-SO-C	52 U	61	607	28 U	143	367	110	47307	6	1122	10	4 U	31 U	15	2 U	19 U	157	48 U	4813	188	96
2/11/2014	0214BB-GSS1-SO-D	51 U	47	512	27 U	79 U	501	67	45932	8	870	13	4 U	31 U	15	2 U	18 U	123	47 U	6735	396	122
2/11/2014	0214BB-GSS1-SO-E	45 U	40	531	24 U	78	581	93	63903	6	1235	11	4 U	32 U	14	2 U	18 U	133	41 U	10097	98	151
2/11/2014	0214BB-GSS1-SO-F	52 U	5 U	738	28 U	61 U	57 U	12 U	8909	8	144	17	6	22 U	121	2 U	19 U	166	48 U	1755	20	121
2/11/2014	0214BB-GSS1-SO-G	44 U	46	559	24 U	64 U	560	98	64831	5 U	1101	20	4 U	32 U	16	2 U	18 U	122	41 U	10333	98	156
2/11/2014	0214BB-GSS2-SO-A	51 U	71	390	28 U	99	474	120	50436	8	1090	14	4 U	32 U	16	2 U	19 U	176	47 U	6041	133	105
2/11/2014	0214BB-GSS2-SO-B	46	46	584	24 U	64 U	617	94	65110	5 U	1245	16	4 U	32 U	15	2 U	18 U	131	41 U	9685	100	165
2/11/2014	0214BB-GSS2-SO-C	44 U	38	382	24 U	64 U	500	89	64512	5 U	1121	14	4 U	32 U	16	2 U	18 U	137	41 U	9948	98	158
2/11/2014	0214BB-GSS2-SO-D	43 U	42	378	23 U	62 U	507	98	64820	5	1117	18	6	32 U	15	2 U	18 U	125	40 U	10161	97	159
2/11/2014	0214BB-GSS2-SO-E	44 U	41	600	24 U	65 U	548	92	67676	7	1412	15	4 U	33 U	18	2 U	18 U	128	41 U	11095	95	170
2/11/2014	0214BB-GSS2-SO-F	44 U	51	737	23 U	64 U	515	100	64780	5 U	1436	21	4 U	32 U	18	2 U	18 U	135	40 U	9417	95	168
2/11/2014	0214BB-GSS2-SO-G	50 U	63	408	27 U	81 U	439	122	48308	7	1276	12	4 U	32 U	14	2 U	19 U	162	46 U	5264	224	92
2/11/2014	0214BB-GSS3-SO-A	43 U	39	585	23 U	62 U	536	105	64334	7	1494	16	4 U	31 U	16	2 U	18 U	133	40 U	10252	96	164
2/11/2014	0214BB-GSS3-SO-B	44 U	41	664	23 U	62 U	575	97	65213	6	1151	17	4 U	32 U	17	2 U	18 U	128	40 U	9550	97	162
2/11/2014	0214BB-GSS3-SO-C	43 U	40	611	23 U	62 U	566	82	65288	8	1076	11	4 U	31 U	16	2 U	18 U	135	40 U	9982	98	163
2/11/2014	0214BB-GSS3-SO-D	44 U	40	573	24 U	64 U	520	98	65410	5	1143	17	6	32 U	16	2 U	18 U	131	40 U	9890	105	163
2/11/2014	0214BB-GSS3-SO-E	44 U	43	668	24 U	64 U	523	87	65819	6	1145	18	6	31 U	16	2 U	18 U	132	41 U	9754	96	168
2/11/2014	0214BB-GSS3-SO-F	44 U	43	564	24 U	62 U	620	75	65112	7	1176	16	4 U	32 U	16	2 U	18 U	131	41 U	9828	97	161
2/11/2014	0214BB-GSS3-SO-G	43 U	40	492	23 U	62 U	435	96	63249	9	1169	12	5	31 U	17	2 U	18 U	133	40 U	9870	100	157
2/12/2014	0214BB-SO21-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/12/2014	0214BB-SO22-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/12/2014	0214BB-SO23-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/12/2014	0214BB-SO1-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/12/2014	0214BB-SO1-30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/12/2014	0214BB-SO24-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/12/2014	0214BB-SO25-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/12/2014	0214BB-SO26-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/12/2014	0214BB-SO27-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/12/2014	0214BB-SO28-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/12/2014	0214BB-SO28-30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/12/2014	0214BB-SO29-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/12/2014	0214BB-SO30-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/15/2014	0214BB-SO31-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/15/2014	0214BB-SO35-30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/15/2014	0214BB-SO32-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/15/2014	0214BB-SO33-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/15/2014	0214BB-SO34-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/15/2014	0214BB-SO35-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

* ***Notes***:
- CLP: contract laboratory program
- ID: identification
- J: estimated
- MEL: Manchester Environmental Laboratoı
- mg/kg: milligram per kilogram

Attachment B
Estimation of the Relative Standard Deviation of the Fundamental Error and Development of Laboratory Subsampling Protocol

Development of Procedure for Sample Preparation of Multi-Increment Soil Samples at Black Butte Mine Superfund Site, Douglass County, Oregon

1.0 Purpose/Objective

The incremental sampling (IS) method is being considered for sampling of trace metals in tailings, mineralized materials and soils at the Black Butte Mine Superfund Site. The IS method consists of collecting 30 or more increments from within one decision unit, combining these increments into one sample for laboratory analysis, and completing specific laboratory preparation and analysis procedures. The IS method is gaining increased acceptance in the environmental remediation community, and is described in recent guidance published by Army Corps of Engineers (2008), Hawaii Department of Health (HDH) (2008), Alaska Department of Environmental Conservation (ADEQ) (2009), US Environmental Protection Agency (EPA) (2006) and Interstate Technology and Regulatory Council (2014). The purpose of the IS method is to enhance sample representativeness to support investigation of contaminated sites.

The theoretical basis of IS sampling is based, in part, on the theory developed by Pierre Gy for sampling of particulate matter (HDH 2008; Pitard 1993; EPA 1999). Additional information regarding Pierre Gy's sampling theory is available in *Guidance for Obtaining Representative Analytical Subsamples from Particulate Laboratory Samples* (EPA 2003). Appropriate sample preparation (e.g. crushing, subsampling, grinding) and laboratory analysis of a subsample of sufficient mass is necessary to achieve an acceptable relative variance of the fundamental error (σ2FE). The σ2FE is caused by the constitutional heterogeneity of sample, and represents the minimum sampling error that would be expected if all other error sources are negligible (e.g. sample delimitation, chemical analysis, potential contamination etc.). In the IS method, the soil is commonly sieved to less than 2 millimeters (mm) prior to laboratory subsampling and a sample mass of 10 to 30 grams is analyzed in the laboratory (EPA 2006; ADEQ 2009). For many soil samples, this provides a relative standard deviation of the fundamental error (σFE) of less than 15 percent. This is based on evaluation of a simplified expression for σ2FE, which is only applicable if the contaminant of concern is not liberated from the soil matrix (Ramsey 2007).

Use of the standard IS method for metals analysis is problematic, because the standard laboratory analysis method specifies a sample mass of only 0.2 to 1 grams. In addition, the critical components at the Black Butte Mine Superfund Site (e.g. mercury) occur within coarse grained sulfide minerals and weathering products of those minerals. Therefore, use of the simplified expression for σ2FE is often applied in IS sampling (Ramsey 2007) is not appropriate for Black ButteMine IS samples, and the standard IS approach of sieving soil samples to less than 2 mm, subsampling, and analyzing 10-30 grams of sample may not provide an acceptable σFE.

The purpose of this calculation is to develop a sample preparation procedure including sieving, grinding and subsampling that will provide an acceptable σFE. This calculation is based on the theory of Pierre Gy and a detailed equation for σFE. For purposes of this investigation, a σFE of less than 15 percent is considered adequate. This corresponds to a σ2FE of 0.0225. Assuming a normal

distribution of the fundamental error, this provides 68 percent confidence that the laboratory result is within 15 percent of the true value, and 95 percent confidence that the laboratory result is within 30% of the true value (Ramsey 2007). It should be noted that other sampling or laboratory analysis errors are additive to the fundamental error, and are not considered in this evaluation.

2.0 Procedure

- Calculate constitutional heterogeneity of Formosa mine soil samples for Hg at various grain sizes
- Calculate σ2FE at various sample masses and grain sizes
- Plot a sampling nomograph showing the variation of the fundamental error with respect to grain size and sample mass
- Develop a sample preparation procedure using the sampling nomograph, which will provide a target relative standard deviation of the fundamental error of less than 15%

3.0 References/Data Sources

Hawaii State Department of Environmental Health (HDH), 2008, *Technical Guidance for the Implementation of the Hawaii State Contingency Plan, Section 4 Soil Sample Collection Approaches*, Interim Final.

Interstate Technology and Regulatory Council (2014), *Incremental sampling Methodology*, http://www.itrc.itrcweb.org/ISM-1/, accessed July 2014.

Pitard, F.T., 1993, *Pierre Gy's Sampling Theory and Sampling Practice: Heterogeneity, Sampling Correctness, and Statistical Process Control*, CRC Press, Boca Raton.

Ramsey, C. 2007, *Sampling for Defensible Environmental Decisions*, Short course manual presented April 30 to May 3, 2007, Envirostat.

State of Alaska Department of Environmental Conservation (ADEQ), 2009, *Draft Guidance on Multi Increment Sampling*.

US Environmental Protection Agency (EPA), 2003, *Guidance for Obtaining Representative Analytical Subsamples from Particulate Laboratory Samples* (EPA 1999), EPA/600/R-03/-27, November

US Environmental Protection Agency (EPA), 2006, *Method 8330B Nitromatics, Nitramines, and Nitrate Esteres by High Performance Liquid Chromatograohy*, Revision 2, October.

4.0 Assumptions

- This evaluation focuses on mercury, because it is the primary constituent of concern at the Black Butte Mine. The σ2FE for other trace elements may vary somewhat from the σ2FE for mercury.
- It is assumed that mercury present within tailings and mineralized materials at the site occurs within particles of cinnabar (HgS). Therefore, an average density of 8.2 g/cm3 is assumed.
- It is likely that cinnabar particles are liberated from the rock matrix. Therefore, the liberation factor is assumed to be 1 based on recommendations in *Guidance for Obtaining Representative Analytical Subsamples from Particulate Laboratory Samples* (EPA 2003).
- The proportion of mercury in the samples is assumed to be the mean concentration of those analytes in IS samples collected from the Tailings and Mineralized Material target population at the Black Butte Mine during February 2014. Based on analyses conducted at Manchester Environmental Lab, then mean concentration of the samples is 176 milligrams per kilogram (mg/kg)

5.0 Calculations

Calculation of mineralogical factor (c)

The mineralogical factor (c) is defined as the maximum heterogeneity that can occur within the sample (Pitard 1993; EPA 2003). This occurs when the constituent of interest is completely liberated from the matrix. The mineralogical factor is a function of the density of the particles containing the constituent of interest, and the decimal proportion of that constituent in the sample.

$\lambda_m := 8.2$ λm = Density of particles containing analyte

$a_{lhg} := .000176$ a_l = decimal proportion of mercury in sample

$$c_{hg} := \frac{\lambda_m}{a_{lhg}}$$

$c_{hg} = 46590.9091$

Liberation factor (l)

Because the mineralogical factor applies to the maximum heterogeneity when the constituent of interest is completely liberated, the liberation factor is applied as a correction factor to account for the degree of liberation of the constituent of interest (EPA 2003). The liberation factor is 1 when the constituent of interest is completely liberated, and ranges from 0 to 1 when the constituent of interest is partially liberated. The liberation factor is assumed to be 1 based on *Guidance for Obtaining Representative Analytical Subsamples from Particulate Laboratory Samples* (EPA 2003).

$l := 1$

Shape Factor

The shape factor (f) is a dimensionless factor that relates to how closely the shape of the particle approaches a cube. A shape factor of 0.5 is adequate for most minerals (EPA 2003).

$f := 0.5$

Granulametric Factor

The granulametric factor (g) takes into account that all particles are not the same size. The granulametric factor is 1 for perfectly calibrated material. It is 0.55 for material calibrated between two screens (Pitard 1993; EPA 2003).

$g := 0.55$

Calculation of Constitutional Heterogeneity

The constant factor of the constitutional heterogeneity (IH_l) is controlled by the difference in composition of of the particles that make up a sample regardless of the spatial distribution of the particles (Ramsey 2007). The constitutional heterogeneity is not affected by mixing or blending of the sample. The relative variance of the fundamental error is controlled by the constitutional heterogeneity and the sample mass (Pitard 1993).

$$d := \begin{pmatrix} 0.0075 \\ 0.015 \\ 0.025 \\ 0.071 \\ 0.1 \\ 0.17 \\ 0.15 \end{pmatrix}$$

200 mesh
100 mesh
60 mesh
24 mesh
16 mesh
10 mesh
1.5 mm

d is the particle diameter in centimeters at various stages of sample preparation

$$IH_{lhg} := \left(c_{hg} \bullet g \bullet f \bullet l \bullet \overrightarrow{d^3}\right)$$

$$IH_{lhg} = \begin{pmatrix} 0.0054 \\ 0.0432 \\ 0.2002 \\ 4.5857 \\ 12.8125 \\ 62.9478 \\ 43.2422 \end{pmatrix}$$

200 mesh
100 mesh
60 mesh
24 mesh
16 mesh
10 mesh
1.5 mm

Preparation of Sampling Nomograph

The sampling nomograph is a two dimensional representation of the relationship between the FE, the sample mass and the particle diameter. It provides a valuable tool to assess and develop sample preparation procedures, which will maintain the FE below a value that is specified in the data quality objectives of the sampling and analysis plan. For this evaluation a σFE of the fundamental error of 15 percent or less is targeted. This equates to a σ2FE of 0.0225.

The relative variance of the fundamental error [σ2FE] is described by the following equation (EPA 2003):

$$\sigma 2\,FE := \left(\frac{1}{M_s} - \frac{1}{M_l}\right) IH_l.$$

where: Ms is the mass of the lot and Ms is mass of the sample

Assuming that the mass of the lot is large with respect to the mass of the sample, s^2(FE) is approximately described by:

$$\sigma 2FE := \frac{IH_l}{M_s}$$

where: $IH_l = cgfld^3 = Cd^3$

Taking the log on both sides provides:

$$\log(\sigma 2FE) = \blacksquare \bullet \log(C) + 3\log(d) - \log(M_s)$$

For a given particle size d and sampling constant C, the value of logσ2(FE) becomes directly proportional to -log Ms, and the derivative of the function logσ2(FE) is equal to -1. This means that the line representing the variation of logσ2(FE) as a function of -log Ms for a given particle size d and sampling constant C has a slope on the nomograph of -1 (Pitard 1993; EPA 2003).

The sampling nomograph is constructed by calculating σ2FE at one sample mass for each particle size. A line of slope -1 is then plotted from the calculated points, which describes the variation in σ2FE with sample mass at the given particle size. A horizontal line is then plotted at the selected value of σ2FE, which is 0.0225 for this calculation. This corresponds to a relative standard deviation of the fundamental error of 15 percent.

$$M_s := \begin{pmatrix} 1 \\ 10 \\ 10 \\ 10 \\ 100 \\ 100 \\ 10 \end{pmatrix} \quad \begin{matrix} \text{200 mesh} \\ \text{100 mesh} \\ \text{60 mesh} \\ \text{24 mesh} \\ \text{16 mesh} \\ \text{10 mesh} \\ \text{1.5 mm} \end{matrix}$$

Selected mass of sample in grams to prepare nomograph

$$\sigma 2FE_{hg} := \overrightarrow{\left(\frac{IH_{lhg}}{M_s}\right)}$$

$$\sigma 2FE_{hg} = \begin{pmatrix} 0.0054 \\ 0.0043 \\ 0.02 \\ 0.4586 \\ 0.1281 \\ 0.6295 \\ 4.3242 \end{pmatrix} \quad \begin{matrix} \text{200 mesh} \\ \text{100 mesh} \\ \text{60 mesh} \\ \text{24 mesh} \\ \text{16 mesh} \\ \text{10 mesh} \\ \text{1.5 mm} \end{matrix}$$

The sampling nomograph for mercury is shown as Figure 1.

3.0 Development of a Sample Preparation Protocol for Black Butte Mine Samples

The sample preparation protocol is based on the mercury sampling nomograph. The sampling protocol is developed based on a target σFE of the fundamental error of less than 15 percent, and to split the samples down to a final laboratory analysis mass of either 0.2 grams or ten grams. The 0.2 gram gram final analysis mass is necessary to meet the EPA contract laboratory requirements for analysis of mercury. Laboratory analysis of a ten gram sample mass is also being considered to simplify the sample preparation protocol. The final mass (0.2 grams or ten grams) will be dependent on assessment of the cost and availability of labs willing to digest and analyze a ten gram aliquot and other factors.

As shown on the attached sampling nomograph, the sample preparation protocol should contain the following steps:

- Collect initial MIS sample mass of at least 2 kilograms;
- Sieve the entire sample to -1.5 mm;
- Crush entire 2 kilogram sample to -60 mesh;
- Split laboratory subsample of 10 grams mass for analysis.

This selected sample preparation protocol is shown graphically on the arsenic sampling nomographs in Figure 1.

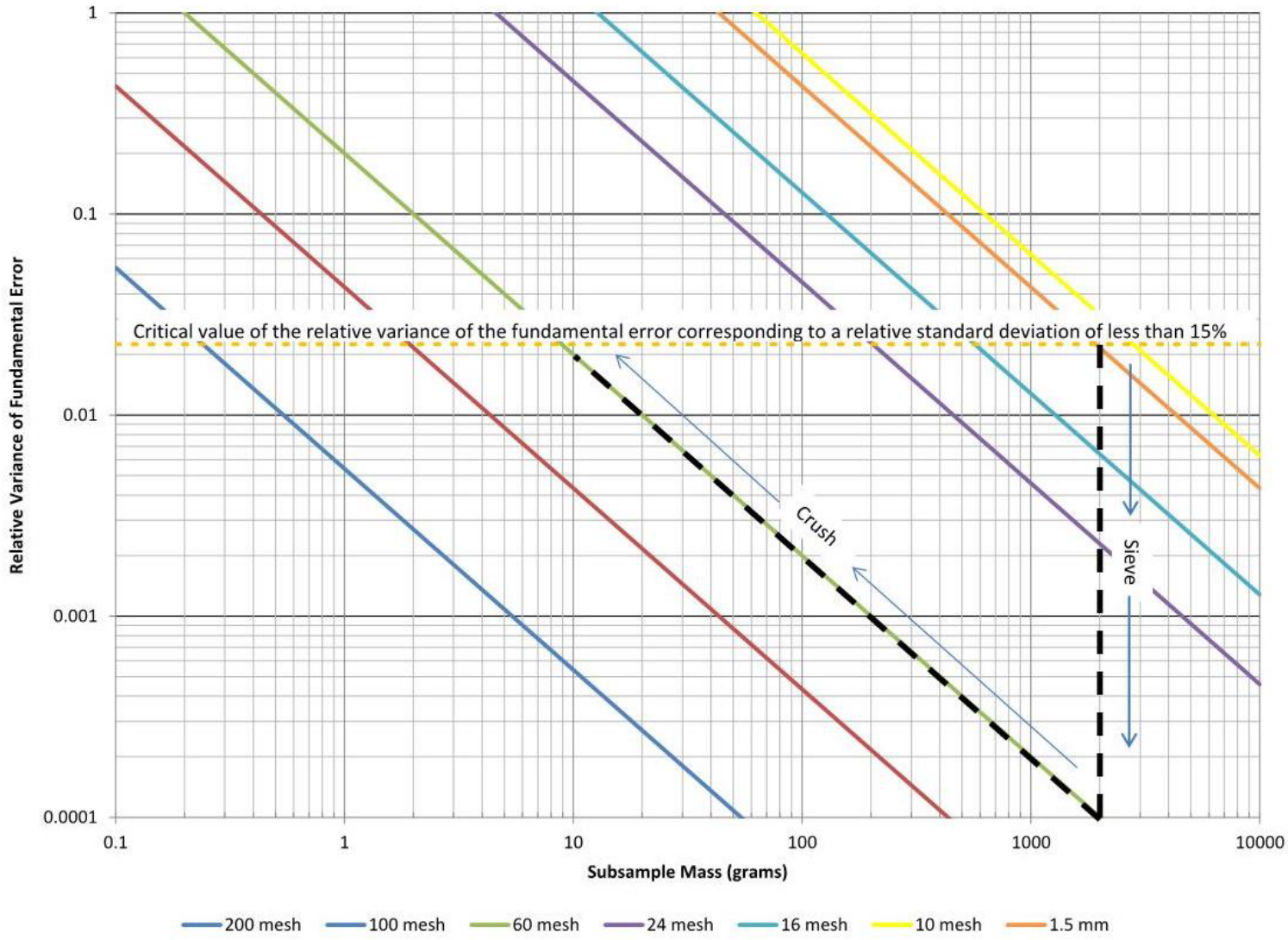

Figure 1. Sampling nomograph showing proposed IS sample preparation procedure, which is designed to maintain the relative variance of the of the fundamental error to less than 0.0.0225, which corresponds to a relative standard deviation of the fundamental error of less than 15 percent.

Appendix C

Data Validation and Usability Narrative

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Attachment A Data Validation Summaries

Section 1

Introduction

Data generated by the contract laboratory program (CLP) laboratories were validated by a Region 10 EPA chemist electronically and manually to the Stage 4 level (S4VEM) level and data generated by Manchester Environmental Laboratory (MEL) were verified with all the steps of Level 4 validation by a supervisory chemist at MEL. Subcontractor data were manually validated to the Stage 4 level (S4VM) by a CDM Smith chemist. Region 10 EPA provided validation reports and EDDs with data qualifiers applied for CLP data. MEL provided Quality Assurance reports with the results of their validation and EDDs with data qualifiers applied. Validation reports were generated for the subcontract laboratory data and data qualifiers were applied to EDDs. The validation and quality assurance reports are provided in Attachment A to this appendix. Samples were collected under the following applicable QAPPS: *Final Black Butte Mine Phase 1 Remedial Investigation – Surface Water Storm Sampling and Sediment Sampling Quality Assurance Project Plan*, dated December 14, 2012 (BBM QAPP 1), the *Final Quality Assurance Project Plan for Black Butte Mine Phase 1 Remedial Investigation – Soil, Groundwater Investigation and Summer Quarter Baseline Surface Water Sampling*, dated June 14, 2013 (BBM QAPP 2), and the *Final Quality Assurance Project plan for Black Butte Mine Phase 2 Remedial Investigation – Demonstration of Methods Applicability*, dated December 31, 2013 (BBM QAPP 3) and all Sample Plan Alteration Forms (SPAFs) associated with these QAPPs. Validation was performed according to the Quality Assurance Project Plans (QAPPs), the analytical methods, and USEPA CLP National Functional Guidelines for Inorganic Superfund Data Review (EPA 2010) (NFGs). All sample result qualifiers were applied to the sample results in the database and tables presented herein. One hundred percent of the chemistry data were validated. All data were evaluated and determined usable. No data was rejected. No data was reported for the nitrate plus nitrite and total alkalinity analyses of the precipitation sample collected during Storm Event #3 due to inadvertent incorrect preservation of the sample collection bottle in the field.

Achievement of the DQOs was determined by the use of data quality indicators (DQIs). DQI criteria were established in the QAPPs and are expressed in terms of precision, accuracy, representativeness, comparability, completeness and sensitivity (PARCCS) parameters. Precision and accuracy are quantitative parameters that are measured with results from quality control (QC) samples. Data validation criteria for the acceptance of data on the basis of these QC sample results are defined in the NFGs and the QAPP. According to the NFGs, data were accepted, or accepted as estimated (qualified "J", "J+", "J-", or "UJ"). The validation reports for the data are included in this appendix. No data was rejected and all of the samples planned for collection were collected, with the exception of the nitrate plus nitrite and total alkalinity for the precipitation sample collected during Storm Event #2, yielding a completeness value of 99.34% overall for Storm Event #2. All analyses planned and collected for the November 2014 GW sampling, the February 2014 Storm Event #3 sampling, and the February 2014 Demonstration of Methods Applicability (DMA) sampling were successfully completed, yielding completeness values of 100% for these sampling events.

Notably, there were some metals that were not detected in the various media that had reporting levels above the screening criteria used in this report. These instances are presented below:

Surface Water

- Cadmium – The reporting level equal to 1 microgram per liter (µg/L) is above the screening criteria of 0.25 µg/L.
- Silver - The reporting level equal to 1 µg/L is above the screening criteria of 0.12 µg/L.

Groundwater

- Selenium - The reporting level equal to35 µg/L is above the screening criteria of 10 µg/L.

The screening criteria of 10 µg/L for the selenium in groundwater can be achieved with analysis by inductively coupled plasma- mass spectroscopy (ICP-MS), which has a contract required reporting level (CRQL) of 5 µg/L. Groundwater samples collected in May 2014 were analyzed by ICP-MS for selenium results rather than inductively coupled plasma – atomic emission spectroscopy (ICP-AES). Selenium was not detected at a reporting limit which met the data quality objectives.

Section 2

October 2013 Background Sediment Sampling

Thirty-seven sediment samples (thirty-six primary samples and one field duplicate sample) and two rinsate blanks were collected in October 2013 and analyzed for methyl mercury by Brooks Rand Laboratories, Contract Laboratory Program (CLP) Target Analyte List (TAL) metals including mercury by EPA CLP laboratory A4 Scientific, total organic carbon (TOC) and sulfate by EPA Region 10 MEL, and acid volatile sulfide (AVS) and grain size by ALS Kelso.

The discussion of the CLP TAL metals, methyl mercury, AVS, and grain size data were included in the *Final Black Butte Mine OU1 Data Summary Report*, dated July 24, 2014. At the time of the preparation of that report, the electronic data deliverable for the TOC and sulfate analyses had not been received. Discussion of the data validation of the TOC and sulfate data is provided in the addendum.

All TOC and sulfate data is considered usable with no qualification for quality control analyses.

No TOC or sulfate were reported in the blanks.

The Laboratory Control Sample recoveries for the TOC and sulfate analyses results met the control limits.

A matrix spike was performed for the sulfate analysis and two matrix spike analyses were performed for the TOC analysis. All recoveries met the control limits.

A laboratory sample duplicate was performed for the sulfate analyses and two samples duplicate analyses were performed for the TOC analyses. All RPDs for sample duplicate analyses met the control limits.

One field duplicate for the sulfate analyses was collected and analyzed, which met the requirements of the QAPP. The RPD met the QAPP control limit of 50%.

Section 3

November 2013 Storm Surface Water Sampling Event #2

Twenty-three surface water samples, a precipitation sample, and three field blanks were collected during the second storm event sampling in November 2013. The samples were analyzed for CLP TAL total and dissolved metals, excluding mercury, by EPA CLP laboratory A4, Scientific, Inc; total and dissolved low-level mercury; total and dissolved methyl mercury; anions (fluoride, chloride, and sulfate); total alkalinity; nitrate plus nitrite; and total suspended solids (TSS) by EPA Region 10 Manchester Environmental Laboratory (MEL). The samples were also analyzed for dissolved organic carbon (DOC), ultraviolet absorbance at 254 nanometers (UV_{254}), and Specific UV_{254} Absorbance ($SUVA_{254}$) by Amtest Laboratories in Redmond, Washington. The total low-level mercury and total methyl mercury analyses of the precipitation sample were analyzed by Frontier Global Sciences.

3.1 CLP TAL Metals (CLP Laboratory – A4 Scientific, Inc.)

All data is considered usable with qualification of selected results as noted in the following discussion.

The following metals results were qualified in selected samples as noted in the validation summaries for blank contamination: aluminum (Al), arsenic (As), barium (Ba), chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), nickel (Ni), silver (Ag), thallium (Tl), vanadium (V), and Zinc (Zn).

All laboratory control sample (LCS) results met the control limits.

Four matrix spikes were analyzed, (two each for total and dissolved fractions). All percent (%) recoveries were within the control limits.

Four laboratory sample duplicate analyses were performed (two for total and two for dissolved analyses). Lab duplicate relative percent differences (RPDs) were within the laboratory defined control limits of $\leq$ 20% or less than 2 times the Contract Required Quantitation Limit (< 2x CRQL).

Three field duplicates were collected for total and dissolved metals analyses, which met the one field duplicate per ten primary sample frequency required in the QAPP. All relative standard deviation (RSD) were within the control limits.

Serial dilutions were performed on four samples. All serial dilution results met the control limits.

3.2 Low-Level Mercury and Methyl Mercury (EPA Region 10 MEL)

All low level mercury and methyl mercury data is considered usable with qualification of some results as noted in the following discussion.

No low level mercury or methyl mercury results were qualified for laboratory blank contamination. Low-level mercury was reported in one field blank sample at a concentration slightly above the minimum reporting level (MRL) at 0.520 ng/L. Low-level mercury was reported in the other field

blank at a concentration below the MRL. The results for all field samples were greater than five times the highest concentration reported in the blank and no data were qualified on the basis of the field blanks.

All LCS results met the control limits.

Six MS analyses (three for total and three for dissolved) were performed for the low level mercury analyses with all recoveries meeting the control limits. Seven MS analyses (four for total and three for dissolved), were performed for the methyl mercury analyses. All recoveries met the control limits.

Six laboratory sample duplicate analyses (three for total and three for dissolved) were performed for the low level mercury analyses and six MS analyses (three for total and three for dissolved), were performed for the methyl mercury analyses. All RPDs met the control limits.

Three field duplicates for total and dissolved low level mercury and methyl mercury were collected and analyzed. All RPDs met the QAPP control limit of 50%.

The methyl mercury results for six samples were qualified as estimated (J+) based on a potential positive interference in the methyl mercury analysis. EPA method 1630 notes that if inorganic mercury is present at high levels, the mercury can react with organic material in a sample to form methyl mercury during the distillation step of the analysis. The data reviewer noted that inorganic mercury in the samples was high relative to the methyl mercury. The laboratory performed spikes on representative sample, which had low levels of inorganic mercury and in which methyl mercury was not detected. Based on the results of these spikes, six samples were qualified as estimated (J) by the MEL supervisory chemist who verified the data. Because this potential bias is positive, CDM Smith revised the "J" qualifiers to "J+".

3.3 Total Low-Level Mercury and Total Methyl Mercury of the Precipitation Sample (Frontier Global Sciences)

The total low-level mercury and methyl mercury data for the precipitation sample are considered usable with no qualification for quality control analyses.

No total low-level mercury and methyl mercury results were qualified for blank contamination.

All LCS and laboratory control sample duplicate (LCSD) results met the control limits.

Matrix QC (MS/MSD, laboratory duplicates, and field duplicates) were not required for the total-low-level and total methyl mercury precipitation analyses per the QAPP.

3.4 General Chemistry Parameters (EPA Region 10 MEL: TSS, anions, nitrate plus nitrite)

All general chemistry data is considered usable with no qualification with the exception of the anions. Data for anions, alkalinity, and nitrate plus nitrite in the precipitation sample were not reported because these analyses were collected in a bottle with incorrect preservative. The samples for these analyses were inadvertently collected in a bottle with nitric acid preservative (correct preservation is sulfuric acid for the nitrate plus nitrite analysis and no preservation other than chilling for the anion and alkalinity analyses). No data has been reported for alkalinity or nitrate plus nitrite analyses, and data for the anion analyses have been reported as estimated (J).

No general chemistry results were qualified for blank contamination.

All LCS results met the control limits.

MS/MSD analyses were performed on four samples for the anions analyses, two samples for nitrate plus nitrite, and two samples for total alkalinity. All recoveries and RPDs met the quality control limits.

Four laboratory sample duplicates were performed for the anion analyses, two for the nitrate plus nitrite analyses, two for the total alkalinity analyses, and two for the TSS analyses. All RPDs met the laboratory defined control limits.

Three field duplicates for the anion, nitrate plus nitrite, total alkalinity, and TSS analyses were submitted, which met the requirements of the QAPP. All RPDs met the QAPP control limit of 50%.

3.5 DOC, UVA254, and SUVA254 (AmTest Laboratories)

All DOC, UV254, and SUVA254 data is considered usable with qualification of some results as noted in the following discussion.

No DOC results were qualified for blank contamination. The UV254 result for the field blank showed a detection slightly above the reporting level of 0.002 liter/milligram-meter L/mg-M at 0.003 L/mg-M. All samples showed UV254 results greater than ten times the level detected in the field blank except for sample the two samples collected from Furnace Creek (113BBM-FC1-SW-000 and 1113BBM-FC1-SW-003). The UV254 results for these two samples have been qualified as not detected.

The Standard Reference Materials (SRMs) recoveries for the DOC and UV254 analyses results met the control limits.

Five MS's were performed for the DOC analyses and all recoveries and RPDs met the control limits.

Five laboratory sample duplicates were performed for the UV254 analyses. All RPDs for sample duplicate analyses met the control limits.

Three field duplicates for the DOC, UV254, or SUVA254 analyses were collected and analyzed, which met the requirements of the QAPP. All RPDs met the QAPP control limit of 50%.

Section 4

November 2013 Groundwater Sampling

Ten groundwater samples, one field duplicate and one field blank were collected during groundwater sampling in November 2013. The groundwater samples were analyzed for dissolved CLP TAL metals, excluding mercury, by EPA CLP laboratory Chemtech Consulting Group; dissolved low-level mercury and methyl mercury; anions (fluoride, chloride, and sulfate); nitrate plus nitrite; and total dissolved solids by EPA Region 10 MEL. The groundwater samples were also analyzed for DOC by Amtest Laboratories in Redmond, Washington.

4.1 CLP TAL Metals (CLP Laboratory –Chemtech Consulting Group)

No CLP TAL metals data for the surface water samples from August 2013 Surface Water sampling event has been rejected. All data is considered usable with qualification of some results as noted in the following discussion.

The following metals results were qualified in selected samples as noted in the validation summaries for blank contamination: Al, Sb, Ba, Ca, Fe, Mg, and Tl.

All LCS results met the control limits.

One MS analysis was performed. All recoveries in the MS analyses were within the control limits.

One laboratory sample duplicate analyses was performed. All RPDs met the control limits.

One field duplicates was collected and analyzed, which met the rate of one per ten primary samples required in the QAPP. All RPDs for the field duplicate and its parent samples met the QAPP control limit of 50%.

A serial dilution was performed on one sample for the metals analyses. All serial dilution results met the control limits.

4.2 Low-Level Mercury and Methyl mercury (EPA Region 10 MEL)

All low level mercury and methyl mercury data is considered usable with qualification of some results as noted in the following discussion.

No low level mercury or methyl mercury results were reported in the laboratory method blanks and no data was qualified for laboratory blank contamination.

Low level mercury was detected in the field blank below the reporting limit. The dissolved methyl mercury results for seven of the samples were detected at a concentration less than five times the concentration detected in the field blank. Results for these five samples have been qualified. Per the method, the dissolved low level mercury results for the samples collected MW-5, MW-7, MW-6, MW03,

MW-4, and MW-2 and its field duplicate have been reported as not detected (U) at their reported levels based on the field blank results.

All LCS results met the control limits.

Two MS analyses were performed for the low level mercury analyses and one MS analysis was performed for the methyl mercury analyses. All recoveries met the control limits. No data was qualified for MS.

Two laboratory sample duplicate analyses were performed for the low level mercury analyses and one laboratory duplicate analysis was performed for the methyl mercury analyses. All RPDs met the control limits.

One field duplicate for the low level mercury and methyl mercury analyses were collected and analyzed. All RPDs met the QAPP control limit of 50%.

4.3 General Chemistry Parameters (EPA Region 10 MEL)

The groundwater samples were analyzed for anions, nitrate plus nitrite, total alkalinity, and total TDS. All general chemistry data is considered usable with no qualification for quality control analyses.

No general chemistry results were qualified for blank contamination.

All LCS results met the control limits.

MS/MSD analyses were performed on two samples for the anions analyses, two samples for nitrate plus nitrite, and two samples for total alkalinity. All recoveries and RPDs met the quality control limits.

Two laboratory sample duplicates were performed for the anion analyses, two for the nitrate plus nitrite analyses, two for the total alkalinity analyses, and one for the TDS analyses. All RPDs met the laboratory defined control limits.

One field duplicates for the anion, nitrate plus nitrite, total alkalinity, and TDS analyses was collected and analyzed. All RPDs met the QAPP control limit of 50%.

4.4 DOC (Amtest Laboratories)

All DOC data is considered usable with qualification of some results as noted in the following discussion.

DOC was detected in the filter blank at a concentration slightly above the reporting level. The concentrations of DOC detected in the samples were all above the reporting level, but less than ten times the concentration detected in the blank. All DOC results were qualified as estimated for a potential positive bias (J+) for blank contamination. SUVA254 is calculated by dividing the UV254 absorbance by the DOC result. The SUVA254 data for the surface waters has been qualified as estimated with a negative bias (J-) due to the potential high bias in the DOC results (denominator).

All Standard Reference Materials (SRMs) recoveries met the control limits

One MS analysis was analyzed for DOC, with the recovery meeting the control limits.

One field duplicate was collected for the DOC analysis. The RPD met the QAPP control limit of 50%.

Section 5

February 2014 Storm Surface Water Sampling Event #3

Twenty-three surface water samples, a precipitation sample, and three field blanks were collected during the third storm event sampling in February 2013. The samples were analyzed for CLP TAL total and dissolved metals, excluding mercury by EPA CLP Chemtech Consulting Group; total and dissolved low-level mercury; total and dissolved methyl mercury; anions (fluoride, chloride, and sulfate); total alkalinity; nitrate plus nitrite; and total suspended solids (TSS) by EPA Region 10 Manchester Environmental Laboratory (MEL). The samples were also analyzed for dissolved organic carbon (DOC), ultraviolet absorbance at 254 nanometers (UV_{254}), and Specific UV_{254} Absorbance ($SUVA_{254}$) by Amtest Laboratories in Redmond, Washington. The total low-level mercury and total methyl mercury analyses of the precipitation sample were analyzed by Frontier Global Sciences.

5.1 CLP TAL Metals (CLP Laboratory – Chemtech Consulting Group)

All data is considered usable with qualification of selected results as noted in the following discussion.

The following metals results were qualified in selected samples as noted in the validation summaries for blank contamination: Al, Ba, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Pb, Ni, Ag, Na, Tl, V, and Zn.

All LCS results met the control limits.

Four matrix spikes were analyzed, (two each for total and dissolved fractions). All percent (%) recoveries were within the control limits.

Four laboratory sample duplicate analyses were performed (two for total and two for dissolved analyses). Lab duplicate RPDs were within the laboratory defined control limits of $\leq$ 20% or < 2x CRQL with the following exceptions:

- Zn in the sample duplicate performed for the dissolved metals for sample 0214BBM-GD1-SW-0005
- Cr in the sample duplicate performed for the total metals for sample 0214BBM-GD1-SW-005

Selected zinc and chromium results have been qualified as estimated (J) for sample duplicate results.

Three field duplicates were collected for total and dissolved metals analyses, which met the one field duplicate per ten primary sample frequency required in the QAPP. All RPDs were within the control limits with the following exceptions:

- Cr, Co, and Ni in the field duplicate for the total metals analysis of sample 0214BBM-GD1-SW-003
- Al in the field duplicate for the dissolved metals analysis of sample 0214BBM-DC1-SW-002

Total Cr, Co, and Ni results were qualified in sample 0214BBM – GD1-SW-003 and its field duplicate as estimated (J) or estimated with a high bias (J+).

Dissolved Al results were qualified were qualified in seven samples as estimated (J or UJ).

Serial dilutions were performed on four samples. All serial dilution results met the control limits with the following exceptions:

- Cu and Zn in the serial dilution performed for the total metals analysis of sample 0214BBM-GD1-SW-002

Cu and Zn results in all samples in the associated sample delivery group (SDG) have been qualified as estimated with a high bias (J+)

5.2 Low-Level Mercury and Methyl Mercury (EPA Region 10 MEL)

All low level mercury and methyl mercury data is considered usable with qualification of some results as noted in the following discussion.

The data reviewer noted that the total methyl-mercury result for sample 0214BBM-FC1-SW-002 is less than its corresponding dissolved methyl-mercury result. The two samples were re-analyzed and showed the same result.

No low level mercury or methyl mercury results were qualified for laboratory blank contamination. One field blank sample showed a detection of methyl-mercury below the MRL. The methyl-mercury results for eight of the samples were less than five times the concentration in the field blank and have been qualified as not detected.

All LCS results met the control limits.

Six MS analyses (three for total and three for dissolved) were performed for the low level mercury analyses with five recoveries meeting the control limits. The spiked result for the matrix spike performed for the 0214BBM-GD1-SW-002 was qualified as not applicable (NA) because the concentration in the sample exceeded the spiked by more than four times. Six MS analyses (four for total and three for dissolved), were performed for the methyl mercury analyses. All recoveries met the control limits. No low-level mercury or methyl-mercury data were qualified for matrix spike results.

Six laboratory sample duplicate analyses (three for total and three for dissolved) were performed for the low level mercury analyses and six MS analyses (three for total and three for dissolved), were performed for the methyl mercury analyses. All relative percent differences (RPDs) met the control limits.

Three field duplicates for total and dissolved low level mercury and methyl mercury were collected and analyzed. All RPDs met the QAPP control limit of 50%. In the Quality Assurance Memorandum for the low-level mercury data, the data reviewer noted that samples with MEL sample numbers 1406418 and 14064220 were identified on the COC as a parent sample and field duplicate. However, sample

14064220 was a field duplicate for sample 14064214 and the RPD for this field duplicate set met the control limit.

The methyl mercury results for nine samples and a lab sample duplicate were qualified as estimated (J+) based on a potential positive interference in the methyl mercury analysis. EPA method 1630 notes that if inorganic mercury is present at high levels, the mercury can react with organic material in a sample to form methyl mercury during the distillation step of the analysis. The data reviewer noted that inorganic mercury in the samples was high relative to the methyl mercury. The laboratory performed spikes on representative sample, which had low levels of inorganic mercury and in which methyl mercury was not detected. Based on the results of these spikes, nine samples were qualified as estimated (J) by the MEL supervisory chemist who verified the data. Because this potential bias is positive, CDM Smith revised the "J" qualifiers to "J+".

5.3 Total Low-Level Mercury and Total Methyl Mercury of the Precipitation Sample (Frontier Global Sciences)

The total low-level mercury and methyl mercury data for the precipitation sample are considered usable with no qualification for quality control analyses.

No total low-level mercury and methyl mercury results were qualified for blank contamination.

All LCS and LCSD results met the control limits.

Matrix QC (MS/MSD, laboratory duplicates, and field duplicates) were not required for the total-low-level and total methyl mercury precipitation analyses per the QAPP.

5.4 General Chemistry Parameters (EPA Region 10 MEL: TSS, anions, nitrate plus nitrite)

All general chemistry data is considered usable with no qualification for quality control analyses with the exception of the anions, alkalinity, and nitrate plus nitrite analyses of the precipitation sample due to the fact that the sample volume for these analyses was inadvertently collected in a bottle with nitric acid preservative. No data has been reported for the alkalinity of nitrate plus nitrite analyses due to this issue and data for the anion analyses have been reported as estimated (J).

No general chemistry results were qualified for blank contamination.

All LCS results met the control limits.

MS analyses were performed on two samples for the anions analyses, two samples for nitrate plus nitrite, and two samples for total alkalinity. All recoveries and RPDs met the quality control limits.

Two laboratory sample duplicates were performed for the anion analyses, two for the nitrate plus nitrite analyses, two for the total alkalinity analyses, and two for the TSS analyses. All RPDs met the laboratory defined control limits.

Three field duplicates for the anion, nitrate plus nitrite, total alkalinity, and TSS analyses were submitted, which met the requirements of the QAPP. All RPDs met the QAPP control limit of 50%.

5.5 DOC, UVA254, and SUVA254 (AmTest Laboratories)

All DOC, UV254, and SUVA254 data is considered usable with qualification of some results as noted in the following discussion.

No DOC results were qualified for blank contamination.

The Standard Reference Materials (SRMs) recoveries for the DOC and UV254 analyses results met the control limits.

Three MS's were performed for the DOC analyses and all recoveries met the control limits.

Five laboratory sample duplicates were performed for the UV254 analyses. All RPDs for sample duplicate analyses met the control limits.

Three field duplicates for the DOC, UV254, or $SUVA_{254}$ analyses were collected and analyzed, which met the requirements of the QAPP. All RPDs met the QAPP control limit of 50% with the exception of the RPD for the UV_{254} result for sample 0214BBM-DC1-SW-002 and its field duplicate. Because the RPDs for the other UV_{254} analyses field duplicate sets met the control limit, the UV_{254} and $SUVA_{254}$ analyses in sample 0214BBM-DC1-SW-002 and its field duplicate only have been qualified as estimated (J).

Section 6

February 2014 Demonstration of Methods Applicability (DMA) Soil Sampling

Eighty-one soil samples (39 grab samples and 42 composite samples generated from two incremental samples (each incremental sample was collected in triplicate and 7 replicates were generated from each of the three triplicates) were collected in February 2014 and analyzed for total CLP TAL metals by EPA CLP laboratory Chemtech Consulting Group, and total mercury with a modified sample preparation mass of 10 grams metals by EPA Region 10 MEL.

6.1 CLP TAL Metals (CLP Laboratory – Chemtech Consulting Group)

No CLP TAL metals data for the soil samples collected in June 2013 has been rejected. All data is considered usable with qualification of some results as noted in the following discussion.

The following metals results were qualified in selected soil samples as noted in the validation summaries for laboratory blank contamination: Sb, Cd, Ca, Mg, Ag, and Tl.

All metals LCS results met the control limits.

Five MS analyses were performed for the metals analyses. All percent (%) recoveries in the MS analyses were within the control limits with the following exceptions:

- Sb recoveries, in all of the MS analyses (0214BB-SO9-00, 0214BB –SO25-00, 0214 - BB- TTM3-SO-G, 0214BB- GSS1-SO-G, and 0214BB-GSS3-SO-G) were below the control limits.
- Cr recovery in one MS analysis (0214BB –SO25-00) was above the control limits.
- Cu recoveries in three of the MS analyses (0214BB-SO9-00, 0214BB –SO25-00, and 0214BB-TTM3-SO-G) were above the criteria.
- Pb recoveries in two of the MS analyses (0214BB-SO9-00 and 0214BB- TTM3-SO-G) were above the control limits.
- V recovery in one of the MS analyses (0214BB-SO9-00) was above control limits.

The following metals results in selected soil samples as noted in the validation reports have been qualified as estimated (J, J+, or UJ) for matrix spike recoveries: Sb, Cr, Cu, Pb, and V.

Five laboratory sample duplicate analyses were performed for the metals analyses. All RPDs met the control limits.

Four field duplicates for the total CLP TAL metals analyses of the 39 grab samples were collected and analyzed, which met the requirements in the QAPP. All RPDs met the QAPP control limit of 50% with the exception of Hg for sample 0214BB-SO21-00 and its field duplicate. Because the RPDs for Hg in the

other three field duplicates and in the laboratory sample duplicate analyses met the control limits, the data validator determined that no data need be qualified for the high RPD.

Serial dilutions were performed on five samples for the metals analyses. The following metals in selected soil samples were qualified as estimated (J) for serial dilution results outside the control limits: Al, Ba, Ca, Cd, Cr, Cu, Fe, Mg, Mn, V, and Zn.

6.2 10-Gram Mercury (EPA Region 10 MEL)

No 10-gram mercury data for the soil samples collected in June 2013 have been rejected. MELAll data is considered usable with qualification of some results as noted in the following discussion.

No mercury results have been qualified for blank contamination.

All mercury reference material results met the control limits.

One MS analysis was performed for the mercury analyses. The % recovery in the MS was within the control limits.

One laboratory sample duplicate analysis was performed for the mercury analyses. The RPD was within the control limits:

Attachment A
Data Validation Summaries

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
ENVIRONMENTAL ASSESSMENT

March 28, 2014

MEMORANDUM

SUBJECT: Data Validation Report for Metals Analysis of Samples Collected for Black Butte Mine Phase 2 RI – DMA, Cottage Grove, OR, Case 44058, SDG: MJGM19

FROM: Don Matheny, Chemist
OEA, Environmental Services Unit

TO: Richard Muza, Remedial Project Manager
Office of Environmental Clean-up, USEPA R10

CC: Mary Lou Fox, CDM

The quality assurance (QA) review of the analytical data generated from the analysis of twenty (20) soils collected from the above referenced site has been completed. These samples were analyzed for Total Metals by The Chemtech Consulting Group located in Mountainside, NJ.

Sample analyses were evaluated following EPA's Stage 4 Data Validation Electronic/Manual Process (S4VEM). The validation was conducted according to the Quality Control Specifications outlined in:

- *QAPP for Black Butte Mine Phase 2 Remedial Investigation – Demonstration of Methods Applicability QAPP, Cottage Grove, OR,* (December, 2013)
- USEPA CLP Statement of Work for Inorganic Superfund Methods (ISM01.3)
- National Functional Guidelines for Inorganic Superfund Data Review (EPA-540-R-10-011)
- Guidance for Labeling Externally Validated Laboratory Analytical Data (EPA-540-R08-005)

Some data may be qualified using the reviewer's professional judgment. The conclusions presented herein are based on the information provided for the review. A summary of samples evaluated in this validation report and the pertinent dates for sample collection, laboratory sample receipt and analyses is attached along with the validated data.

I. QUALITY CONTROL RESULTS SUMMARY

Quality Control Test	Result Ranges	Outliers?	Evaluation Criteria
Blanks	Detects Reported	Y*	ND, ≤ RL or < 10xSample
Matrix Spike (MJGM28)	11 – 160%	Y*	75 – 125%
Sample Duplicate (MJGM28)	≤ 17% or < 2xCRQL	N	≤ 30% RPD or ± 2xCRQL
Field Duplicates (MJGM27)	≤ 25% or < 2xCRQL	N	≤ 50% RPD or ± 2xCRQL
LCS (blank spike)	90 - 113%	N	70 – 130%
Serial Dilution (MJGM28)	≤ 18%	Y*	≤ 10%

*See the "*Data Qualifications*" section below for excursions and qualification of affected data.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
ENVIRONMENTAL ASSESSMENT

March 28, 2014

MEMORANDUM

SUBJECT: Data Validation Report for Metals Analysis of Samples Collected for Black Butte Mine Phase 2 RI – DMA, Cottage Grove, OR, Case 44058, SDG: MJGM39

FROM: Don Matheny, Chemist
OEA, Environmental Services Unit

TO: Richard Muza, Remedial Project Manager
Office of Environmental Clean-up, USEPA R10

CC: Mary Lou Fox, CDM

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Some data may be qualified using the reviewer's professional judgment. The conclusions presented herein are based on the information provided for the review. A summary of samples evaluated in this validation report and the pertinent dates for sample collection, laboratory sample receipt and analyses is attached along with the validated data.

I. QUALITY CONTROL RESULTS SUMMARY

Quality Control Test	Result Ranges	Outliers?	Evaluation Criteria
Blanks	Detects Reported	Y*	ND, ≤ RL or < 10xSample
Matrix Spike (MJGM45)	61 – 150%	Y*	75 – 125%
Sample Duplicate (MJGM45)	≤ 3% or < 2xCRQL	N	≤ 30% RPD or ± 2xCRQL
Field Duplicate (MJGM41; MJGM49)	≤ 59% or < 2xCRQL	Y*	≤ 50% RPD or ± 2xCRQL
LCS (blank spike)	91 - 120%	N	70 – 130%
Serial Dilution (MJGM45)	≤ 16%	Y*	≤ 10%

*See the "*Data Qualifications*" section below for excursions and qualification of affected data.

II. DATA QUALIFICATIONS

Summary of Validation Qualifiers Applied

After the manual and electronic data review, the following data qualifications were applied:

Blanks
The following samples have analyte results ≥ MDLs but ≤ CRQLs. The associated instrument, preparation and/or field blank results are ≥ MDLs but ≤ CRQLs. Detected analytes are qualified U and the results reported at the CRQLs.
Antimony - MJGM40 - MJGM46, MJGM48 - MJGM51, MJGM58 - MJGM64, MJGM39 **Barium** - MJGM42 **Cadmium** - MJGM39, MJGM40, MJGM42 - MJGM44, MJGM46 - MJGM51, MJGM58 - MJGM64 **Calcium** - MJGM39 **Silver** - MJGM39 - MJGM42, MJGM44 - MJGM47, MJGM49, MJGM51, MJGM58, MJGM60, MJGM61, MJGM63 **Thallium** - MJGM39, MJGM40, MJGM42 - MJGM51, MJGM58 - MJGM64
Detection Limits
The following samples have results ≥ MDLs but ≤ CRQLs. Detected analytes are qualified J.
Barium – MJGM45 **Potassium –** MJGM39, MJGM43, MJGM44, MJGM46 - MJGM51 **Sodium –** All samples
Matrix Spike
The following Matrix Spike samples have percent recoveries greater than 125% and post-digestion spike samples have percent recoveries less than or equal to 125%. Detected analytes with results greater than or equal to MDLs are qualified J. Non-detected analytes are not qualified.
Chromium, Copper – All samples
The following Matrix Spike samples have percent recoveries in the range of 30-74% and post-digestion spike samples have percent recoveries greater than or equal to 75%. Detected analytes with results greater than or equal to MDLs are qualified J. Non-detected analytes are qualified UJ.
Antimony – All samples
Duplicates
The field duplicates (*MJGM38 & MJGM41)* for mercury exceeded the acceptance criteria of 50% RPD. As the other lab and field duplicates were compliant, mercury data were not qualified based on this single result.
Serial Dilution
The following ICP-AES Serial Dilution (SD) samples have percent difference (%D) greater than 10% and initial sample results are greater than 50xMDLs. The detected analytes in samples with results greater than or equal to MDLs are qualified J. Non-detected analytes in samples are qualified UJ.
Aluminum, Barium, Calcium, Cadmium, Copper, Iron, Magnesium, Manganese, Vanadium, Zinc – All samples

Data Validation Qualifiers

The following is a list of data validation qualifiers applied to the sample result(s) and their definitions.

Data Validation Qualifiers	
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J	The associated value is an estimated quantity.
J+	The associated value is an estimated quantity but the result may be biased high.
J-	The associated value is an estimated quantity but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The data are unusable. The analyte may or may not be present in the sample.

III. SAMPLE INDEX

Sample Number	Matrix	Sampling Date	Date Received	ICP-AES Analysis	ICP-MS Analysis	Mercury Analysis
MJGM39	Water	2/11/2014	2/26/2014	2/26-27/2014	2/27/2014	2/27/2014
MJGM40	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM41	Water	2/12/2014	2/26/2014	2/26-27/2014	2/27/2014	2/27/2014
MJGM42	Water	2/12/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM43	Water	2/12/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM44	Water	2/12/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM45	Water	2/12/2014	2/26/2014	2/26-27/2014	2/27/2014	2/27/2014
MJGM46	Water	2/12/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM47	Water	2/12/2014	2/26/2014	2/26-27/2014	2/27/2014	2/27/2014
MJGM48	Water	2/12/2014	2/26/2014	2/26-27/2014	2/27/2014	2/27/2014
MJGM49	Water	2/12/2014	2/26/2014	2/26-27/2014	2/27/2014	2/27/2014
MJGM50	Water	2/12/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM51	Water	2/12/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM58	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM59	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM60	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM61	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM62	Water	2/11/2014	2/26/2014	2/26/2014	2/28/2014	2/27/2014
MJGM63	Water	2/11/2014	2/26/2014	2/26/2014	2/28/2014	2/27/2014
MJGM64	Water	2/11/2014	2/26/2014	2/26/2014	2/28/2014	2/27/2014

Field Duplicates are as follows: MJGM38 – MJGM41; MJGM48 – MJGM49. MJGM38 was reported in a previous SDG.

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM39	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO19	pH:	2	Sample Date:	02/11/2014	Sample Time:	14:08:00
% Moisture :				% Solids :	93.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	1.8	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM39	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO19	pH:	2	Sample Date:	02/11/2014	Sample Time:	14:08:00
% Moisture :				% Solids :	93.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	33900	mg/kg	1	E	J	Yes	S4VEM
Barium	49.9	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.57	mg/kg	1			Yes	S4VEM
Cadmium	0.40	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	401	mg/kg	1	JE	UJ	Yes	S4VEM
Chromium	48.2	mg/kg	1	N	J	Yes	S4VEM
Cobalt	13.3	mg/kg	1			Yes	S4VEM
Copper	211	mg/kg	1	NE	J	Yes	S4VEM
Iron	73200	mg/kg	10	ED	J	Yes	S4VEM
Lead	10.5	mg/kg	1			Yes	S4VEM
Magnesium	468	mg/kg	1	E	J	Yes	S4VEM
Manganese	669	mg/kg	1	E	J	Yes	S4VEM
Nickel	16.9	mg/kg	1			Yes	S4VEM
Potassium	114	mg/kg	1	J	J	Yes	S4VEM
Sodium	223	mg/kg	1	J	J	Yes	S4VEM
Vanadium	174	mg/kg	1	E	J	Yes	S4VEM
Zinc	41.2	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM39	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO19	pH:	2	Sample Date:	02/11/2014	Sample Time:	14:08:00
% Moisture :				% Solids :	93.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	20.1	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	341	mg/kg	25	D		Yes	S4VEM
Selenium	50.2	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.0	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.0	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM40	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO20	pH:	2	Sample Date:	02/11/2014	Sample Time:	14:12:00
% Moisture :				% Solids :	86.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	20.6	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	35.6	mg/kg	25	D		Yes	S4VEM
Selenium	51.5	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.3	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.3	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM40	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO20	pH:	2	Sample Date:	02/11/2014	Sample Time:	14:12:00
% Moisture :				% Solids :	86.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	32400	mg/kg	1	E	J	Yes	S4VEM
Barium	86.1	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.72	mg/kg	1			Yes	S4VEM
Cadmium	0.42	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	1290	mg/kg	1	E	J	Yes	S4VEM
Chromium	24.6	mg/kg	1	N	J	Yes	S4VEM
Cobalt	21.0	mg/kg	1			Yes	S4VEM
Copper	140	mg/kg	1	NE	J	Yes	S4VEM
Iron	62200	mg/kg	1	E	J	Yes	S4VEM
Lead	3.1	mg/kg	1			Yes	S4VEM
Magnesium	5970	mg/kg	1	E	J	Yes	S4VEM
Manganese	752	mg/kg	1	E	J	Yes	S4VEM
Nickel	18.7	mg/kg	1			Yes	S4VEM
Potassium	573	mg/kg	1			Yes	S4VEM
Sodium	215	mg/kg	1	J	J	Yes	S4VEM
Vanadium	136	mg/kg	1	E	J	Yes	S4VEM
Zinc	51.1	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM40	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO20	pH:	2	Sample Date:	02/11/2014	Sample Time:	14:12:00
% Moisture :				% Solids :	86.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	39.8	mg/kg	20	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM41	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO21	pH:	2	Sample Date:	02/12/2014	Sample Time:	12:00:00
% Moisture :				% Solids :	96.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	177	mg/kg	200	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM41	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO21	pH:	2	Sample Date:	02/12/2014	Sample Time:	12:00:00
% Moisture :				% Solids :	96.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	17.9	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	42.4	mg/kg	25	D		Yes	S4VEM
Selenium	44.8	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.0	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.0	mg/kg	25	UD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM41	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO21	pH:	2	Sample Date:	02/12/2014	Sample Time:	12:00:00
% Moisture :				% Solids :	96.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	2700	mg/kg	1	E	J	Yes	S4VEM
Barium	25.1	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.58	mg/kg	1			Yes	S4VEM
Cadmium	0.94	mg/kg	1	E	J	Yes	S4VEM
Calcium	1270	mg/kg	1	E	J	Yes	S4VEM
Chromium	68.5	mg/kg	1	N	J	Yes	S4VEM
Cobalt	29.7	mg/kg	1			Yes	S4VEM
Copper	125	mg/kg	1	NE	J	Yes	S4VEM
Iron	81600	mg/kg	10	ED	J	Yes	S4VEM
Lead	24.9	mg/kg	1			Yes	S4VEM
Magnesium	613	mg/kg	1	E	J	Yes	S4VEM
Manganese	2190	mg/kg	1	E	J	Yes	S4VEM
Nickel	30.2	mg/kg	1			Yes	S4VEM
Potassium	397	mg/kg	1	U	U	Yes	S4VEM
Sodium	203	mg/kg	1	J	J	Yes	S4VEM
Vanadium	161	mg/kg	1	E	J	Yes	S4VEM
Zinc	92.0	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM42	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO22	pH:	2	Sample Date:	02/12/2014	Sample Time:	12:10:00
% Moisture :				% Solids :	92.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.0	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	134	mg/kg	25	D		Yes	S4VEM
Selenium	47.4	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.5	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.5	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM42	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO22	pH:	2	Sample Date:	02/12/2014	Sample Time:	12:10:00
% Moisture :				% Solids :	92.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	4360	mg/kg	1	E	J	Yes	S4VEM
Barium	16.3	mg/kg	1	JE	UJ	Yes	S4VEM
Beryllium	0.41	mg/kg	1			Yes	S4VEM
Cadmium	0.41	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	2640	mg/kg	1	E	J	Yes	S4VEM
Chromium	30.9	mg/kg	1	N	J	Yes	S4VEM
Cobalt	26.9	mg/kg	1			Yes	S4VEM
Copper	117	mg/kg	1	NE	J	Yes	S4VEM
Iron	47000	mg/kg	1	E	J	Yes	S4VEM
Lead	3.2	mg/kg	1			Yes	S4VEM
Magnesium	1110	mg/kg	1	E	J	Yes	S4VEM
Manganese	1330	mg/kg	1	E	J	Yes	S4VEM
Nickel	34.8	mg/kg	1			Yes	S4VEM
Potassium	408	mg/kg	1	U	U	Yes	S4VEM
Sodium	150	mg/kg	1	J	J	Yes	S4VEM
Vanadium	65.8	mg/kg	1	E	J	Yes	S4VEM
Zinc	58.1	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM42	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO22	pH:	2	Sample Date:	02/12/2014	Sample Time:	12:10:00
% Moisture :				% Solids :	92.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	77.9	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM43	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO23	pH:	2	Sample Date:	02/12/2014	Sample Time:	13:15:00
% Moisture :				% Solids :	80.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	22.2	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	67.6	mg/kg	25	D		Yes	S4VEM
Selenium	55.6	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.1	mg/kg	25	UD	U	Yes	S4VEM
Thallium	11.1	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM43	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO23	pH:	2	Sample Date:	02/12/2014	Sample Time:	13:15:00
% Moisture :				% Solids :	80.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	25300	mg/kg	1	E	J	Yes	S4VEM
Barium	41.2	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.62	mg/kg	1			Yes	S4VEM
Cadmium	0.44	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	4220	mg/kg	1	E	J	Yes	S4VEM
Chromium	64.7	mg/kg	1	N	J	Yes	S4VEM
Cobalt	29.0	mg/kg	1			Yes	S4VEM
Copper	67.2	mg/kg	1	NE	J	Yes	S4VEM
Iron	60700	mg/kg	1	E	J	Yes	S4VEM
Lead	1.1	mg/kg	1			Yes	S4VEM
Magnesium	2040	mg/kg	1	E	J	Yes	S4VEM
Manganese	1130	mg/kg	1	E	J	Yes	S4VEM
Nickel	29.5	mg/kg	1			Yes	S4VEM
Potassium	162	mg/kg	1	J	J	Yes	S4VEM
Sodium	328	mg/kg	1	J	J	Yes	S4VEM
Vanadium	134	mg/kg	1	E	J	Yes	S4VEM
Zinc	77.7	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM43	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO23	pH:	2	Sample Date:	02/12/2014	Sample Time:	13:15:00
% Moisture :				% Solids :	80.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	3.0	mg/kg	2	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM44	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO24	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:10:00
% Moisture :				% Solids :	91.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	140	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM44	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO24	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:10:00
% Moisture :				% Solids :	91.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	8240	mg/kg	1	E	J	Yes	S4VEM
Barium	25.6	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.46	mg/kg	1			Yes	S4VEM
Cadmium	0.40	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	2610	mg/kg	1	E	J	Yes	S4VEM
Chromium	43.0	mg/kg	1	N	J	Yes	S4VEM
Cobalt	33.6	mg/kg	1			Yes	S4VEM
Copper	106	mg/kg	1	NE	J	Yes	S4VEM
Iron	51100	mg/kg	1	E	J	Yes	S4VEM
Lead	4.6	mg/kg	1			Yes	S4VEM
Magnesium	996	mg/kg	1	E	J	Yes	S4VEM
Manganese	1470	mg/kg	1	E	J	Yes	S4VEM
Nickel	41.1	mg/kg	1			Yes	S4VEM
Potassium	23.6	mg/kg	1	J	J	Yes	S4VEM
Sodium	171	mg/kg	1	J	J	Yes	S4VEM
Vanadium	95.8	mg/kg	1	E	J	Yes	S4VEM
Zinc	72.0	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM44	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO24	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:10:00
% Moisture :				% Solids :	91.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.2	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	104	mg/kg	25	D		Yes	S4VEM
Selenium	48.0	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.6	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.6	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM45	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO25	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:20:00
% Moisture :				% Solids :	92.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	54900	mg/kg	1	E	J	Yes	S4VEM
Barium	15.4	mg/kg	1	JE	J	Yes	S4VEM
Beryllium	0.42	mg/kg	1			Yes	S4VEM
Cadmium	1.4	mg/kg	1	E	J	Yes	S4VEM
Calcium	1520	mg/kg	1	E	J	Yes	S4VEM
Chromium	99.2	mg/kg	1	N	J	Yes	S4VEM
Cobalt	25.1	mg/kg	1			Yes	S4VEM
Copper	119	mg/kg	1	NE	J	Yes	S4VEM
Iron	63200	mg/kg	1	E	J	Yes	S4VEM
Lead	4.9	mg/kg	1			Yes	S4VEM
Magnesium	840	mg/kg	1	E	J	Yes	S4VEM
Manganese	797	mg/kg	1	E	J	Yes	S4VEM
Nickel	39.4	mg/kg	1			Yes	S4VEM
Potassium	406	mg/kg	1	U	U	Yes	S4VEM
Sodium	381	mg/kg	1	J	J	Yes	S4VEM
Vanadium	119	mg/kg	1	E	J	Yes	S4VEM
Zinc	58.7	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM45	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO25	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:20:00
% Moisture :				% Solids :	92.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	20.0	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	195	mg/kg	25	D		Yes	S4VEM
Selenium	50.1	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.0	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.0	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM45	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO25	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:20:00
% Moisture :				% Solids :	92.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	3.2	mg/kg	2	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM46	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO26	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:30:00
% Moisture :				% Solids :	87.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	7.1	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM46	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO26	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:30:00
% Moisture :				% Solids :	87.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	39000	mg/kg	1	E	J	Yes	S4VEM
Barium	70.6	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.64	mg/kg	1			Yes	S4VEM
Cadmium	0.42	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	2310	mg/kg	1	E	J	Yes	S4VEM
Chromium	76.5	mg/kg	1	N	J	Yes	S4VEM
Cobalt	33.6	mg/kg	1			Yes	S4VEM
Copper	118	mg/kg	1	NE	J	Yes	S4VEM
Iron	67100	mg/kg	1	E	J	Yes	S4VEM
Lead	3.2	mg/kg	1			Yes	S4VEM
Magnesium	4120	mg/kg	1	E	J	Yes	S4VEM
Manganese	1290	mg/kg	1	E	J	Yes	S4VEM
Nickel	39.2	mg/kg	1			Yes	S4VEM
Potassium	365	mg/kg	1	J	J	Yes	S4VEM
Sodium	287	mg/kg	1	J	J	Yes	S4VEM
Vanadium	138	mg/kg	1	E	J	Yes	S4VEM
Zinc	78.7	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM46	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO26	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:30:00
% Moisture :				% Solids :	87.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	20.4	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	95.6	mg/kg	25	D		Yes	S4VEM
Selenium	51.0	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.2	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.2	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM47	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO27	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:40:00
% Moisture :				% Solids :	94.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	20.0	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	50.2	mg/kg	25	D		Yes	S4VEM
Selenium	49.9	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.0	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.0	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM47	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO27	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:40:00
% Moisture :				% Solids :	94.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	5.0	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM47	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO27	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:40:00
% Moisture :				% Solids :	94.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	16900	mg/kg	1	E	J	Yes	S4VEM
Barium	32.6	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.66	mg/kg	1			Yes	S4VEM
Cadmium	0.41	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	1920	mg/kg	1	E	J	Yes	S4VEM
Chromium	43.9	mg/kg	1	N	J	Yes	S4VEM
Cobalt	39.5	mg/kg	1			Yes	S4VEM
Copper	67.9	mg/kg	1	NE	J	Yes	S4VEM
Iron	73300	mg/kg	10	ED	J	Yes	S4VEM
Lead	4.4	mg/kg	1			Yes	S4VEM
Magnesium	1630	mg/kg	1	E	J	Yes	S4VEM
Manganese	772	mg/kg	1	E	J	Yes	S4VEM
Nickel	13.6	mg/kg	1			Yes	S4VEM
Potassium	185	mg/kg	1	J	J	Yes	S4VEM
Sodium	406	mg/kg	1	J	J	Yes	S4VEM
Vanadium	164	mg/kg	1	E	J	Yes	S4VEM
Zinc	68.4	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM48	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO28	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:50:00
% Moisture :				% Solids :	92.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	27800	mg/kg	1	E	J	Yes	S4VEM
Barium	59.3	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.65	mg/kg	1			Yes	S4VEM
Cadmium	0.41	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	1050	mg/kg	1	E	J	Yes	S4VEM
Chromium	56.5	mg/kg	1	N	J	Yes	S4VEM
Cobalt	27.8	mg/kg	1			Yes	S4VEM
Copper	84.0	mg/kg	1	NE	J	Yes	S4VEM
Iron	78500	mg/kg	10	ED	J	Yes	S4VEM
Lead	5.4	mg/kg	1			Yes	S4VEM
Magnesium	1680	mg/kg	1	E	J	Yes	S4VEM
Manganese	1010	mg/kg	1	E	J	Yes	S4VEM
Nickel	24.5	mg/kg	1			Yes	S4VEM
Potassium	192	mg/kg	1	J	J	Yes	S4VEM
Sodium	291	mg/kg	1	J	J	Yes	S4VEM
Vanadium	158	mg/kg	1	E	J	Yes	S4VEM
Zinc	83.3	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM48	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO28	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:50:00
% Moisture :				% Solids :	92.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.4	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	88.3	mg/kg	25	D		Yes	S4VEM
Selenium	48.5	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.7	mg/kg	25	UD	U	Yes	S4VEM
Thallium	9.7	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM48	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO28	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:50:00
% Moisture :				% Solids :	92.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	21.8	mg/kg	20	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM49	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO28	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:55:00
% Moisture :				% Solids :	90.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	15.5	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM49	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO28	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:55:00
% Moisture :				% Solids :	90.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	20.1	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	99.1	mg/kg	25	D		Yes	S4VEM
Selenium	50.2	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.0	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.0	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM49	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO28	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:55:00
% Moisture :				% Solids :	90.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	29900	mg/kg	1	E	J	Yes	S4VEM
Barium	61.3	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.69	mg/kg	1			Yes	S4VEM
Cadmium	0.41	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	1060	mg/kg	1	E	J	Yes	S4VEM
Chromium	58.8	mg/kg	1	N	J	Yes	S4VEM
Cobalt	27.1	mg/kg	1			Yes	S4VEM
Copper	85.0	mg/kg	1	NE	J	Yes	S4VEM
Iron	82000	mg/kg	10	ED	J	Yes	S4VEM
Lead	4.4	mg/kg	1			Yes	S4VEM
Magnesium	1560	mg/kg	1	E	J	Yes	S4VEM
Manganese	1060	mg/kg	1	E	J	Yes	S4VEM
Nickel	25.8	mg/kg	1			Yes	S4VEM
Potassium	187	mg/kg	1	J	J	Yes	S4VEM
Sodium	334	mg/kg	1	J	J	Yes	S4VEM
Vanadium	163	mg/kg	1	E	J	Yes	S4VEM
Zinc	84.7	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM50	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO29	pH:	2	Sample Date:	02/12/2014	Sample Time:	16:00:00
% Moisture :				% Solids :	83.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.1	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	101	mg/kg	25	D		Yes	S4VEM
Selenium	52.8	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.6	mg/kg	25	UD	U	Yes	S4VEM
Thallium	10.6	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM50	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO29	pH:	2	Sample Date:	02/12/2014	Sample Time:	16:00:00
% Moisture :				% Solids :	83.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	43900	mg/kg	1	E	J	Yes	S4VEM
Barium	94.0	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.86	mg/kg	1			Yes	S4VEM
Cadmium	0.46	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	808	mg/kg	1	E	J	Yes	S4VEM
Chromium	81.7	mg/kg	1	N	J	Yes	S4VEM
Cobalt	35.5	mg/kg	1			Yes	S4VEM
Copper	130	mg/kg	1	NE	J	Yes	S4VEM
Iron	61400	mg/kg	1	E	J	Yes	S4VEM
Lead	2.9	mg/kg	1			Yes	S4VEM
Magnesium	6180	mg/kg	1	E	J	Yes	S4VEM
Manganese	1300	mg/kg	1	E	J	Yes	S4VEM
Nickel	46.1	mg/kg	1			Yes	S4VEM
Potassium	378	mg/kg	1	J	J	Yes	S4VEM
Sodium	234	mg/kg	1	J	J	Yes	S4VEM
Vanadium	122	mg/kg	1	E	J	Yes	S4VEM
Zinc	72.9	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM50	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO29	pH:	2	Sample Date:	02/12/2014	Sample Time:	16:00:00
% Moisture :				% Solids :	83.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	1.4	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM51	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO30	pH:	2	Sample Date:	02/12/2014	Sample Time:	16:20:00
% Moisture :				% Solids :	79.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	13.2	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM51	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO30	pH:	2	Sample Date:	02/12/2014	Sample Time:	16:20:00
% Moisture :				% Solids :	79.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	29700	mg/kg	1	E	J	Yes	S4VEM
Barium	69.5	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.63	mg/kg	1			Yes	S4VEM
Cadmium	0.44	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	2290	mg/kg	1	E	J	Yes	S4VEM
Chromium	50.0	mg/kg	1	N	J	Yes	S4VEM
Cobalt	29.8	mg/kg	1			Yes	S4VEM
Copper	97.9	mg/kg	1	NE	J	Yes	S4VEM
Iron	66200	mg/kg	1	E	J	Yes	S4VEM
Lead	14.4	mg/kg	1			Yes	S4VEM
Magnesium	2340	mg/kg	1	E	J	Yes	S4VEM
Manganese	1260	mg/kg	1	E	J	Yes	S4VEM
Nickel	25.2	mg/kg	1			Yes	S4VEM
Potassium	234	mg/kg	1	J	J	Yes	S4VEM
Sodium	362	mg/kg	1	J	J	Yes	S4VEM
Vanadium	148	mg/kg	1	E	J	Yes	S4VEM
Zinc	87.7	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM51	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO30	pH:	2	Sample Date:	02/12/2014	Sample Time:	16:20:00
% Moisture :				% Solids :	79.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	22.1	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	72.7	mg/kg	25	D		Yes	S4VEM
Selenium	55.2	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.0	mg/kg	25	JD	U	Yes	S4VEM
Thallium	11.0	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM58	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	167	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM58	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.0	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	90.3	mg/kg	25	D		Yes	S4VEM
Selenium	47.4	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.5	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.5	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM58	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	33900	mg/kg	1	E	J	Yes	S4VEM
Barium	140	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.71	mg/kg	1			Yes	S4VEM
Cadmium	0.40	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	2350	mg/kg	1	E	J	Yes	S4VEM
Chromium	35.0	mg/kg	1	N	J	Yes	S4VEM
Cobalt	23.5	mg/kg	1			Yes	S4VEM
Copper	110	mg/kg	1	NE	J	Yes	S4VEM
Iron	51900	mg/kg	1	E	J	Yes	S4VEM
Lead	6.3	mg/kg	1			Yes	S4VEM
Magnesium	6890	mg/kg	1	E	J	Yes	S4VEM
Manganese	1010	mg/kg	1	E	J	Yes	S4VEM
Nickel	25.3	mg/kg	1			Yes	S4VEM
Potassium	570	mg/kg	1			Yes	S4VEM
Sodium	227	mg/kg	1	J	J	Yes	S4VEM
Vanadium	130	mg/kg	1	E	J	Yes	S4VEM
Zinc	59.2	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM59	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.8		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	176	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM59	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.8		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	33100	mg/kg	1	E	J	Yes	S4VEM
Barium	134	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.67	mg/kg	1			Yes	S4VEM
Cadmium	0.38	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	2080	mg/kg	1	E	J	Yes	S4VEM
Chromium	37.3	mg/kg	1	N	J	Yes	S4VEM
Cobalt	23.6	mg/kg	1			Yes	S4VEM
Copper	122	mg/kg	1	NE	J	Yes	S4VEM
Iron	50200	mg/kg	1	E	J	Yes	S4VEM
Lead	8.0	mg/kg	1			Yes	S4VEM
Magnesium	6840	mg/kg	1	E	J	Yes	S4VEM
Manganese	1000	mg/kg	1	E	J	Yes	S4VEM
Nickel	23.8	mg/kg	1			Yes	S4VEM
Potassium	573	mg/kg	1			Yes	S4VEM
Sodium	217	mg/kg	1	J	J	Yes	S4VEM
Vanadium	127	mg/kg	1	E	J	Yes	S4VEM
Zinc	57.1	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM59	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.8		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.8	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	104	mg/kg	25	D		Yes	S4VEM
Selenium	49.6	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.9	mg/kg	25	UD	U	Yes	S4VEM
Thallium	9.9	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM60	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	33000	mg/kg	1	E	J	Yes	S4VEM
Barium	144	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.55	mg/kg	1			Yes	S4VEM
Cadmium	0.40	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	2560	mg/kg	1	E	J	Yes	S4VEM
Chromium	30.0	mg/kg	1	N	J	Yes	S4VEM
Cobalt	23.2	mg/kg	1			Yes	S4VEM
Copper	101	mg/kg	1	NE	J	Yes	S4VEM
Iron	49100	mg/kg	1	E	J	Yes	S4VEM
Lead	5.9	mg/kg	1			Yes	S4VEM
Magnesium	7420	mg/kg	1	E	J	Yes	S4VEM
Manganese	918	mg/kg	1	E	J	Yes	S4VEM
Nickel	24.0	mg/kg	1			Yes	S4VEM
Potassium	599	mg/kg	1			Yes	S4VEM
Sodium	201	mg/kg	1	J	J	Yes	S4VEM
Vanadium	122	mg/kg	1	E	J	Yes	S4VEM
Zinc	56.1	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM60	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	106	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM60	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	18.7	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	65.3	mg/kg	25	D		Yes	S4VEM
Selenium	46.7	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.3	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.3	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM61	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	127	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM61	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	33800	mg/kg	1	E	J	Yes	S4VEM
Barium	147	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.73	mg/kg	1			Yes	S4VEM
Cadmium	0.39	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	2400	mg/kg	1	E	J	Yes	S4VEM
Chromium	36.5	mg/kg	1	N	J	Yes	S4VEM
Cobalt	25.0	mg/kg	1			Yes	S4VEM
Copper	106	mg/kg	1	NE	J	Yes	S4VEM
Iron	50100	mg/kg	1	E	J	Yes	S4VEM
Lead	6.3	mg/kg	1			Yes	S4VEM
Magnesium	7030	mg/kg	1	E	J	Yes	S4VEM
Manganese	1050	mg/kg	1	E	J	Yes	S4VEM
Nickel	24.7	mg/kg	1			Yes	S4VEM
Potassium	601	mg/kg	1			Yes	S4VEM
Sodium	201	mg/kg	1	J	J	Yes	S4VEM
Vanadium	126	mg/kg	1	E	J	Yes	S4VEM
Zinc	62.0	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM61	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	18.7	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	98.9	mg/kg	25	D		Yes	S4VEM
Selenium	46.6	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.3	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.3	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM62	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	33300	mg/kg	1	E	J	Yes	S4VEM
Barium	131	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.63	mg/kg	1			Yes	S4VEM
Cadmium	0.37	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	2460	mg/kg	1	E	J	Yes	S4VEM
Chromium	32.1	mg/kg	1	N	J	Yes	S4VEM
Cobalt	21.8	mg/kg	1			Yes	S4VEM
Copper	102	mg/kg	1	NE	J	Yes	S4VEM
Iron	47000	mg/kg	1	E	J	Yes	S4VEM
Lead	6.5	mg/kg	1			Yes	S4VEM
Magnesium	5960	mg/kg	1	E	J	Yes	S4VEM
Manganese	851	mg/kg	1	E	J	Yes	S4VEM
Nickel	22.3	mg/kg	1			Yes	S4VEM
Potassium	524	mg/kg	1			Yes	S4VEM
Sodium	197	mg/kg	1	J	J	Yes	S4VEM
Vanadium	114	mg/kg	1	E	J	Yes	S4VEM
Zinc	52.1	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM62	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	137	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM62	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.0	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	103	mg/kg	25	D		Yes	S4VEM
Selenium	47.6	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.5	mg/kg	25	UD	U	Yes	S4VEM
Thallium	9.5	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM63	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	91.6	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM63	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	34600	mg/kg	1	E	J	Yes	S4VEM
Barium	151	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.70	mg/kg	1			Yes	S4VEM
Cadmium	0.40	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	2560	mg/kg	1	E	J	Yes	S4VEM
Chromium	32.5	mg/kg	1	N	J	Yes	S4VEM
Cobalt	26.6	mg/kg	1			Yes	S4VEM
Copper	109	mg/kg	1	NE	J	Yes	S4VEM
Iron	49200	mg/kg	1	E	J	Yes	S4VEM
Lead	5.3	mg/kg	1			Yes	S4VEM
Magnesium	7870	mg/kg	1	E	J	Yes	S4VEM
Manganese	1030	mg/kg	1	E	J	Yes	S4VEM
Nickel	26.5	mg/kg	1			Yes	S4VEM
Potassium	647	mg/kg	1			Yes	S4VEM
Sodium	209	mg/kg	1	J	J	Yes	S4VEM
Vanadium	119	mg/kg	1	E	J	Yes	S4VEM
Zinc	57.9	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM63	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.2	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	77.3	mg/kg	25	D		Yes	S4VEM
Selenium	48.0	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.6	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.6	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM64	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	92.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	33700	mg/kg	1	E	J	Yes	S4VEM
Barium	131	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.67	mg/kg	1			Yes	S4VEM
Cadmium	0.39	mg/kg	1	JE	UJ	Yes	S4VEM
Calcium	2140	mg/kg	1	E	J	Yes	S4VEM
Chromium	36.7	mg/kg	1	N	J	Yes	S4VEM
Cobalt	21.1	mg/kg	1			Yes	S4VEM
Copper	114	mg/kg	1	NE	J	Yes	S4VEM
Iron	50700	mg/kg	1	E	J	Yes	S4VEM
Lead	7.8	mg/kg	1			Yes	S4VEM
Magnesium	6210	mg/kg	1	E	J	Yes	S4VEM
Manganese	891	mg/kg	1	E	J	Yes	S4VEM
Nickel	23.6	mg/kg	1			Yes	S4VEM
Potassium	552	mg/kg	1			Yes	S4VEM
Sodium	217	mg/kg	1	J	J	Yes	S4VEM
Vanadium	129	mg/kg	1	E	J	Yes	S4VEM
Zinc	52.5	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM64	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	92.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	18.9	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	123	mg/kg	25	D		Yes	S4VEM
Selenium	47.2	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.4	mg/kg	25	UD	U	Yes	S4VEM
Thallium	9.4	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM39	Lab Code:	CHEM
Sample Number:	MJGM64	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	92.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	175	mg/kg	100	D		Yes	S4VEM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE OF
ENVIRONMENTAL ASSESSMENT

March 31, 2014

MEMORANDUM

SUBJECT: Data Validation Report for Metals Analysis of Samples Collected for Black Butte Mine Phase 2 RI – DMA, Cottage Grove, OR, Case 44058, SDG: MJGM52

FROM: Don Matheny, Chemist DM
OEA, Environmental Services Unit

TO: Richard Muza, Remedial Project Manager
Office of Environmental Clean-up, USEPA R10

CC: Mary Lou Fox, CDM

The quality assurance (QA) review of the analytical data generated from the analysis of twenty (20) soils collected from the above referenced site has been completed. These samples were analyzed for Total Metals by The Chemtech Consulting Group located in Mountainside, NJ.

Sample analyses were evaluated following EPA's Stage 4 Data Validation Electronic/Manual Process (S4VEM). The validation was conducted according to the Quality Control Specifications outlined in:

- *QAPP for Black Butte Mine Phase 2 Remedial Investigation – Demonstration of Methods Applicability QAPP, Cottage Grove, OR,* (December, 2013)
- USEPA CLP Statement of Work for Inorganic Superfund Methods (ISM01.3)
- National Functional Guidelines for Inorganic Superfund Data Review (EPA-540-R-10-011)
- Guidance for Labeling Externally Validated Laboratory Analytical Data (EPA-540-R08-005)

Some data may be qualified using the reviewer's professional judgment. The conclusions presented herein are based on the information provided for the review. A summary of samples evaluated in this validation report and the pertinent dates for sample collection, laboratory sample receipt and analyses is attached along with the validated data.

I. QUALITY CONTROL RESULTS SUMMARY

Quality Control Test	Result Ranges	Outliers?	Evaluation Criteria
Blanks	Detects Reported	Y*	ND, ≤ RL or < 10xSample
Matrix Spike (MJGM85)	3 – 110%	Y*	75 – 125%
Sample Duplicate (MJGM85)	≤ 2% or < 2xCRQL	N	≤ 30% RPD or ± 2xCRQL
Field Duplicate (MJGM57)	≤ 16% or < 2xCRQL	N	≤ 50% RPD or ± 2xCRQL
LCS (blank spike)	92 - 117%	N	70 – 130%
Serial Dilution (MJGM85)	≤ 21%	Y*	≤ 10%

*See the "*Data Qualifications*" section below for excursions and qualification of affected data.

II. DATA QUALIFICATIONS

Summary of Validation Qualifiers Applied

After the manual and electronic data review, the following data qualifications were applied:

Blanks
The following samples have analyte results ≥ MDLs but ≤ CRQLs. The associated instrument, preparation and/or field blank results are ≥ MDLs but ≤ CRQLs. Detected analytes are qualified U and the results reported at the CRQLs.
Antimony - MJGM85S, MJGM88, MJGM52, MJGM57, MJGM81 **Silver** - MJGM52 - MJGM57, MJGM81 - MJGM83, MJGM86 - MJGM91 **Thallium** - MJGM52 - MJGM57, MJGM79 - MJGM91
Detection Limits
The following samples have results ≥ MDLs but ≤ CRQLs. Detected analytes are qualified J.
Beryllium - MJGM52, MJGM56, MJGM57 **Sodium** - MJGM53 - MJGM56, MJGM79 - MJGM92
Matrix Spike
The following Matrix Spike samples have percent recoveries < 30% and post-digestion spike samples have percent recoveries greater than or equal to 75%. Detected analytes with results greater than or equal to MDLs are qualified J. Non-detected analytes are qualified UJ.
Antimony – All samples
Serial Dilution
The following ICP-AES Serial Dilution (SD) samples have percent difference (%D) greater than 10% and initial sample results are greater than 50xMDLs. The detected analytes in samples with results greater than or equal to MDLs are qualified J. Non-detected analytes in samples are qualified UJ.
Calcium, Cadmium, Iron, Manganese, Vanadium, Zinc – All samples

Data Validation Qualifiers

The following is a list of data validation qualifiers applied to the sample result(s) and their definitions.

Data Validation Qualifiers	
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J	The associated value is an estimated quantity.
J+	The associated value is an estimated quantity but the result may be biased high.
J-	The associated value is an estimated quantity but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The data are unusable. The analyte may or may not be present in the sample.

III. SAMPLE INDEX

Sample Number	Matrix	Sampling Date	Date Received	ICP-AES Analysis	ICP-MS Analysis	Mercury Analysis
MJGM52	Water	2/15/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM53	Water	2/15/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM54	Water	2/15/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM55	Water	2/15/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM56	Water	2/15/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM57	Water	2/15/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM79	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM80	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM81	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM82	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM83	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM84	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM85	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM86	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM87	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM88	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM89	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM90	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM91	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM92	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014

Field Duplicates are as follows: MJGM52 – MJGM57.

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM52	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO31	pH:	2	Sample Date:	02/15/2014	Sample Time:	14:35:00
% Moisture :				% Solids :	84.8		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	36100	mg/kg	1			Yes	S4VEM
Barium	140	mg/kg	1			Yes	S4VEM
Beryllium	0.42	mg/kg	1	J	J	Yes	S4VEM
Cadmium	1.5	mg/kg	1	E	J	Yes	S4VEM
Calcium	5550	mg/kg	1	E	J	Yes	S4VEM
Chromium	68.5	mg/kg	1			Yes	S4VEM
Cobalt	31.7	mg/kg	1			Yes	S4VEM
Copper	111	mg/kg	1			Yes	S4VEM
Iron	53000	mg/kg	1	E	J	Yes	S4VEM
Lead	236	mg/kg	1			Yes	S4VEM
Magnesium	6480	mg/kg	1			Yes	S4VEM
Manganese	1500	mg/kg	1	E	J	Yes	S4VEM
Nickel	34.2	mg/kg	1			Yes	S4VEM
Potassium	698	mg/kg	1			Yes	S4VEM
Sodium	455	mg/kg	1			Yes	S4VEM
Vanadium	163	mg/kg	1	E	J	Yes	S4VEM
Zinc	202	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM52	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO31	pH:	2	Sample Date:	02/15/2014	Sample Time:	14:35:00
% Moisture :				% Solids :	84.8		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	13.3	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM52	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO31	pH:	2	Sample Date:	02/15/2014	Sample Time:	14:35:00
% Moisture :				% Solids :	84.8		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.1	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	52.8	mg/kg	25	D		Yes	S4VEM
Selenium	52.6	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.5	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.5	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM53	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO32	pH:	2	Sample Date:	02/15/2014	Sample Time:	14:45:00
% Moisture :				% Solids :	81		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.9	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	34.5	mg/kg	25	D		Yes	S4VEM
Selenium	54.7	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.9	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.9	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM53	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO32	pH:	2	Sample Date:	02/15/2014	Sample Time:	14:45:00
% Moisture :				% Solids :	81		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	31.9	mg/kg	20	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM53	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO32	pH:	2	Sample Date:	02/15/2014	Sample Time:	14:45:00
% Moisture :				% Solids :	81		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	28400	mg/kg	1			Yes	S4VEM
Barium	151	mg/kg	1			Yes	S4VEM
Beryllium	0.47	mg/kg	1			Yes	S4VEM
Cadmium	1.3	mg/kg	1	E	J	Yes	S4VEM
Calcium	6930	mg/kg	1	E	J	Yes	S4VEM
Chromium	63.1	mg/kg	1			Yes	S4VEM
Cobalt	21.3	mg/kg	1			Yes	S4VEM
Copper	296	mg/kg	1			Yes	S4VEM
Iron	51000	mg/kg	1	E	J	Yes	S4VEM
Lead	23.5	mg/kg	1			Yes	S4VEM
Magnesium	4380	mg/kg	1			Yes	S4VEM
Manganese	1100	mg/kg	1	E	J	Yes	S4VEM
Nickel	22.8	mg/kg	1			Yes	S4VEM
Potassium	684	mg/kg	1			Yes	S4VEM
Sodium	327	mg/kg	1	J	J	Yes	S4VEM
Vanadium	155	mg/kg	1	E	J	Yes	S4VEM
Zinc	117	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM54	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO33	pH:	2	Sample Date:	02/15/2014	Sample Time:	14:55:00
% Moisture :				% Solids :	79.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	24900	mg/kg	1			Yes	S4VEM
Barium	130	mg/kg	1			Yes	S4VEM
Beryllium	0.53	mg/kg	1			Yes	S4VEM
Cadmium	1.4	mg/kg	1	E	J	Yes	S4VEM
Calcium	9870	mg/kg	1	E	J	Yes	S4VEM
Chromium	63.6	mg/kg	1			Yes	S4VEM
Cobalt	21.0	mg/kg	1			Yes	S4VEM
Copper	69.8	mg/kg	1			Yes	S4VEM
Iron	48100	mg/kg	1	E	J	Yes	S4VEM
Lead	44.8	mg/kg	1			Yes	S4VEM
Magnesium	4390	mg/kg	1			Yes	S4VEM
Manganese	1100	mg/kg	1	E	J	Yes	S4VEM
Nickel	24.1	mg/kg	1			Yes	S4VEM
Potassium	893	mg/kg	1			Yes	S4VEM
Sodium	319	mg/kg	1	J	J	Yes	S4VEM
Vanadium	139	mg/kg	1	E	J	Yes	S4VEM
Zinc	477	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM54	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO33	pH:	2	Sample Date:	02/15/2014	Sample Time:	14:55:00
% Moisture :				% Solids :	79.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	22.0	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	39.5	mg/kg	25	D		Yes	S4VEM
Selenium	55.0	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.0	mg/kg	25	JD	U	Yes	S4VEM
Thallium	11.0	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM54	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO33	pH:	2	Sample Date:	02/15/2014	Sample Time:	14:55:00
% Moisture :				% Solids :	79.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	27.7	mg/kg	20	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM55	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO34	pH:	2	Sample Date:	02/15/2014	Sample Time:	15:05:00
% Moisture :				% Solids :	78.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	9.2	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM55	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO34	pH:	2	Sample Date:	02/15/2014	Sample Time:	15:05:00
% Moisture :				% Solids :	78.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	22.9	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	36.2	mg/kg	25	D		Yes	S4VEM
Selenium	57.1	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.4	mg/kg	25	JD	U	Yes	S4VEM
Thallium	11.4	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM55	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO34	pH:	2	Sample Date:	02/15/2014	Sample Time:	15:05:00
% Moisture :				% Solids :	78.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	29700	mg/kg	1			Yes	S4VEM
Barium	137	mg/kg	1			Yes	S4VEM
Beryllium	0.50	mg/kg	1			Yes	S4VEM
Cadmium	1.3	mg/kg	1	E	J	Yes	S4VEM
Calcium	6610	mg/kg	1	E	J	Yes	S4VEM
Chromium	45.2	mg/kg	1			Yes	S4VEM
Cobalt	26.2	mg/kg	1			Yes	S4VEM
Copper	87.3	mg/kg	1			Yes	S4VEM
Iron	48300	mg/kg	1	E	J	Yes	S4VEM
Lead	8.0	mg/kg	1			Yes	S4VEM
Magnesium	5120	mg/kg	1			Yes	S4VEM
Manganese	1080	mg/kg	1	E	J	Yes	S4VEM
Nickel	25.2	mg/kg	1			Yes	S4VEM
Potassium	1210	mg/kg	1			Yes	S4VEM
Sodium	352	mg/kg	1	J	J	Yes	S4VEM
Vanadium	132	mg/kg	1	E	J	Yes	S4VEM
Zinc	104	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM56	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO35	pH:	2	Sample Date:	02/15/2014	Sample Time:	15:35:00
% Moisture :				% Solids :	77.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	37800	mg/kg	1			Yes	S4VEM
Barium	142	mg/kg	1			Yes	S4VEM
Beryllium	0.45	mg/kg	1	J	J	Yes	S4VEM
Cadmium	1.3	mg/kg	1	E	J	Yes	S4VEM
Calcium	4570	mg/kg	1	E	J	Yes	S4VEM
Chromium	83.4	mg/kg	1			Yes	S4VEM
Cobalt	30.0	mg/kg	1			Yes	S4VEM
Copper	103	mg/kg	1			Yes	S4VEM
Iron	51700	mg/kg	1	E	J	Yes	S4VEM
Lead	27.4	mg/kg	1			Yes	S4VEM
Magnesium	5770	mg/kg	1			Yes	S4VEM
Manganese	1370	mg/kg	1	E	J	Yes	S4VEM
Nickel	41.4	mg/kg	1			Yes	S4VEM
Potassium	625	mg/kg	1			Yes	S4VEM
Sodium	447	mg/kg	1	J	J	Yes	S4VEM
Vanadium	152	mg/kg	1	E	J	Yes	S4VEM
Zinc	139	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM56	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO35	pH:	2	Sample Date:	02/15/2014	Sample Time:	15:35:00
% Moisture :				% Solids :	77.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	22.4	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM56	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO35	pH:	2	Sample Date:	02/15/2014	Sample Time:	15:35:00
% Moisture :				% Solids :	77.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	22.7	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	55.1	mg/kg	25	D		Yes	S4VEM
Selenium	56.7	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.3	mg/kg	25	JD	U	Yes	S4VEM
Thallium	11.3	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM57	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO31	pH:	2	Sample Date:	02/15/2014	Sample Time:	14:40:00
% Moisture :				% Solids :	81.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	35800	mg/kg	1			Yes	S4VEM
Barium	143	mg/kg	1			Yes	S4VEM
Beryllium	0.43	mg/kg	1	J	J	Yes	S4VEM
Cadmium	1.4	mg/kg	1	E	J	Yes	S4VEM
Calcium	5740	mg/kg	1	E	J	Yes	S4VEM
Chromium	65.1	mg/kg	1			Yes	S4VEM
Cobalt	30.5	mg/kg	1			Yes	S4VEM
Copper	118	mg/kg	1			Yes	S4VEM
Iron	51800	mg/kg	1	E	J	Yes	S4VEM
Lead	223	mg/kg	1			Yes	S4VEM
Magnesium	6370	mg/kg	1			Yes	S4VEM
Manganese	1470	mg/kg	1	E	J	Yes	S4VEM
Nickel	33.3	mg/kg	1			Yes	S4VEM
Potassium	734	mg/kg	1			Yes	S4VEM
Sodium	448	mg/kg	1			Yes	S4VEM
Vanadium	159	mg/kg	1	E	J	Yes	S4VEM
Zinc	236	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM57	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO31	pH:	2	Sample Date:	02/15/2014	Sample Time:	14:40:00
% Moisture :				% Solids :	81.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	22.3	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	59.4	mg/kg	25	D		Yes	S4VEM
Selenium	55.6	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.1	mg/kg	25	JD	U	Yes	S4VEM
Thallium	11.1	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM57	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO31	pH:	2	Sample Date:	02/15/2014	Sample Time:	14:40:00
% Moisture :				% Solids :	81.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	12.3	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM79	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	13.3	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM79	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	35900	mg/kg	1			Yes	S4VEM
Barium	182	mg/kg	1			Yes	S4VEM
Beryllium	0.70	mg/kg	1			Yes	S4VEM
Cadmium	1.4	mg/kg	1	E	J	Yes	S4VEM
Calcium	5650	mg/kg	1	E	J	Yes	S4VEM
Chromium	50.1	mg/kg	1			Yes	S4VEM
Cobalt	29.3	mg/kg	1			Yes	S4VEM
Copper	91.4	mg/kg	1			Yes	S4VEM
Iron	58000	mg/kg	1	E	J	Yes	S4VEM
Lead	4.5	mg/kg	1			Yes	S4VEM
Magnesium	5350	mg/kg	1			Yes	S4VEM
Manganese	1610	mg/kg	1	E	J	Yes	S4VEM
Nickel	24.0	mg/kg	1			Yes	S4VEM
Potassium	569	mg/kg	1			Yes	S4VEM
Sodium	289	mg/kg	1	J	J	Yes	S4VEM
Vanadium	148	mg/kg	1	E	J	Yes	S4VEM
Zinc	109	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM79	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.2	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	27.9	mg/kg	25	D		Yes	S4VEM
Selenium	53.0	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.6	mg/kg	25	UD	U	Yes	S4VEM
Thallium	10.6	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM80	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	84.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	10.0	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM80	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	84.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	22.4	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	29.3	mg/kg	25	D		Yes	S4VEM
Selenium	56.0	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.2	mg/kg	25	UD	U	Yes	S4VEM
Thallium	11.2	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM80	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	84.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	33300	mg/kg	1			Yes	S4VEM
Barium	168	mg/kg	1			Yes	S4VEM
Beryllium	0.59	mg/kg	1			Yes	S4VEM
Cadmium	1.4	mg/kg	1	E	J	Yes	S4VEM
Calcium	5180	mg/kg	1	E	J	Yes	S4VEM
Chromium	53.5	mg/kg	1			Yes	S4VEM
Cobalt	27.5	mg/kg	1			Yes	S4VEM
Copper	84.9	mg/kg	1			Yes	S4VEM
Iron	56000	mg/kg	1	E	J	Yes	S4VEM
Lead	4.8	mg/kg	1			Yes	S4VEM
Magnesium	5100	mg/kg	1			Yes	S4VEM
Manganese	1520	mg/kg	1	E	J	Yes	S4VEM
Nickel	24.3	mg/kg	1			Yes	S4VEM
Potassium	452	mg/kg	1			Yes	S4VEM
Sodium	275	mg/kg	1	J	J	Yes	S4VEM
Vanadium	136	mg/kg	1	E	J	Yes	S4VEM
Zinc	100	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM81	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	31700	mg/kg	1			Yes	S4VEM
Barium	161	mg/kg	1			Yes	S4VEM
Beryllium	0.59	mg/kg	1			Yes	S4VEM
Cadmium	1.3	mg/kg	1	E	J	Yes	S4VEM
Calcium	4970	mg/kg	1	E	J	Yes	S4VEM
Chromium	43.8	mg/kg	1			Yes	S4VEM
Cobalt	26.2	mg/kg	1			Yes	S4VEM
Copper	80.2	mg/kg	1			Yes	S4VEM
Iron	51800	mg/kg	1	E	J	Yes	S4VEM
Lead	4.0	mg/kg	1			Yes	S4VEM
Magnesium	4860	mg/kg	1			Yes	S4VEM
Manganese	1450	mg/kg	1	E	J	Yes	S4VEM
Nickel	20.7	mg/kg	1			Yes	S4VEM
Potassium	481	mg/kg	1			Yes	S4VEM
Sodium	235	mg/kg	1	J	J	Yes	S4VEM
Vanadium	131	mg/kg	1	E	J	Yes	S4VEM
Zinc	92.7	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM81	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	13.2	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM81	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.6	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	29.3	mg/kg	25	D		Yes	S4VEM
Selenium	54.1	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.8	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.8	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM82	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	32100	mg/kg	1			Yes	S4VEM
Barium	169	mg/kg	1			Yes	S4VEM
Beryllium	0.63	mg/kg	1			Yes	S4VEM
Cadmium	1.3	mg/kg	1	E	J	Yes	S4VEM
Calcium	5290	mg/kg	1	E	J	Yes	S4VEM
Chromium	41.7	mg/kg	1			Yes	S4VEM
Cobalt	26.3	mg/kg	1			Yes	S4VEM
Copper	81.6	mg/kg	1			Yes	S4VEM
Iron	52500	mg/kg	1	E	J	Yes	S4VEM
Lead	3.8	mg/kg	1			Yes	S4VEM
Magnesium	4970	mg/kg	1			Yes	S4VEM
Manganese	1480	mg/kg	1	E	J	Yes	S4VEM
Nickel	20.6	mg/kg	1			Yes	S4VEM
Potassium	496	mg/kg	1			Yes	S4VEM
Sodium	259	mg/kg	1	J	J	Yes	S4VEM
Vanadium	135	mg/kg	1	E	J	Yes	S4VEM
Zinc	97.8	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM82	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	9.8	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM82	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	20.7	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	22.4	mg/kg	25	D		Yes	S4VEM
Selenium	51.7	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.3	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.3	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM83	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	31100	mg/kg	1			Yes	S4VEM
Barium	159	mg/kg	1			Yes	S4VEM
Beryllium	0.59	mg/kg	1			Yes	S4VEM
Cadmium	1.2	mg/kg	1	E	J	Yes	S4VEM
Calcium	4980	mg/kg	1	E	J	Yes	S4VEM
Chromium	44.2	mg/kg	1			Yes	S4VEM
Cobalt	26.3	mg/kg	1			Yes	S4VEM
Copper	78.1	mg/kg	1			Yes	S4VEM
Iron	50500	mg/kg	1	E	J	Yes	S4VEM
Lead	3.7	mg/kg	1			Yes	S4VEM
Magnesium	4750	mg/kg	1			Yes	S4VEM
Manganese	1470	mg/kg	1	E	J	Yes	S4VEM
Nickel	21.3	mg/kg	1			Yes	S4VEM
Potassium	477	mg/kg	1			Yes	S4VEM
Sodium	251	mg/kg	1	J	J	Yes	S4VEM
Vanadium	128	mg/kg	1	E	J	Yes	S4VEM
Zinc	92.4	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM83	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	14.3	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM83	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.1	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	23.3	mg/kg	25	D		Yes	S4VEM
Selenium	52.9	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.6	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.6	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM84	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	88		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.7	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	27.2	mg/kg	25	D		Yes	S4VEM
Selenium	54.2	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.8	mg/kg	25	UD	U	Yes	S4VEM
Thallium	10.8	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM84	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	88		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	29200	mg/kg	1			Yes	S4VEM
Barium	150	mg/kg	1			Yes	S4VEM
Beryllium	0.65	mg/kg	1			Yes	S4VEM
Cadmium	1.3	mg/kg	1	E	J	Yes	S4VEM
Calcium	4680	mg/kg	1	E	J	Yes	S4VEM
Chromium	45.6	mg/kg	1			Yes	S4VEM
Cobalt	25.9	mg/kg	1			Yes	S4VEM
Copper	74.5	mg/kg	1			Yes	S4VEM
Iron	49100	mg/kg	1	E	J	Yes	S4VEM
Lead	4.3	mg/kg	1			Yes	S4VEM
Magnesium	4430	mg/kg	1			Yes	S4VEM
Manganese	1340	mg/kg	1	E	J	Yes	S4VEM
Nickel	20.4	mg/kg	1			Yes	S4VEM
Potassium	479	mg/kg	1			Yes	S4VEM
Sodium	244	mg/kg	1	J	J	Yes	S4VEM
Vanadium	126	mg/kg	1	E	J	Yes	S4VEM
Zinc	87.2	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM84	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	88		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	14.0	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM85	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	87.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	11.0	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM85	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	87.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.6	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	28.2	mg/kg	25	D		Yes	S4VEM
Selenium	54.0	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.8	mg/kg	25	UD	U	Yes	S4VEM
Thallium	10.8	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM85	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	87.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	35600	mg/kg	1			Yes	S4VEM
Barium	181	mg/kg	1			Yes	S4VEM
Beryllium	0.69	mg/kg	1			Yes	S4VEM
Cadmium	1.4	mg/kg	1	E	J	Yes	S4VEM
Calcium	5540	mg/kg	1	E	J	Yes	S4VEM
Chromium	48.3	mg/kg	1			Yes	S4VEM
Cobalt	28.4	mg/kg	1			Yes	S4VEM
Copper	86.6	mg/kg	1			Yes	S4VEM
Iron	56600	mg/kg	1	E	J	Yes	S4VEM
Lead	4.5	mg/kg	1			Yes	S4VEM
Magnesium	5330	mg/kg	1			Yes	S4VEM
Manganese	1610	mg/kg	1	E	J	Yes	S4VEM
Nickel	23.3	mg/kg	1			Yes	S4VEM
Potassium	559	mg/kg	1			Yes	S4VEM
Sodium	284	mg/kg	1	J	J	Yes	S4VEM
Vanadium	145	mg/kg	1	E	J	Yes	S4VEM
Zinc	105	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM86	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	22.2	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	30.0	mg/kg	25	D		Yes	S4VEM
Selenium	55.4	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.1	mg/kg	25	JD	U	Yes	S4VEM
Thallium	11.1	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM86	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	33900	mg/kg	1			Yes	S4VEM
Barium	171	mg/kg	1			Yes	S4VEM
Beryllium	0.70	mg/kg	1			Yes	S4VEM
Cadmium	1.3	mg/kg	1	E	J	Yes	S4VEM
Calcium	5170	mg/kg	1	E	J	Yes	S4VEM
Chromium	50.6	mg/kg	1			Yes	S4VEM
Cobalt	28.1	mg/kg	1			Yes	S4VEM
Copper	83.6	mg/kg	1			Yes	S4VEM
Iron	54800	mg/kg	1	E	J	Yes	S4VEM
Lead	5.1	mg/kg	1			Yes	S4VEM
Magnesium	4900	mg/kg	1			Yes	S4VEM
Manganese	1570	mg/kg	1	E	J	Yes	S4VEM
Nickel	23.5	mg/kg	1			Yes	S4VEM
Potassium	500	mg/kg	1			Yes	S4VEM
Sodium	281	mg/kg	1	J	J	Yes	S4VEM
Vanadium	138	mg/kg	1	E	J	Yes	S4VEM
Zinc	98.2	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM86	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	11.8	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM87	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	22.2	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	26.2	mg/kg	25	D		Yes	S4VEM
Selenium	55.6	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.1	mg/kg	25	JD	U	Yes	S4VEM
Thallium	11.1	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM87	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	15.6	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM87	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	33200	mg/kg	1			Yes	S4VEM
Barium	172	mg/kg	1			Yes	S4VEM
Beryllium	0.65	mg/kg	1			Yes	S4VEM
Cadmium	1.4	mg/kg	1	E	J	Yes	S4VEM
Calcium	5250	mg/kg	1	E	J	Yes	S4VEM
Chromium	48.5	mg/kg	1			Yes	S4VEM
Cobalt	28.2	mg/kg	1			Yes	S4VEM
Copper	82.1	mg/kg	1			Yes	S4VEM
Iron	53000	mg/kg	1	E	J	Yes	S4VEM
Lead	4.7	mg/kg	1			Yes	S4VEM
Magnesium	4970	mg/kg	1			Yes	S4VEM
Manganese	1580	mg/kg	1	E	J	Yes	S4VEM
Nickel	22.8	mg/kg	1			Yes	S4VEM
Potassium	513	mg/kg	1			Yes	S4VEM
Sodium	269	mg/kg	1	J	J	Yes	S4VEM
Vanadium	138	mg/kg	1	E	J	Yes	S4VEM
Zinc	98.4	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM88	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	31000	mg/kg	1			Yes	S4VEM
Barium	159	mg/kg	1			Yes	S4VEM
Beryllium	0.56	mg/kg	1			Yes	S4VEM
Cadmium	1.2	mg/kg	1	E	J	Yes	S4VEM
Calcium	4960	mg/kg	1	E	J	Yes	S4VEM
Chromium	42.0	mg/kg	1			Yes	S4VEM
Cobalt	26.3	mg/kg	1			Yes	S4VEM
Copper	77.5	mg/kg	1			Yes	S4VEM
Iron	51700	mg/kg	1	E	J	Yes	S4VEM
Lead	3.9	mg/kg	1			Yes	S4VEM
Magnesium	4720	mg/kg	1			Yes	S4VEM
Manganese	1470	mg/kg	1	E	J	Yes	S4VEM
Nickel	19.8	mg/kg	1			Yes	S4VEM
Potassium	461	mg/kg	1			Yes	S4VEM
Sodium	261	mg/kg	1	J	J	Yes	S4VEM
Vanadium	132	mg/kg	1	E	J	Yes	S4VEM
Zinc	91.9	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM88	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.6	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	30.7	mg/kg	25	D		Yes	S4VEM
Selenium	54.0	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.8	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.8	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM88	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	10.9	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM89	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	33000	mg/kg	1			Yes	S4VEM
Barium	171	mg/kg	1			Yes	S4VEM
Beryllium	0.68	mg/kg	1			Yes	S4VEM
Cadmium	1.3	mg/kg	1	E	J	Yes	S4VEM
Calcium	5290	mg/kg	1	E	J	Yes	S4VEM
Chromium	45.0	mg/kg	1			Yes	S4VEM
Cobalt	26.7	mg/kg	1			Yes	S4VEM
Copper	83.7	mg/kg	1			Yes	S4VEM
Iron	53800	mg/kg	1	E	J	Yes	S4VEM
Lead	4.2	mg/kg	1			Yes	S4VEM
Magnesium	5070	mg/kg	1			Yes	S4VEM
Manganese	1500	mg/kg	1	E	J	Yes	S4VEM
Nickel	21.5	mg/kg	1			Yes	S4VEM
Potassium	533	mg/kg	1			Yes	S4VEM
Sodium	279	mg/kg	1	J	J	Yes	S4VEM
Vanadium	137	mg/kg	1	E	J	Yes	S4VEM
Zinc	99.6	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM89	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	8.5	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM89	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.4	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	24.7	mg/kg	25	D		Yes	S4VEM
Selenium	53.4	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.7	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.7	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM90	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	33000	mg/kg	1			Yes	S4VEM
Barium	179	mg/kg	1			Yes	S4VEM
Beryllium	0.60	mg/kg	1			Yes	S4VEM
Cadmium	1.4	mg/kg	1	E	J	Yes	S4VEM
Calcium	5270	mg/kg	1	E	J	Yes	S4VEM
Chromium	45.8	mg/kg	1			Yes	S4VEM
Cobalt	27.6	mg/kg	1			Yes	S4VEM
Copper	81.6	mg/kg	1			Yes	S4VEM
Iron	51400	mg/kg	1	E	J	Yes	S4VEM
Lead	3.8	mg/kg	1			Yes	S4VEM
Magnesium	5120	mg/kg	1			Yes	S4VEM
Manganese	1580	mg/kg	1	E	J	Yes	S4VEM
Nickel	22.5	mg/kg	1			Yes	S4VEM
Potassium	510	mg/kg	1			Yes	S4VEM
Sodium	267	mg/kg	1	J	J	Yes	S4VEM
Vanadium	132	mg/kg	1	E	J	Yes	S4VEM
Zinc	98.9	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM90	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	10.6	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM90	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.6	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	21.0	mg/kg	25	D		Yes	S4VEM
Selenium	54.1	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.8	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.8	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM91	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	87.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	12.0	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM91	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	87.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	20.3	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	24.4	mg/kg	25	D		Yes	S4VEM
Selenium	50.8	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.2	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.2	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM91	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	87.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	33000	mg/kg	1			Yes	S4VEM
Barium	169	mg/kg	1			Yes	S4VEM
Beryllium	0.63	mg/kg	1			Yes	S4VEM
Cadmium	1.4	mg/kg	1	E	J	Yes	S4VEM
Calcium	5220	mg/kg	1	E	J	Yes	S4VEM
Chromium	56.2	mg/kg	1			Yes	S4VEM
Cobalt	27.4	mg/kg	1			Yes	S4VEM
Copper	82.9	mg/kg	1			Yes	S4VEM
Iron	53000	mg/kg	1	E	J	Yes	S4VEM
Lead	4.2	mg/kg	1			Yes	S4VEM
Magnesium	4980	mg/kg	1			Yes	S4VEM
Manganese	1520	mg/kg	1	E	J	Yes	S4VEM
Nickel	26.2	mg/kg	1			Yes	S4VEM
Potassium	540	mg/kg	1			Yes	S4VEM
Sodium	276	mg/kg	1	J	J	Yes	S4VEM
Vanadium	138	mg/kg	1	E	J	Yes	S4VEM
Zinc	95.8	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM92	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	87.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	12.9	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM92	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	87.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	20.9	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	23.2	mg/kg	25	D		Yes	S4VEM
Selenium	52.3	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.5	mg/kg	25	UD	U	Yes	S4VEM
Thallium	10.5	mg/kg	25	UD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM52	Lab Code:	CHEM
Sample Number:	MJGM92	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	87.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	33200	mg/kg	1			Yes	S4VEM
Barium	169	mg/kg	1			Yes	S4VEM
Beryllium	0.64	mg/kg	1			Yes	S4VEM
Cadmium	1.4	mg/kg	1	E	J	Yes	S4VEM
Calcium	5210	mg/kg	1	E	J	Yes	S4VEM
Chromium	46.4	mg/kg	1			Yes	S4VEM
Cobalt	28.3	mg/kg	1			Yes	S4VEM
Copper	83.5	mg/kg	1			Yes	S4VEM
Iron	53500	mg/kg	1	E	J	Yes	S4VEM
Lead	4.2	mg/kg	1			Yes	S4VEM
Magnesium	4980	mg/kg	1			Yes	S4VEM
Manganese	1570	mg/kg	1	E	J	Yes	S4VEM
Nickel	22.5	mg/kg	1			Yes	S4VEM
Potassium	550	mg/kg	1			Yes	S4VEM
Sodium	268	mg/kg	1	J	J	Yes	S4VEM
Vanadium	139	mg/kg	1	E	J	Yes	S4VEM
Zinc	98.7	mg/kg	1	E	J	Yes	S4VEM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE OF
ENVIRONMENTAL ASSESSMENT

March 31, 2014

MEMORANDUM

SUBJECT: Data Validation Report for Metals Analysis of Samples Collected for Black Butte Mine Phase 2 RI – DMA, Cottage Grove, OR, Case 44058, SDG: MJGM65

FROM: Don Matheny, Chemist DM
OEA, Environmental Services Unit

TO: Richard Muza, Remedial Project Manager
Office of Environmental Clean-up, USEPA R10

CC: Mary Lou Fox, CDM

The quality assurance (QA) review of the analytical data generated from the analysis of fourteen (14) soils collected from the above referenced site has been completed. These samples were analyzed for Total Metals by The Chemtech Consulting Group located in Mountainside, NJ.

Sample analyses were evaluated following EPA's Stage 4 Data Validation Electronic/Manual Process (S4VEM). The validation was conducted according to the Quality Control Specifications outlined in:

- *QAPP for Black Butte Mine Phase 2 Remedial Investigation – Demonstration of Methods Applicability QAPP, Cottage Grove, OR,* (December, 2013)
- USEPA CLP Statement of Work for Inorganic Superfund Methods (ISM01.3)
- National Functional Guidelines for Inorganic Superfund Data Review (EPA-540-R-10-011)
- Guidance for Labeling Externally Validated Laboratory Analytical Data (EPA-540-R08-005)

Some data may be qualified using the reviewer's professional judgment. The conclusions presented herein are based on the information provided for the review. A summary of samples evaluated in this validation report and the pertinent dates for sample collection, laboratory sample receipt and analyses is attached along with the validated data.

I. QUALITY CONTROL RESULTS SUMMARY

Quality Control Test	Result Ranges	Outliers?	Evaluation Criteria
Blanks	Detects Reported	Y*	ND, ≤ RL or < 10xSample
Matrix Spike (MJGM85)	4 – 147%	Y*	75 – 125%
Sample Duplicate (MJGM85)	≤ 12% or < 2xCRQL	N	≤ 30% RPD or ± 2xCRQL
LCS (blank spike)	88 - 114%	N	70 – 130%
Serial Dilution (MJGM85)	≤ 23%	Y*	≤ 10%

*See the "*Data Qualifications*" section below for excursions and qualification of affected data.

II. DATA QUALIFICATIONS

Summary of Validation Qualifiers Applied

After the manual and electronic data review, the following data qualifications were applied:

Blanks
The following samples have analyte results ≥ MDLs but ≤ CRQLs. The associated instrument, preparation and/or field blank results are ≥ MDLs but ≤ CRQLs. Detected analytes are qualified U and the results reported at the CRQLs.
Antimony – All samples **Silver -** MJGM65 - MJGM69, MJGM71 - MJGM76 **Thallium -** All samples
Detection Limits
The following samples have results ≥ MDLs but ≤ CRQLs. Detected analytes are qualified J.
Sodium – All samples
Matrix Spike
The following Matrix Spike samples have percent recoveries greater than 125% and post-digestion spike samples have percent recoveries less than or equal to 125%. Detected analytes with results greater than or equal to MDLs are qualified J. Non-detected analytes are not qualified.
Copper, Lead – All samples
The following Matrix Spike samples have percent recoveries < 30% and post-digestion spike samples have percent recoveries greater than or equal to 75%. Detected analytes with results greater than or equal to MDLs are qualified J. Non-detected analytes are qualified UJ.
Antimony – All samples
Serial Dilution
The following ICP-AES Serial Dilution (SD) samples have percent difference (%D) greater than 10% and initial sample results are greater than 50xMDLs. The detected analytes in samples with results greater than or equal to MDLs are qualified J. Non-detected analytes in samples are qualified UJ.
Cadmium, Calcium, Chromium, Copper, Iron, Magnesium, Manganese, Vanadium, Zinc – All samples

Data Validation Qualifiers

The following is a list of data validation qualifiers applied to the sample result(s) and their definitions.

Data Validation Qualifiers	
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J	The associated value is an estimated quantity.
J+	The associated value is an estimated quantity but the result may be biased high.
J-	The associated value is an estimated quantity but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The data are unusable. The analyte may or may not be present in the sample.

III. SAMPLE INDEX

Sample Number	Matrix	Sampling Date	Date Received	ICP-AES Analysis	ICP-MS Analysis	Mercury Analysis
MJGM65	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM66	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM67	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM68	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM69	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM70	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM71	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM72	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM73	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM74	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM75	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM76	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM77	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM78	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM65	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	129	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM65	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	32400	mg/kg	1			Yes	S4VEM
Barium	136	mg/kg	1			Yes	S4VEM
Beryllium	0.50	mg/kg	1			Yes	S4VEM
Cadmium	1.1	mg/kg	1	E	J	Yes	S4VEM
Calcium	2780	mg/kg	1	E	J	Yes	S4VEM
Chromium	31.5	mg/kg	1	E	J	Yes	S4VEM
Cobalt	21.5	mg/kg	1			Yes	S4VEM
Copper	103	mg/kg	1	NE	J	Yes	S4VEM
Iron	47000	mg/kg	1	E	J	Yes	S4VEM
Lead	6.7	mg/kg	1	N	J	Yes	S4VEM
Magnesium	6400	mg/kg	1	E	J	Yes	S4VEM
Manganese	899	mg/kg	1	E	J	Yes	S4VEM
Nickel	20.8	mg/kg	1			Yes	S4VEM
Potassium	422	mg/kg	1			Yes	S4VEM
Sodium	206	mg/kg	1	J	J	Yes	S4VEM
Vanadium	119	mg/kg	1	E	J	Yes	S4VEM
Zinc	62.2	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM65	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.4	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	98.2	mg/kg	25	D		Yes	S4VEM
Selenium	48.4	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.7	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.7	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM66	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	32700	mg/kg	1			Yes	S4VEM
Barium	139	mg/kg	1			Yes	S4VEM
Beryllium	0.52	mg/kg	1			Yes	S4VEM
Cadmium	1.3	mg/kg	1	E	J	Yes	S4VEM
Calcium	2640	mg/kg	1	E	J	Yes	S4VEM
Chromium	34.2	mg/kg	1	E	J	Yes	S4VEM
Cobalt	23.9	mg/kg	1			Yes	S4VEM
Copper	108	mg/kg	1	NE	J	Yes	S4VEM
Iron	51200	mg/kg	1	E	J	Yes	S4VEM
Lead	9.5	mg/kg	1	N	J	Yes	S4VEM
Magnesium	6590	mg/kg	1	E	J	Yes	S4VEM
Manganese	995	mg/kg	1	E	J	Yes	S4VEM
Nickel	21.4	mg/kg	1			Yes	S4VEM
Potassium	474	mg/kg	1			Yes	S4VEM
Sodium	216	mg/kg	1	J	J	Yes	S4VEM
Vanadium	130	mg/kg	1	E	J	Yes	S4VEM
Zinc	59.6	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM66	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	20.1	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	112	mg/kg	25	D		Yes	S4VEM
Selenium	50.2	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.0	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.0	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM66	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	157	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM67	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	20.5	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	97.6	mg/kg	25	D		Yes	S4VEM
Selenium	51.2	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.2	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.2	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM67	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	30500	mg/kg	1			Yes	S4VEM
Barium	136	mg/kg	1			Yes	S4VEM
Beryllium	0.45	mg/kg	1			Yes	S4VEM
Cadmium	1.3	mg/kg	1	E	J	Yes	S4VEM
Calcium	2690	mg/kg	1	E	J	Yes	S4VEM
Chromium	34.5	mg/kg	1	E	J	Yes	S4VEM
Cobalt	22.9	mg/kg	1			Yes	S4VEM
Copper	114	mg/kg	1	NE	J	Yes	S4VEM
Iron	49300	mg/kg	1	E	J	Yes	S4VEM
Lead	6.5	mg/kg	1	N	J	Yes	S4VEM
Magnesium	7200	mg/kg	1	E	J	Yes	S4VEM
Manganese	941	mg/kg	1	E	J	Yes	S4VEM
Nickel	21.8	mg/kg	1			Yes	S4VEM
Potassium	500	mg/kg	1			Yes	S4VEM
Sodium	206	mg/kg	1	J	J	Yes	S4VEM
Vanadium	130	mg/kg	1	E	J	Yes	S4VEM
Zinc	59.2	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM67	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	209	mg/kg	200	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM68	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.6	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	107	mg/kg	25	D		Yes	S4VEM
Selenium	49.0	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.8	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.8	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM68	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	31600	mg/kg	1			Yes	S4VEM
Barium	133	mg/kg	1			Yes	S4VEM
Beryllium	0.48	mg/kg	1			Yes	S4VEM
Cadmium	1.3	mg/kg	1	E	J	Yes	S4VEM
Calcium	2470	mg/kg	1	E	J	Yes	S4VEM
Chromium	35.6	mg/kg	1	E	J	Yes	S4VEM
Cobalt	21.4	mg/kg	1			Yes	S4VEM
Copper	111	mg/kg	1	NE	J	Yes	S4VEM
Iron	49100	mg/kg	1	E	J	Yes	S4VEM
Lead	9.8	mg/kg	1	N	J	Yes	S4VEM
Magnesium	6370	mg/kg	1	E	J	Yes	S4VEM
Manganese	927	mg/kg	1	E	J	Yes	S4VEM
Nickel	21.2	mg/kg	1			Yes	S4VEM
Potassium	448	mg/kg	1			Yes	S4VEM
Sodium	209	mg/kg	1	J	J	Yes	S4VEM
Vanadium	131	mg/kg	1	E	J	Yes	S4VEM
Zinc	57.7	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM68	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	156	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM69	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	128	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM69	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	18.9	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	107	mg/kg	25	D		Yes	S4VEM
Selenium	47.4	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.5	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.5	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM69	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	33000	mg/kg	1			Yes	S4VEM
Barium	134	mg/kg	1			Yes	S4VEM
Beryllium	0.48	mg/kg	1			Yes	S4VEM
Cadmium	1.2	mg/kg	1	E	J	Yes	S4VEM
Calcium	2570	mg/kg	1	E	J	Yes	S4VEM
Chromium	33.2	mg/kg	1	E	J	Yes	S4VEM
Cobalt	21.5	mg/kg	1			Yes	S4VEM
Copper	102	mg/kg	1	NE	J	Yes	S4VEM
Iron	47400	mg/kg	1	E	J	Yes	S4VEM
Lead	10.7	mg/kg	1	N	J	Yes	S4VEM
Magnesium	5900	mg/kg	1	E	J	Yes	S4VEM
Manganese	833	mg/kg	1	E	J	Yes	S4VEM
Nickel	20.0	mg/kg	1			Yes	S4VEM
Potassium	403	mg/kg	1			Yes	S4VEM
Sodium	215	mg/kg	1	J	J	Yes	S4VEM
Vanadium	120	mg/kg	1	E	J	Yes	S4VEM
Zinc	54.3	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM70	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	32400	mg/kg	1			Yes	S4VEM
Barium	134	mg/kg	1			Yes	S4VEM
Beryllium	0.52	mg/kg	1			Yes	S4VEM
Cadmium	1.2	mg/kg	1	E	J	Yes	S4VEM
Calcium	2620	mg/kg	1	E	J	Yes	S4VEM
Chromium	33.7	mg/kg	1	E	J	Yes	S4VEM
Cobalt	21.8	mg/kg	1			Yes	S4VEM
Copper	105	mg/kg	1	NE	J	Yes	S4VEM
Iron	47600	mg/kg	1	E	J	Yes	S4VEM
Lead	7.6	mg/kg	1	N	J	Yes	S4VEM
Magnesium	6330	mg/kg	1	E	J	Yes	S4VEM
Manganese	906	mg/kg	1	E	J	Yes	S4VEM
Nickel	22.2	mg/kg	1			Yes	S4VEM
Potassium	446	mg/kg	1			Yes	S4VEM
Sodium	217	mg/kg	1	J	J	Yes	S4VEM
Vanadium	123	mg/kg	1	E	J	Yes	S4VEM
Zinc	54.7	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM70	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	142	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM70	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.3	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	97.8	mg/kg	25	D		Yes	S4VEM
Selenium	48.2	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.6	mg/kg	25	UD	U	Yes	S4VEM
Thallium	9.6	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM71	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.8		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	32100	mg/kg	1			Yes	S4VEM
Barium	124	mg/kg	1			Yes	S4VEM
Beryllium	0.45	mg/kg	1			Yes	S4VEM
Cadmium	1.2	mg/kg	1	E	J	Yes	S4VEM
Calcium	2460	mg/kg	1	E	J	Yes	S4VEM
Chromium	37.6	mg/kg	1	E	J	Yes	S4VEM
Cobalt	21.5	mg/kg	1			Yes	S4VEM
Copper	105	mg/kg	1	NE	J	Yes	S4VEM
Iron	49300	mg/kg	1	E	J	Yes	S4VEM
Lead	6.7	mg/kg	1	N	J	Yes	S4VEM
Magnesium	6660	mg/kg	1	E	J	Yes	S4VEM
Manganese	869	mg/kg	1	E	J	Yes	S4VEM
Nickel	23.0	mg/kg	1			Yes	S4VEM
Potassium	481	mg/kg	1			Yes	S4VEM
Sodium	221	mg/kg	1	J	J	Yes	S4VEM
Vanadium	127	mg/kg	1	E	J	Yes	S4VEM
Zinc	60.1	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM71	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.8		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	155	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM71	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.8		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.7	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	112	mg/kg	25	D		Yes	S4VEM
Selenium	49.2	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.8	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.8	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM72	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.1	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	76.4	mg/kg	25	D		Yes	S4VEM
Selenium	47.6	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.5	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.5	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM72	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	34600	mg/kg	1			Yes	S4VEM
Barium	144	mg/kg	1			Yes	S4VEM
Beryllium	0.55	mg/kg	1			Yes	S4VEM
Cadmium	1.4	mg/kg	1	E	J	Yes	S4VEM
Calcium	2910	mg/kg	1	E	J	Yes	S4VEM
Chromium	34.9	mg/kg	1	E	J	Yes	S4VEM
Cobalt	23.8	mg/kg	1			Yes	S4VEM
Copper	104	mg/kg	1	NE	J	Yes	S4VEM
Iron	50700	mg/kg	1	E	J	Yes	S4VEM
Lead	5.6	mg/kg	1	N	J	Yes	S4VEM
Magnesium	7550	mg/kg	1	E	J	Yes	S4VEM
Manganese	943	mg/kg	1	E	J	Yes	S4VEM
Nickel	23.8	mg/kg	1			Yes	S4VEM
Potassium	516	mg/kg	1			Yes	S4VEM
Sodium	219	mg/kg	1	J	J	Yes	S4VEM
Vanadium	130	mg/kg	1	E	J	Yes	S4VEM
Zinc	62.1	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM72	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	121	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM73	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.8		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.5	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	97.4	mg/kg	25	D		Yes	S4VEM
Selenium	48.8	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.8	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.8	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM73	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.8		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	149	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM73	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.8		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	37100	mg/kg	1			Yes	S4VEM
Barium	159	mg/kg	1			Yes	S4VEM
Beryllium	0.59	mg/kg	1			Yes	S4VEM
Cadmium	1.5	mg/kg	1	E	J	Yes	S4VEM
Calcium	3070	mg/kg	1	E	J	Yes	S4VEM
Chromium	39.3	mg/kg	1	E	J	Yes	S4VEM
Cobalt	26.0	mg/kg	1			Yes	S4VEM
Copper	126	mg/kg	1	NE	J	Yes	S4VEM
Iron	53900	mg/kg	1	E	J	Yes	S4VEM
Lead	8.8	mg/kg	1	N	J	Yes	S4VEM
Magnesium	7780	mg/kg	1	E	J	Yes	S4VEM
Manganese	1060	mg/kg	1	E	J	Yes	S4VEM
Nickel	25.7	mg/kg	1			Yes	S4VEM
Potassium	581	mg/kg	1			Yes	S4VEM
Sodium	257	mg/kg	1	J	J	Yes	S4VEM
Vanadium	141	mg/kg	1	E	J	Yes	S4VEM
Zinc	72.4	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM74	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.8		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.1	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	116	mg/kg	25	D		Yes	S4VEM
Selenium	47.8	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.6	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.6	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM74	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.8		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	172	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM74	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.8		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	35200	mg/kg	1			Yes	S4VEM
Barium	140	mg/kg	1			Yes	S4VEM
Beryllium	0.50	mg/kg	1			Yes	S4VEM
Cadmium	1.5	mg/kg	1	E	J	Yes	S4VEM
Calcium	2720	mg/kg	1	E	J	Yes	S4VEM
Chromium	37.8	mg/kg	1	E	J	Yes	S4VEM
Cobalt	26.3	mg/kg	1			Yes	S4VEM
Copper	119	mg/kg	1	NE	J	Yes	S4VEM
Iron	55500	mg/kg	1	E	J	Yes	S4VEM
Lead	8.1	mg/kg	1	N	J	Yes	S4VEM
Magnesium	6990	mg/kg	1	E	J	Yes	S4VEM
Manganese	1060	mg/kg	1	E	J	Yes	S4VEM
Nickel	25.9	mg/kg	1			Yes	S4VEM
Potassium	517	mg/kg	1			Yes	S4VEM
Sodium	234	mg/kg	1	J	J	Yes	S4VEM
Vanadium	137	mg/kg	1	E	J	Yes	S4VEM
Zinc	64.7	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM75	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	18.8	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	61.9	mg/kg	25	D		Yes	S4VEM
Selenium	47.1	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.4	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.4	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM75	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	103	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM75	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	30600	mg/kg	1			Yes	S4VEM
Barium	137	mg/kg	1			Yes	S4VEM
Beryllium	0.49	mg/kg	1			Yes	S4VEM
Cadmium	1.2	mg/kg	1	E	J	Yes	S4VEM
Calcium	2840	mg/kg	1	E	J	Yes	S4VEM
Chromium	30.2	mg/kg	1	E	J	Yes	S4VEM
Cobalt	24.0	mg/kg	1			Yes	S4VEM
Copper	94.8	mg/kg	1	NE	J	Yes	S4VEM
Iron	46100	mg/kg	1	E	J	Yes	S4VEM
Lead	5.5	mg/kg	1	N	J	Yes	S4VEM
Magnesium	7060	mg/kg	1	E	J	Yes	S4VEM
Manganese	954	mg/kg	1	E	J	Yes	S4VEM
Nickel	21.6	mg/kg	1			Yes	S4VEM
Potassium	465	mg/kg	1			Yes	S4VEM
Sodium	198	mg/kg	1	J	J	Yes	S4VEM
Vanadium	117	mg/kg	1	E	J	Yes	S4VEM
Zinc	58.3	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM76	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	32100	mg/kg	1			Yes	S4VEM
Barium	129	mg/kg	1			Yes	S4VEM
Beryllium	0.47	mg/kg	1			Yes	S4VEM
Cadmium	1.4	mg/kg	1	E	J	Yes	S4VEM
Calcium	2600	mg/kg	1	E	J	Yes	S4VEM
Chromium	36.2	mg/kg	1	E	J	Yes	S4VEM
Cobalt	21.7	mg/kg	1			Yes	S4VEM
Copper	111	mg/kg	1	NE	J	Yes	S4VEM
Iron	51200	mg/kg	1	E	J	Yes	S4VEM
Lead	8.2	mg/kg	1	N	J	Yes	S4VEM
Magnesium	6430	mg/kg	1	E	J	Yes	S4VEM
Manganese	866	mg/kg	1	E	J	Yes	S4VEM
Nickel	21.4	mg/kg	1			Yes	S4VEM
Potassium	464	mg/kg	1			Yes	S4VEM
Sodium	217	mg/kg	1	J	J	Yes	S4VEM
Vanadium	132	mg/kg	1	E	J	Yes	S4VEM
Zinc	59.3	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM76	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	18.6	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	122	mg/kg	25	D		Yes	S4VEM
Selenium	46.4	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.3	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.3	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM76	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	202	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM77	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	18.9	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	100	mg/kg	25	D		Yes	S4VEM
Selenium	47.2	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.4	mg/kg	25	UD	U	Yes	S4VEM
Thallium	9.4	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM77	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	31200	mg/kg	1			Yes	S4VEM
Barium	135	mg/kg	1			Yes	S4VEM
Beryllium	0.43	mg/kg	1			Yes	S4VEM
Cadmium	1.3	mg/kg	1	E	J	Yes	S4VEM
Calcium	2560	mg/kg	1	E	J	Yes	S4VEM
Chromium	35.0	mg/kg	1	E	J	Yes	S4VEM
Cobalt	22.0	mg/kg	1			Yes	S4VEM
Copper	108	mg/kg	1	NE	J	Yes	S4VEM
Iron	48000	mg/kg	1	E	J	Yes	S4VEM
Lead	7.4	mg/kg	1	N	J	Yes	S4VEM
Magnesium	6750	mg/kg	1	E	J	Yes	S4VEM
Manganese	884	mg/kg	1	E	J	Yes	S4VEM
Nickel	22.0	mg/kg	1			Yes	S4VEM
Potassium	463	mg/kg	1			Yes	S4VEM
Sodium	209	mg/kg	1	J	J	Yes	S4VEM
Vanadium	128	mg/kg	1	E	J	Yes	S4VEM
Zinc	59.8	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM77	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	94.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	165	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM78	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	34800	mg/kg	1			Yes	S4VEM
Barium	148	mg/kg	1			Yes	S4VEM
Beryllium	0.52	mg/kg	1			Yes	S4VEM
Cadmium	1.4	mg/kg	1	E	J	Yes	S4VEM
Calcium	2960	mg/kg	1	E	J	Yes	S4VEM
Chromium	35.9	mg/kg	1	E	J	Yes	S4VEM
Cobalt	25.9	mg/kg	1			Yes	S4VEM
Copper	108	mg/kg	1	NE	J	Yes	S4VEM
Iron	48300	mg/kg	1	E	J	Yes	S4VEM
Lead	6.7	mg/kg	1	N	J	Yes	S4VEM
Magnesium	7510	mg/kg	1	E	J	Yes	S4VEM
Manganese	1020	mg/kg	1	E	J	Yes	S4VEM
Nickel	24.9	mg/kg	1			Yes	S4VEM
Potassium	526	mg/kg	1			Yes	S4VEM
Sodium	222	mg/kg	1	J	J	Yes	S4VEM
Vanadium	124	mg/kg	1	E	J	Yes	S4VEM
Zinc	63.2	mg/kg	1	E	J	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM78	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	18.7	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	73.7	mg/kg	25	D		Yes	S4VEM
Selenium	46.9	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.4	mg/kg	25	UD	U	Yes	S4VEM
Thallium	9.4	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM78	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	TMM	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	137	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM78A	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:		pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	33.0	mg/kg	25			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM78A	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:		pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Copper	270	mg/kg	1			Yes	S4VEM
Lead	20.9	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM78D	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:		pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	122	mg/kg	100			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM78D	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:		pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	18.4	mg/kg	25	J	U	Yes	S4VEM
Arsenic	69.0	mg/kg	25			Yes	S4VEM
Selenium	45.9	mg/kg	25	U	U	Yes	S4VEM
Silver	9.2	mg/kg	25	U	U	Yes	S4VEM
Thallium	9.2	mg/kg	25	J	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM78D	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:		pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	34500	mg/kg	1			Yes	S4VEM
Barium	147	mg/kg	1			Yes	S4VEM
Beryllium	0.51	mg/kg	1			Yes	S4VEM
Cadmium	1.3	mg/kg	1			Yes	S4VEM
Calcium	2920	mg/kg	1			Yes	S4VEM
Chromium	35.2	mg/kg	1			Yes	S4VEM
Cobalt	25.4	mg/kg	1			Yes	S4VEM
Copper	107	mg/kg	1			Yes	S4VEM
Iron	48100	mg/kg	1			Yes	S4VEM
Lead	6.5	mg/kg	1			Yes	S4VEM
Magnesium	7510	mg/kg	1			Yes	S4VEM
Manganese	1010	mg/kg	1			Yes	S4VEM
Nickel	24.4	mg/kg	1			Yes	S4VEM
Potassium	523	mg/kg	1			Yes	S4VEM
Sodium	220	mg/kg	1	J	J	Yes	S4VEM
Vanadium	123	mg/kg	1			Yes	S4VEM
Zinc	62.7	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM78S	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:		pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	24.4	mg/kg	25	JN	U	Yes	S4VEM
Arsenic	76.6	mg/kg	25			Yes	S4VEM
Selenium	7.8	mg/kg	25	J	J	Yes	S4VEM
Silver	12.2	mg/kg	25	J	U	Yes	S4VEM
Thallium	12.2	mg/kg	25	J	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM78S	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:		pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Barium	552	mg/kg	1			Yes	S4VEM
Beryllium	9.0	mg/kg	1			Yes	S4VEM
Cadmium	11.3	mg/kg	1			Yes	S4VEM
Chromium	81.3	mg/kg	1			Yes	S4VEM
Cobalt	130	mg/kg	1			Yes	S4VEM
Copper	182	mg/kg	1	N		Yes	S4VEM
Lead	12.4	mg/kg	1	N		Yes	S4VEM
Manganese	1410	mg/kg	1			Yes	S4VEM
Nickel	125	mg/kg	1			Yes	S4VEM
Vanadium	247	mg/kg	1			Yes	S4VEM
Zinc	163	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM65	Lab Code:	CHEM
Sample Number:	MJGM78S	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:		pH:	2	Sample Date:	02/11/2014	Sample Time:	10:30:00
% Moisture :				% Solids :	93.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	122	mg/kg	100			Yes	S4VEM

Case No: 44058	Contract: EPW09038	SDG No: MJGM65	Lab Code: CHEM
Sample Number: PBS01	Method: ICP_AES	Matrix: Soil	MA Number: DEFAULT
Sample Location:	pH:	Sample Date:	Sample Time:
% Moisture :		% Solids :	

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	20.0	mg/kg	1	J	U	Yes	S4VEM
Barium	20.0	mg/kg	1	U	U	Yes	S4VEM
Beryllium	0.50	mg/kg	1	U	U	Yes	S4VEM
Cadmium	0.50	mg/kg	1	U	U	Yes	S4VEM
Calcium	500	mg/kg	1	U	U	Yes	S4VEM
Chromium	1.0	mg/kg	1	U	U	Yes	S4VEM
Cobalt	5.0	mg/kg	1	U	U	Yes	S4VEM
Copper	2.5	mg/kg	1	U	U	Yes	S4VEM
Iron	10.0	mg/kg	1	J	U	Yes	S4VEM
Lead	1.0	mg/kg	1	U	U	Yes	S4VEM
Magnesium	500	mg/kg	1	U	U	Yes	S4VEM
Manganese	1.5	mg/kg	1	J	U	Yes	S4VEM
Nickel	4.0	mg/kg	1	U	U	Yes	S4VEM
Potassium	500	mg/kg	1	J	J	Yes	S4VEM
Sodium	500	mg/kg	1	U	U	Yes	S4VEM
Vanadium	5.0	mg/kg	1	U	U	Yes	S4VEM
Zinc	6.0	mg/kg	1	U	U	Yes	S4VEM

Case No: 44058	Contract: EPW09038	SDG No: MJGM65	Lab Code: CHEM
Sample Number: PBS02	Method: Hg	Matrix: Soil	MA Number: DEFAULT
Sample Location:	pH:	Sample Date:	Sample Time:
% Moisture :		% Solids :	

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	0.10	mg/kg	1	U	U	Yes	S4VEM

Case No: 44058	Contract: EPW09038	SDG No: MJGM65	Lab Code: CHEM
Sample Number: PBS04	Method: ICP_MS	Matrix: Soil	MA Number: DEFAULT
Sample Location:	pH:	Sample Date:	Sample Time:
% Moisture :		% Solids :	

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	1.0	mg/kg	1	U	U	Yes	S4VEM
Arsenic	0.50	mg/kg	1	U	U	Yes	S4VEM
Selenium	2.5	mg/kg	1	U	U	Yes	S4VEM
Silver	0.50	mg/kg	1	U	U	Yes	S4VEM
Thallium	0.50	mg/kg	1	U	U	Yes	S4VEM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE OF
ENVIRONMENTAL ASSESSMENT

April 1, 2014

MEMORANDUM

SUBJECT: Data Validation Report for Metals Analysis of Samples Collected for Black Butte Mine Phase 2 RI – DMA, Cottage Grove, OR, Case 44058, SDG: MJGM93

FROM: Don Matheny, Chemist
OEA, Environmental Services Unit

TO: Richard Muza, Remedial Project Manager
Office of Environmental Clean-up, USEPA R10

CC: Mary Lou Fox, CDM

The quality assurance (QA) review of the analytical data generated from the analysis of seven (7) soils collected from the above referenced site has been completed. These samples were analyzed for Total Metals by The Chemtech Consulting Group located in Mountainside, NJ.

Sample analyses were evaluated following EPA's Stage 4 Data Validation Electronic/Manual Process (S4VEM). The validation was conducted according to the Quality Control Specifications outlined in:

- *QAPP for Black Butte Mine Phase 2 Remedial Investigation – Demonstration of Methods Applicability QAPP, Cottage Grove, OR,* (December, 2013)
- USEPA CLP Statement of Work for Inorganic Superfund Methods (ISM01.3)
- National Functional Guidelines for Inorganic Superfund Data Review (EPA-540-R-10-011)
- Guidance for Labeling Externally Validated Laboratory Analytical Data (EPA-540-R08-005)

Some data may be qualified using the reviewer's professional judgment. The conclusions presented herein are based on the information provided for the review. A summary of samples evaluated in this validation report and the pertinent dates for sample collection, laboratory sample receipt and analyses is attached along with the validated data.

I. QUALITY CONTROL RESULTS SUMMARY

Quality Control Test	Result Ranges	Outliers?	Evaluation Criteria
Blanks	Detects Reported	Y*	ND, ≤ RL or < 10xSample
Matrix Spike (MJGM99)	3 – 123%	Y*	75 – 125%
Sample Duplicate (MJGM99)	≤ 4% or < 2xCRQL	N	≤ 30% RPD or ± 2xCRQL
LCS (blank spike)	89 - 116%	N	70 – 130%
Serial Dilution (MJGM99)	≤ 20%	Y*	≤ 10%

*See the "*Data Qualifications*" section below for excursions and qualification of affected data.

II. DATA QUALIFICATIONS

Summary of Validation Qualifiers Applied

After the manual and electronic data review, the following data qualifications were applied:

Blanks
The following samples have analyte results ≥ MDLs but ≤ CRQLs. The associated instrument, preparation and/or field blank results are ≥ MDLs but ≤ CRQLs. Detected analytes are qualified U and the results reported at the CRQLs.
Silver – MJGM93 - MJGM98 **Thallium -** MJGM94 - MJGM99
Detection Limits
The following samples have results ≥ MDLs but ≤ CRQLs. Detected analytes are qualified J.
Arsenic – MJGM93 **Sodium –** All samples
Matrix Spike
The following Matrix Spike samples have percent recoveries < 30% and post-digestion spike samples have percent recoveries ≥ 75%. Detected analytes with results greater than or equal to MDLs are qualified J. Non-detected analytes are qualified UJ.
Antimony – All samples
Serial Dilution
The following ICP-AES Serial Dilution (SD) samples have percent difference (%D) greater than 10% and initial sample results are greater than 50xMDLs. The detected analytes in samples with results greater than or equal to MDLs are qualified J. Non-detected analytes in samples are qualified UJ.
Cadmium, Calcium, Magnesium, Manganese – All samples

Data Validation Qualifiers

The following is a list of data validation qualifiers applied to the sample result(s) and their definitions.

Data Validation Qualifiers	
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J	The associated value is an estimated quantity.
J+	The associated value is an estimated quantity but the result may be biased high.
J-	The associated value is an estimated quantity but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The data are unusable. The analyte may or may not be present in the sample.

III. SAMPLE INDEX

Sample Number	Matrix	Sampling Date	Date Received	ICP-AES Analysis	ICP-MS Analysis	Mercury Analysis
MJGM93	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM94	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM95	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM96	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM97	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM98	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014
MJGM99	Water	2/11/2014	2/26/2014	2/27/2014	2/28/2014	2/28/2014

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM93	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	29500	mg/kg	1			Yes	S4VEM
Barium	196	mg/kg	1			Yes	S4VEM
Beryllium	0.76	mg/kg	1			Yes	S4VEM
Cadmium	1.6	mg/kg	1	E	J	Yes	S4VEM
Calcium	5930	mg/kg	1	E	J	Yes	S4VEM
Chromium	42.8	mg/kg	1			Yes	S4VEM
Cobalt	29.7	mg/kg	1			Yes	S4VEM
Copper	86.4	mg/kg	1			Yes	S4VEM
Iron	56000	mg/kg	1			Yes	S4VEM
Lead	5.1	mg/kg	1			Yes	S4VEM
Magnesium	5210	mg/kg	1	E	J	Yes	S4VEM
Manganese	1760	mg/kg	1	E	J	Yes	S4VEM
Nickel	19.6	mg/kg	1			Yes	S4VEM
Potassium	542	mg/kg	1			Yes	S4VEM
Sodium	249	mg/kg	1	J	J	Yes	S4VEM
Vanadium	137	mg/kg	1			Yes	S4VEM
Zinc	101	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM93	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	9.8	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM93	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	20.2	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	8.9	mg/kg	25	JD	J	Yes	S4VEM
Selenium	50.6	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.1	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.1	mg/kg	25	UD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM94	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	10.0	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM94	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.6	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	23.2	mg/kg	25	D		Yes	S4VEM
Selenium	54.0	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.8	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.8	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM94	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	25100	mg/kg	1			Yes	S4VEM
Barium	173	mg/kg	1			Yes	S4VEM
Beryllium	0.62	mg/kg	1			Yes	S4VEM
Cadmium	1.4	mg/kg	1	E	J	Yes	S4VEM
Calcium	5390	mg/kg	1	E	J	Yes	S4VEM
Chromium	37.5	mg/kg	1			Yes	S4VEM
Cobalt	26.6	mg/kg	1			Yes	S4VEM
Copper	78.4	mg/kg	1			Yes	S4VEM
Iron	50200	mg/kg	1			Yes	S4VEM
Lead	4.4	mg/kg	1			Yes	S4VEM
Magnesium	4530	mg/kg	1	E	J	Yes	S4VEM
Manganese	1540	mg/kg	1	E	J	Yes	S4VEM
Nickel	17.3	mg/kg	1			Yes	S4VEM
Potassium	488	mg/kg	1			Yes	S4VEM
Sodium	235	mg/kg	1	J	J	Yes	S4VEM
Vanadium	121	mg/kg	1			Yes	S4VEM
Zinc	90.3	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM95	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.6	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	24.6	mg/kg	25	D		Yes	S4VEM
Selenium	54.1	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.8	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.8	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM95	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	9.4	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM95	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	25000	mg/kg	1			Yes	S4VEM
Barium	164	mg/kg	1			Yes	S4VEM
Beryllium	0.58	mg/kg	1			Yes	S4VEM
Cadmium	1.3	mg/kg	1	E	J	Yes	S4VEM
Calcium	5170	mg/kg	1	E	J	Yes	S4VEM
Chromium	38.3	mg/kg	1			Yes	S4VEM
Cobalt	24.4	mg/kg	1			Yes	S4VEM
Copper	75.0	mg/kg	1			Yes	S4VEM
Iron	48300	mg/kg	1			Yes	S4VEM
Lead	4.2	mg/kg	1			Yes	S4VEM
Magnesium	4430	mg/kg	1	E	J	Yes	S4VEM
Manganese	1450	mg/kg	1	E	J	Yes	S4VEM
Nickel	17.0	mg/kg	1			Yes	S4VEM
Potassium	444	mg/kg	1			Yes	S4VEM
Sodium	218	mg/kg	1	J	J	Yes	S4VEM
Vanadium	119	mg/kg	1			Yes	S4VEM
Zinc	87.0	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM96	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	25600	mg/kg	1			Yes	S4VEM
Barium	170	mg/kg	1			Yes	S4VEM
Beryllium	0.66	mg/kg	1			Yes	S4VEM
Cadmium	1.3	mg/kg	1	E	J	Yes	S4VEM
Calcium	5310	mg/kg	1	E	J	Yes	S4VEM
Chromium	39.5	mg/kg	1			Yes	S4VEM
Cobalt	25.2	mg/kg	1			Yes	S4VEM
Copper	77.0	mg/kg	1			Yes	S4VEM
Iron	49300	mg/kg	1			Yes	S4VEM
Lead	4.7	mg/kg	1			Yes	S4VEM
Magnesium	4540	mg/kg	1	E	J	Yes	S4VEM
Manganese	1510	mg/kg	1	E	J	Yes	S4VEM
Nickel	17.3	mg/kg	1			Yes	S4VEM
Potassium	476	mg/kg	1			Yes	S4VEM
Sodium	229	mg/kg	1	J	J	Yes	S4VEM
Vanadium	121	mg/kg	1			Yes	S4VEM
Zinc	93.8	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM96	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.2	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	24.9	mg/kg	25	D		Yes	S4VEM
Selenium	53.0	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.6	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.6	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM96	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	11.7	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM97	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	25900	mg/kg	1			Yes	S4VEM
Barium	173	mg/kg	1			Yes	S4VEM
Beryllium	0.60	mg/kg	1			Yes	S4VEM
Cadmium	1.4	mg/kg	1	E	J	Yes	S4VEM
Calcium	5400	mg/kg	1	E	J	Yes	S4VEM
Chromium	38.8	mg/kg	1			Yes	S4VEM
Cobalt	27.2	mg/kg	1			Yes	S4VEM
Copper	78.6	mg/kg	1			Yes	S4VEM
Iron	50900	mg/kg	1			Yes	S4VEM
Lead	4.5	mg/kg	1			Yes	S4VEM
Magnesium	4640	mg/kg	1	E	J	Yes	S4VEM
Manganese	1560	mg/kg	1	E	J	Yes	S4VEM
Nickel	17.7	mg/kg	1			Yes	S4VEM
Potassium	478	mg/kg	1			Yes	S4VEM
Sodium	236	mg/kg	1	J	J	Yes	S4VEM
Vanadium	126	mg/kg	1			Yes	S4VEM
Zinc	93.3	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM97	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	10.0	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM97	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.2	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	24.7	mg/kg	25	D		Yes	S4VEM
Selenium	53.0	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.6	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.6	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM98	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	10.8	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM98	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	20.7	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	24.4	mg/kg	25	D		Yes	S4VEM
Selenium	51.9	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.4	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.4	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM98	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	86.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	28400	mg/kg	1			Yes	S4VEM
Barium	185	mg/kg	1			Yes	S4VEM
Beryllium	0.65	mg/kg	1			Yes	S4VEM
Cadmium	1.5	mg/kg	1	E	J	Yes	S4VEM
Calcium	5610	mg/kg	1	E	J	Yes	S4VEM
Chromium	41.9	mg/kg	1			Yes	S4VEM
Cobalt	27.3	mg/kg	1			Yes	S4VEM
Copper	84.2	mg/kg	1			Yes	S4VEM
Iron	54100	mg/kg	1			Yes	S4VEM
Lead	4.7	mg/kg	1			Yes	S4VEM
Magnesium	4900	mg/kg	1	E	J	Yes	S4VEM
Manganese	1590	mg/kg	1	E	J	Yes	S4VEM
Nickel	18.8	mg/kg	1			Yes	S4VEM
Potassium	528	mg/kg	1			Yes	S4VEM
Sodium	247	mg/kg	1	J	J	Yes	S4VEM
Vanadium	133	mg/kg	1			Yes	S4VEM
Zinc	94.4	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM99	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	85.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	27600	mg/kg	1			Yes	S4VEM
Barium	183	mg/kg	1			Yes	S4VEM
Beryllium	0.65	mg/kg	1			Yes	S4VEM
Cadmium	1.5	mg/kg	1	E	J	Yes	S4VEM
Calcium	5670	mg/kg	1	E	J	Yes	S4VEM
Chromium	42.1	mg/kg	1			Yes	S4VEM
Cobalt	27.5	mg/kg	1			Yes	S4VEM
Copper	83.0	mg/kg	1			Yes	S4VEM
Iron	53300	mg/kg	1			Yes	S4VEM
Lead	4.9	mg/kg	1			Yes	S4VEM
Magnesium	4830	mg/kg	1	E	J	Yes	S4VEM
Manganese	1620	mg/kg	1	E	J	Yes	S4VEM
Nickel	18.1	mg/kg	1			Yes	S4VEM
Potassium	519	mg/kg	1			Yes	S4VEM
Sodium	238	mg/kg	1	J	J	Yes	S4VEM
Vanadium	133	mg/kg	1			Yes	S4VEM
Zinc	95.1	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM99	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	85.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	22.3	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	23.3	mg/kg	25	D		Yes	S4VEM
Selenium	55.8	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.2	mg/kg	25	UD	U	Yes	S4VEM
Thallium	11.2	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM93	Lab Code:	CHEM
Sample Number:	MJGM99	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	GSS	pH:	2	Sample Date:	02/11/2014	Sample Time:	15:45:00
% Moisture :				% Solids :	85.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	14.9	mg/kg	10	D		Yes	S4VEM

II. DATA QUALIFICATIONS

Summary of Validation Qualifiers Applied

After the manual and electronic data review, the following data qualifications were applied:

Blanks
The following samples have analyte results ≥ MDLs but ≤ CRQLs. The associated instrument, preparation and/or field blank results are ≥ MDLs but ≤ CRQLs. Detected analytes are qualified U and the results reported at the CRQLs.
Antimony – MJGM19, MJGM20, MJGM23, MJGM24, MJGM27, MJGM29 - MJGM31, MJGM33 - MJGM38 **Calcium –** MJGM35 **Magnesium –** MJGM35, MJGM37, MJGM30 **Silver –** MJGM19, MJGM20, MJGM21, MJGM23, MJGM27 - MJGM31, MJGM33 - MJGM38 **Thallium -** MJGM19 - MJGM37
Detection Limits
The following samples have results ≥ MDLs but ≤ CRQLs. Detected analytes are qualified J.
Arsenic – MJGM21, MJGM22, MJGM26, MJGM28 **Potassium –** MJGM35, MJGM36, MJGM37, MJGM24, MJGM30, MJGM31 **Sodium –** All samples
Matrix Spike
The following Matrix Spike samples have percent recoveries greater than 125% and post-digestion spike samples have percent recoveries greater than 125%. Detected analytes with results greater than or equal to MDLs are qualified J+. Non-detected analytes are not qualified.
Lead, Vanadium – All samples
The following Matrix Spike samples have percent recoveries greater than 125% and post-digestion spike samples have percent recoveries less than or equal to 125%. Detected analytes with results greater than or equal to MDLs are qualified J. Non-detected analytes are not qualified.
Copper – All samples
The following Matrix Spike samples have percent recoveries less than 30% and post-digestion spike samples have percent recoveries greater than or equal to 75%. Detected analytes with results greater than or equal to MDLs are qualified J. Non-detected analytes are qualified UJ.
Antimony – All samples
Serial Dilution
The following ICP-AES Serial Dilution (SD) samples have percent difference (%D) greater than 10% and initial sample results are greater than 50xMDLs. The detected analytes in samples with results greater than or equal to MDLs are qualified J. Non-detected analytes in samples are qualified UJ.
Aluminum, Barium, Calcium, Chromium, Copper, Iron, Magnesium, Manganese, Vanadium – All samples

Data Validation Qualifiers

The following is a list of data validation qualifiers applied to the sample result(s) and their definitions.

Data Validation Qualifiers	
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J	The associated value is an estimated quantity.
J+	The associated value is an estimated quantity but the result may be biased high.
J-	The associated value is an estimated quantity but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The data are unusable. The analyte may or may not be present in the sample.

III. SAMPLE INDEX

Sample Number	Matrix	Sampling Date	Date Received	ICP-AES Analysis	ICP-MS Analysis	Mercury Analysis
MJGM19	Water	2/12/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM20	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM21	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM22	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM23	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM24	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM25	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM26	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM27	Water	2/12/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM28	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM29	Water	2/11/2014	2/26/2014	2/26-29/2014	2/27/2014	2/27/2014
MJGM30	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM31	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM32	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM33	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM34	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM35	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM36	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM37	Water	2/11/2014	2/26/2014	2/26/2014	2/27/2014	2/27/2014
MJGM38	Water	2/12/2014	2/26/2014	2/26-27/2014	2/27/2014	2/27/2014

Field Duplicates are as follows: MJGM19 – MJGM27.

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM19	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO1	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:00:00
% Moisture :				% Solids :	86.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	38200	mg/kg	1	E	J	Yes	S4VEM
Barium	85.3	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.80	mg/kg	1			Yes	S4VEM
Cadmium	0.45	mg/kg	1	J	U	Yes	S4VEM
Calcium	950	mg/kg	1	E	J	Yes	S4VEM
Chromium	80.2	mg/kg	1	E	J	Yes	S4VEM
Cobalt	39.9	mg/kg	1			Yes	S4VEM
Copper	125	mg/kg	1	NE	J	Yes	S4VEM
Iron	59200	mg/kg	1	E	J	Yes	S4VEM
Lead	3.6	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	6700	mg/kg	1	E	J	Yes	S4VEM
Manganese	1710	mg/kg	1	E	J	Yes	S4VEM
Nickel	44.2	mg/kg	1			Yes	S4VEM
Potassium	609	mg/kg	1			Yes	S4VEM
Sodium	239	mg/kg	1	J	J	Yes	S4VEM
Vanadium	123	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	79.9	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM19	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO1	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:00:00
% Moisture :				% Solids :	86.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.9	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	98.3	mg/kg	25	D		Yes	S4VEM
Selenium	54.8	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.0	mg/kg	25	JD	U	Yes	S4VEM
Thallium	11.0	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM19	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO1	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:00:00
% Moisture :				% Solids :	86.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	1.8	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM20	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO2	pH:	2	Sample Date:	02/11/2014	Sample Time:	09:48:00
% Moisture :				% Solids :	78.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	22.8	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	38.5	mg/kg	25	D		Yes	S4VEM
Selenium	57.1	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.4	mg/kg	25	JD	U	Yes	S4VEM
Thallium	11.4	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM20	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO2	pH:	2	Sample Date:	02/11/2014	Sample Time:	09:48:00
% Moisture :				% Solids :	78.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	118	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM20	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO2	pH:	2	Sample Date:	02/11/2014	Sample Time:	09:48:00
% Moisture :				% Solids :	78.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	24300	mg/kg	1	E	J	Yes	S4VEM
Barium	180	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.63	mg/kg	1			Yes	S4VEM
Cadmium	0.47	mg/kg	1	J	U	Yes	S4VEM
Calcium	5040	mg/kg	1	E	J	Yes	S4VEM
Chromium	25.3	mg/kg	1	E	J	Yes	S4VEM
Cobalt	14.4	mg/kg	1			Yes	S4VEM
Copper	99.4	mg/kg	1	NE	J	Yes	S4VEM
Iron	46300	mg/kg	1	E	J	Yes	S4VEM
Lead	8.8	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	2530	mg/kg	1	E	J	Yes	S4VEM
Manganese	883	mg/kg	1	E	J	Yes	S4VEM
Nickel	14.6	mg/kg	1			Yes	S4VEM
Potassium	945	mg/kg	1			Yes	S4VEM
Sodium	159	mg/kg	1	J	J	Yes	S4VEM
Vanadium	170	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	64.0	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM21	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO3	pH:	2	Sample Date:	02/11/2014	Sample Time:	09:53:00
% Moisture :				% Solids :	78.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	9.8	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM21	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO3	pH:	2	Sample Date:	02/11/2014	Sample Time:	09:53:00
% Moisture :				% Solids :	78.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	39200	mg/kg	1	E	J	Yes	S4VEM
Barium	214	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.78	mg/kg	1			Yes	S4VEM
Cadmium	0.47	mg/kg	1	J	U	Yes	S4VEM
Calcium	2530	mg/kg	1	E	J	Yes	S4VEM
Chromium	23.4	mg/kg	1	E	J	Yes	S4VEM
Cobalt	30.8	mg/kg	1			Yes	S4VEM
Copper	120	mg/kg	1	NE	J	Yes	S4VEM
Iron	51700	mg/kg	1	E	J	Yes	S4VEM
Lead	3.5	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	12800	mg/kg	1	E	J	Yes	S4VEM
Manganese	1060	mg/kg	1	E	J	Yes	S4VEM
Nickel	31.7	mg/kg	1			Yes	S4VEM
Potassium	665	mg/kg	1			Yes	S4VEM
Sodium	247	mg/kg	1	J	J	Yes	S4VEM
Vanadium	133	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	67.2	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM21	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO3	pH:	2	Sample Date:	02/11/2014	Sample Time:	09:53:00
% Moisture :				% Solids :	78.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	22.4	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	10.5	mg/kg	25	JD	J	Yes	S4VEM
Selenium	55.9	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.2	mg/kg	25	JD	U	Yes	S4VEM
Thallium	11.2	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM22	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO4	pH:	2	Sample Date:	02/11/2014	Sample Time:	09:56:00
% Moisture :				% Solids :	81		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	22.7	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	11.2	mg/kg	25	JD	J	Yes	S4VEM
Selenium	56.7	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.3	mg/kg	25	UD	U	Yes	S4VEM
Thallium	11.3	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM22	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO4	pH:	2	Sample Date:	02/11/2014	Sample Time:	09:56:00
% Moisture :				% Solids :	81		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	44200	mg/kg	1	E	J	Yes	S4VEM
Barium	206	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.75	mg/kg	1			Yes	S4VEM
Cadmium	0.46	mg/kg	1	J	U	Yes	S4VEM
Calcium	3740	mg/kg	1	E	J	Yes	S4VEM
Chromium	23.3	mg/kg	1	E	J	Yes	S4VEM
Cobalt	32.5	mg/kg	1			Yes	S4VEM
Copper	118	mg/kg	1	NE	J	Yes	S4VEM
Iron	52200	mg/kg	1	E	J	Yes	S4VEM
Lead	3.4	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	15600	mg/kg	1	E	J	Yes	S4VEM
Manganese	1120	mg/kg	1	E	J	Yes	S4VEM
Nickel	33.4	mg/kg	1			Yes	S4VEM
Potassium	879	mg/kg	1			Yes	S4VEM
Sodium	249	mg/kg	1	J	J	Yes	S4VEM
Vanadium	130	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	64.4	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM22	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO4	pH:	2	Sample Date:	02/11/2014	Sample Time:	09:56:00
% Moisture :				% Solids :	81		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	22.4	mg/kg	20	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM23	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO5	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:00:00
% Moisture :				% Solids :	87.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	24400	mg/kg	1	E	J	Yes	S4VEM
Barium	137	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.58	mg/kg	1			Yes	S4VEM
Cadmium	0.41	mg/kg	1	J	U	Yes	S4VEM
Calcium	2960	mg/kg	1	E	J	Yes	S4VEM
Chromium	19.8	mg/kg	1	E	J	Yes	S4VEM
Cobalt	16.7	mg/kg	1			Yes	S4VEM
Copper	67.9	mg/kg	1	NE	J	Yes	S4VEM
Iron	44700	mg/kg	1	E	J	Yes	S4VEM
Lead	4.2	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	1450	mg/kg	1	E	J	Yes	S4VEM
Manganese	1180	mg/kg	1	E	J	Yes	S4VEM
Nickel	9.8	mg/kg	1			Yes	S4VEM
Potassium	644	mg/kg	1			Yes	S4VEM
Sodium	145	mg/kg	1	J	J	Yes	S4VEM
Vanadium	116	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	39.3	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM23	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO5	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:00:00
% Moisture :				% Solids :	87.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	8.0	mg/kg	10	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM23	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO5	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:00:00
% Moisture :				% Solids :	87.9		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.5	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	27.0	mg/kg	25	D		Yes	S4VEM
Selenium	48.7	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.7	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.7	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM24	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO6	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:43:00
% Moisture :				% Solids :	89.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	2.5	mg/kg	2	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM24	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO6	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:43:00
% Moisture :				% Solids :	89.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	20.6	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	80.6	mg/kg	25	D		Yes	S4VEM
Selenium	51.6	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.3	mg/kg	25	UD	U	Yes	S4VEM
Thallium	10.3	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM24	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO6	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:43:00
% Moisture :				% Solids :	89.7		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	37800	mg/kg	1	E	J	Yes	S4VEM
Barium	112	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.88	mg/kg	1			Yes	S4VEM
Cadmium	0.38	mg/kg	1	J	U	Yes	S4VEM
Calcium	876	mg/kg	1	E	J	Yes	S4VEM
Chromium	82.8	mg/kg	1	E	J	Yes	S4VEM
Cobalt	36.2	mg/kg	1			Yes	S4VEM
Copper	130	mg/kg	1	NE	J	Yes	S4VEM
Iron	58400	mg/kg	1	E	J	Yes	S4VEM
Lead	3.2	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	7710	mg/kg	1	E	J	Yes	S4VEM
Manganese	1340	mg/kg	1	E	J	Yes	S4VEM
Nickel	45.4	mg/kg	1			Yes	S4VEM
Potassium	370	mg/kg	1	J	J	Yes	S4VEM
Sodium	222	mg/kg	1	J	J	Yes	S4VEM
Vanadium	126	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	77.6	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM25	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO7	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:50:00
% Moisture :				% Solids :	82.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	22.0	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	13.5	mg/kg	25	D		Yes	S4VEM
Selenium	54.9	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.0	mg/kg	25	UD	U	Yes	S4VEM
Thallium	11.0	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM25	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO7	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:50:00
% Moisture :				% Solids :	82.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	28.5	mg/kg	20	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM25	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO7	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:50:00
% Moisture :				% Solids :	82.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	29600	mg/kg	1	E	J	Yes	S4VEM
Barium	200	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.66	mg/kg	1			Yes	S4VEM
Cadmium	0.46	mg/kg	1	J	U	Yes	S4VEM
Calcium	2500	mg/kg	1	E	J	Yes	S4VEM
Chromium	27.4	mg/kg	1	E	J	Yes	S4VEM
Cobalt	29.2	mg/kg	1			Yes	S4VEM
Copper	97.9	mg/kg	1	NE	J	Yes	S4VEM
Iron	51300	mg/kg	1	E	J	Yes	S4VEM
Lead	4.2	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	9760	mg/kg	1	E	J	Yes	S4VEM
Manganese	1080	mg/kg	1	E	J	Yes	S4VEM
Nickel	27.3	mg/kg	1			Yes	S4VEM
Potassium	969	mg/kg	1			Yes	S4VEM
Sodium	199	mg/kg	1	J	J	Yes	S4VEM
Vanadium	145	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	73.8	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM26	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO8	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:53:00
% Moisture :				% Solids :	84		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.3	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	5.9	mg/kg	25	JD	J	Yes	S4VEM
Selenium	53.1	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.6	mg/kg	25	UD	U	Yes	S4VEM
Thallium	10.6	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM26	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO8	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:53:00
% Moisture :				% Solids :	84		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	3.7	mg/kg	2	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM26	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO8	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:53:00
% Moisture :				% Solids :	84		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	39700	mg/kg	1	E	J	Yes	S4VEM
Barium	226	mg/kg	1	E	J	Yes	S4VEM
Beryllium	1.0	mg/kg	1			Yes	S4VEM
Cadmium	0.45	mg/kg	1	J	U	Yes	S4VEM
Calcium	2320	mg/kg	1	E	J	Yes	S4VEM
Chromium	23.5	mg/kg	1	E	J	Yes	S4VEM
Cobalt	30.5	mg/kg	1			Yes	S4VEM
Copper	115	mg/kg	1	NE	J	Yes	S4VEM
Iron	49300	mg/kg	1	E	J	Yes	S4VEM
Lead	3.6	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	17900	mg/kg	1	E	J	Yes	S4VEM
Manganese	711	mg/kg	1	E	J	Yes	S4VEM
Nickel	37.4	mg/kg	1			Yes	S4VEM
Potassium	920	mg/kg	1			Yes	S4VEM
Sodium	191	mg/kg	1	J	J	Yes	S4VEM
Vanadium	122	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	71.0	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM27	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO1	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:10:00
% Moisture :				% Solids :	87.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	1.7	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM27	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO1	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:10:00
% Moisture :				% Solids :	87.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	39400	mg/kg	1	E	J	Yes	S4VEM
Barium	76.5	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.74	mg/kg	1			Yes	S4VEM
Cadmium	0.40	mg/kg	1	J	U	Yes	S4VEM
Calcium	852	mg/kg	1	E	J	Yes	S4VEM
Chromium	81.7	mg/kg	1	E	J	Yes	S4VEM
Cobalt	33.2	mg/kg	1			Yes	S4VEM
Copper	121	mg/kg	1	NE	J	Yes	S4VEM
Iron	57300	mg/kg	1	E	J	Yes	S4VEM
Lead	4.0	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	6450	mg/kg	1	E	J	Yes	S4VEM
Manganese	1330	mg/kg	1	E	J	Yes	S4VEM
Nickel	44.0	mg/kg	1			Yes	S4VEM
Potassium	529	mg/kg	1			Yes	S4VEM
Sodium	219	mg/kg	1	J	J	Yes	S4VEM
Vanadium	122	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	73.6	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM27	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO1	pH:	2	Sample Date:	02/12/2014	Sample Time:	15:10:00
% Moisture :				% Solids :	87.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.3	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	121	mg/kg	25	D		Yes	S4VEM
Selenium	53.2	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.6	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.6	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM28	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO9	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:57:00
% Moisture :				% Solids :	78.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	52.0	mg/kg	50	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM28	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO9	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:57:00
% Moisture :				% Solids :	78.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	23.9	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	10.1	mg/kg	25	JD	J	Yes	S4VEM
Selenium	59.6	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.9	mg/kg	25	JD	U	Yes	S4VEM
Thallium	11.9	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM28	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO9	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:57:00
% Moisture :				% Solids :	78.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	45400	mg/kg	1	E	J	Yes	S4VEM
Barium	220	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.75	mg/kg	1			Yes	S4VEM
Cadmium	0.48	mg/kg	1	J	U	Yes	S4VEM
Calcium	3300	mg/kg	1	E	J	Yes	S4VEM
Chromium	23.9	mg/kg	1	E	J	Yes	S4VEM
Cobalt	30.6	mg/kg	1			Yes	S4VEM
Copper	127	mg/kg	1	NE	J	Yes	S4VEM
Iron	52000	mg/kg	1	E	J	Yes	S4VEM
Lead	3.0	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	16800	mg/kg	1	E	J	Yes	S4VEM
Manganese	909	mg/kg	1	E	J	Yes	S4VEM
Nickel	35.8	mg/kg	1			Yes	S4VEM
Potassium	1190	mg/kg	1			Yes	S4VEM
Sodium	230	mg/kg	1	J	J	Yes	S4VEM
Vanadium	127	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	66.4	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM29	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO10	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:00:00
% Moisture :				% Solids :	82.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	22.7	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	32.9	mg/kg	25	D		Yes	S4VEM
Selenium	56.8	mg/kg	25	UD	U	Yes	S4VEM
Silver	11.4	mg/kg	25	JD	U	Yes	S4VEM
Thallium	11.4	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM29	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO10	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:00:00
% Moisture :				% Solids :	82.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	25600	mg/kg	1	E	J	Yes	S4VEM
Barium	303	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.59	mg/kg	1			Yes	S4VEM
Cadmium	0.45	mg/kg	1	J	U	Yes	S4VEM
Calcium	3460	mg/kg	1	E	J	Yes	S4VEM
Chromium	21.3	mg/kg	1	E	J	Yes	S4VEM
Cobalt	15.8	mg/kg	1			Yes	S4VEM
Copper	45.3	mg/kg	1	NE	J	Yes	S4VEM
Iron	42800	mg/kg	1	E	J	Yes	S4VEM
Lead	11.8	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	1140	mg/kg	1	E	J	Yes	S4VEM
Manganese	4900	mg/kg	10	ED	J	Yes	S4VEM
Nickel	13.8	mg/kg	1			Yes	S4VEM
Potassium	1130	mg/kg	1			Yes	S4VEM
Sodium	153	mg/kg	1	J	J	Yes	S4VEM
Vanadium	114	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	102	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM29	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO10	pH:	2	Sample Date:	02/11/2014	Sample Time:	10:00:00
% Moisture :				% Solids :	82.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	130	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM30	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO11	pH:	2	Sample Date:	02/11/2014	Sample Time:	12:00:00
% Moisture :				% Solids :	84.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	44900	mg/kg	1	E	J	Yes	S4VEM
Barium	32.8	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.70	mg/kg	1			Yes	S4VEM
Cadmium	0.43	mg/kg	1	U	U	Yes	S4VEM
Calcium	428	mg/kg	1	UE	UJ	Yes	S4VEM
Chromium	54.9	mg/kg	1	E	J	Yes	S4VEM
Cobalt	14.8	mg/kg	1			Yes	S4VEM
Copper	157	mg/kg	1	NE	J	Yes	S4VEM
Iron	60900	mg/kg	1	E	J	Yes	S4VEM
Lead	10.4	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	428	mg/kg	1	JE	UJ	Yes	S4VEM
Manganese	886	mg/kg	1	E	J	Yes	S4VEM
Nickel	16.4	mg/kg	1			Yes	S4VEM
Potassium	51.5	mg/kg	1	J	J	Yes	S4VEM
Sodium	216	mg/kg	1	J	J	Yes	S4VEM
Vanadium	156	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	37.5	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM30	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO11	pH:	2	Sample Date:	02/11/2014	Sample Time:	12:00:00
% Moisture :				% Solids :	84.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	20.8	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	254	mg/kg	25	D		Yes	S4VEM
Selenium	52.0	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.4	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.4	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM30	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO11	pH:	2	Sample Date:	02/11/2014	Sample Time:	12:00:00
% Moisture :				% Solids :	84.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	265	mg/kg	200	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM31	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO12	pH:	2	Sample Date:	02/11/2014	Sample Time:	12:05:00
% Moisture :				% Solids :	87.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	55.5	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM31	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO12	pH:	2	Sample Date:	02/11/2014	Sample Time:	12:05:00
% Moisture :				% Solids :	87.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	33000	mg/kg	1	E	J	Yes	S4VEM
Barium	208	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.75	mg/kg	1			Yes	S4VEM
Cadmium	0.41	mg/kg	1	J	U	Yes	S4VEM
Calcium	1780	mg/kg	1	E	J	Yes	S4VEM
Chromium	24.6	mg/kg	1	E	J	Yes	S4VEM
Cobalt	26.9	mg/kg	1			Yes	S4VEM
Copper	108	mg/kg	1	NE	J	Yes	S4VEM
Iron	50300	mg/kg	1	E	J	Yes	S4VEM
Lead	3.7	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	11500	mg/kg	1	E	J	Yes	S4VEM
Manganese	781	mg/kg	1	E	J	Yes	S4VEM
Nickel	29.5	mg/kg	1			Yes	S4VEM
Potassium	365	mg/kg	1	J	J	Yes	S4VEM
Sodium	193	mg/kg	1	J	J	Yes	S4VEM
Vanadium	135	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	61.6	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM31	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO12	pH:	2	Sample Date:	02/11/2014	Sample Time:	12:05:00
% Moisture :				% Solids :	87.5		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.7	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	16.3	mg/kg	25	D		Yes	S4VEM
Selenium	49.3	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.9	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.9	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM32	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO13	pH:	2	Sample Date:	02/11/2014	Sample Time:	12:10:00
% Moisture :				% Solids :	83.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	36600	mg/kg	1	E	J	Yes	S4VEM
Barium	197	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.71	mg/kg	1			Yes	S4VEM
Cadmium	0.44	mg/kg	1	J	U	Yes	S4VEM
Calcium	2400	mg/kg	1	E	J	Yes	S4VEM
Chromium	23.5	mg/kg	1	E	J	Yes	S4VEM
Cobalt	29.2	mg/kg	1			Yes	S4VEM
Copper	114	mg/kg	1	NE	J	Yes	S4VEM
Iron	49700	mg/kg	1	E	J	Yes	S4VEM
Lead	3.6	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	13600	mg/kg	1	E	J	Yes	S4VEM
Manganese	895	mg/kg	1	E	J	Yes	S4VEM
Nickel	31.7	mg/kg	1			Yes	S4VEM
Potassium	539	mg/kg	1			Yes	S4VEM
Sodium	209	mg/kg	1	J	J	Yes	S4VEM
Vanadium	129	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	64.8	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM32	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO13	pH:	2	Sample Date:	02/11/2014	Sample Time:	12:10:00
% Moisture :				% Solids :	83.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	56.1	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM32	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO13	pH:	2	Sample Date:	02/11/2014	Sample Time:	12:10:00
% Moisture :				% Solids :	83.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.4	mg/kg	25	UND	UJ	Yes	S4VEM
Arsenic	11.8	mg/kg	25	D		Yes	S4VEM
Selenium	53.4	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.7	mg/kg	25	UD	U	Yes	S4VEM
Thallium	10.7	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM33	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO14	pH:	2	Sample Date:	02/11/2014	Sample Time:	12:12:00
% Moisture :				% Solids :	82.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	30100	mg/kg	1	E	J	Yes	S4VEM
Barium	187	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.65	mg/kg	1			Yes	S4VEM
Cadmium	0.43	mg/kg	1	J	U	Yes	S4VEM
Calcium	4190	mg/kg	1	E	J	Yes	S4VEM
Chromium	27.9	mg/kg	1	E	J	Yes	S4VEM
Cobalt	27.5	mg/kg	1			Yes	S4VEM
Copper	106	mg/kg	1	NE	J	Yes	S4VEM
Iron	52200	mg/kg	1	E	J	Yes	S4VEM
Lead	4.5	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	8690	mg/kg	1	E	J	Yes	S4VEM
Manganese	1180	mg/kg	1	E	J	Yes	S4VEM
Nickel	26.1	mg/kg	1			Yes	S4VEM
Potassium	819	mg/kg	1			Yes	S4VEM
Sodium	210	mg/kg	1	J	J	Yes	S4VEM
Vanadium	146	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	78.1	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM33	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO14	pH:	2	Sample Date:	02/11/2014	Sample Time:	12:12:00
% Moisture :				% Solids :	82.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	20.7	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	30.3	mg/kg	25	D		Yes	S4VEM
Selenium	51.8	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.4	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.4	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM33	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO14	pH:	2	Sample Date:	02/11/2014	Sample Time:	12:12:00
% Moisture :				% Solids :	82.6		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	192	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM34	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO15	pH:	2	Sample Date:	02/11/2014	Sample Time:	12:15:00
% Moisture :				% Solids :	79.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	138	mg/kg	100	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM34	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO15	pH:	2	Sample Date:	02/11/2014	Sample Time:	12:15:00
% Moisture :				% Solids :	79.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	19400	mg/kg	1	E	J	Yes	S4VEM
Barium	131	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.71	mg/kg	1			Yes	S4VEM
Cadmium	0.45	mg/kg	1	J	U	Yes	S4VEM
Calcium	4460	mg/kg	1	E	J	Yes	S4VEM
Chromium	6.1	mg/kg	1	E	J	Yes	S4VEM
Cobalt	28.1	mg/kg	1			Yes	S4VEM
Copper	52.0	mg/kg	1	NE	J	Yes	S4VEM
Iron	37800	mg/kg	1	E	J	Yes	S4VEM
Lead	6.3	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	1190	mg/kg	1	E	J	Yes	S4VEM
Manganese	1860	mg/kg	1	E	J	Yes	S4VEM
Nickel	4.8	mg/kg	1			Yes	S4VEM
Potassium	471	mg/kg	1			Yes	S4VEM
Sodium	136	mg/kg	1	J	J	Yes	S4VEM
Vanadium	47.0	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	42.4	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM34	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO15	pH:	2	Sample Date:	02/11/2014	Sample Time:	12:15:00
% Moisture :				% Solids :	79.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.7	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	21.4	mg/kg	25	D		Yes	S4VEM
Selenium	54.4	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.9	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.9	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM35	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO16	pH:	2	Sample Date:	02/11/2014	Sample Time:	13:50:00
% Moisture :				% Solids :	93.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.5	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	307	mg/kg	25	D		Yes	S4VEM
Selenium	48.8	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.8	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.8	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM35	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO16	pH:	2	Sample Date:	02/11/2014	Sample Time:	13:50:00
% Moisture :				% Solids :	93.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	526	mg/kg	500	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM35	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO16	pH:	2	Sample Date:	02/11/2014	Sample Time:	13:50:00
% Moisture :				% Solids :	93.4		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	37500	mg/kg	1	E	J	Yes	S4VEM
Barium	77.9	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.60	mg/kg	1			Yes	S4VEM
Cadmium	0.40	mg/kg	1	J	U	Yes	S4VEM
Calcium	400	mg/kg	1	JE	UJ	Yes	S4VEM
Chromium	50.7	mg/kg	1	E	J	Yes	S4VEM
Cobalt	6.4	mg/kg	1			Yes	S4VEM
Copper	108	mg/kg	1	NE	J	Yes	S4VEM
Iron	59400	mg/kg	1	E	J	Yes	S4VEM
Lead	14.9	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	400	mg/kg	1	JE	UJ	Yes	S4VEM
Manganese	305	mg/kg	1	E	J	Yes	S4VEM
Nickel	14.3	mg/kg	1			Yes	S4VEM
Potassium	63.0	mg/kg	1	J	J	Yes	S4VEM
Sodium	261	mg/kg	1	J	J	Yes	S4VEM
Vanadium	149	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	27.2	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM36	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO17	pH:	2	Sample Date:	02/11/2014	Sample Time:	13:55:00
% Moisture :				% Solids :	87.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	26400	mg/kg	1	E	J	Yes	S4VEM
Barium	43.5	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.62	mg/kg	1			Yes	S4VEM
Cadmium	0.40	mg/kg	1	J	U	Yes	S4VEM
Calcium	423	mg/kg	1	E	J	Yes	S4VEM
Chromium	39.6	mg/kg	1	E	J	Yes	S4VEM
Cobalt	10.9	mg/kg	1			Yes	S4VEM
Copper	197	mg/kg	1	NE	J	Yes	S4VEM
Iron	50400	mg/kg	1	E	J	Yes	S4VEM
Lead	13.7	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	479	mg/kg	1	E	J	Yes	S4VEM
Manganese	763	mg/kg	1	E	J	Yes	S4VEM
Nickel	18.7	mg/kg	1			Yes	S4VEM
Potassium	119	mg/kg	1	J	J	Yes	S4VEM
Sodium	179	mg/kg	1	J	J	Yes	S4VEM
Vanadium	138	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	36.5	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM36	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO17	pH:	2	Sample Date:	02/11/2014	Sample Time:	13:55:00
% Moisture :				% Solids :	87.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	543	mg/kg	500	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM36	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO17	pH:	2	Sample Date:	02/11/2014	Sample Time:	13:55:00
% Moisture :				% Solids :	87.2		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	21.4	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	299	mg/kg	25	D		Yes	S4VEM
Selenium	53.5	mg/kg	25	UD	U	Yes	S4VEM
Silver	10.7	mg/kg	25	JD	U	Yes	S4VEM
Thallium	10.7	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM37	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO18	pH:	2	Sample Date:	02/11/2014	Sample Time:	14:05:00
% Moisture :				% Solids :	91.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	19.2	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	373	mg/kg	25	D		Yes	S4VEM
Selenium	48.0	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.6	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.6	mg/kg	25	JD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM37	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO18	pH:	2	Sample Date:	02/11/2014	Sample Time:	14:05:00
% Moisture :				% Solids :	91.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	401	mg/kg	500	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM37	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO18	pH:	2	Sample Date:	02/11/2014	Sample Time:	14:05:00
% Moisture :				% Solids :	91.1		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	28100	mg/kg	1	E	J	Yes	S4VEM
Barium	31.7	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.47	mg/kg	1			Yes	S4VEM
Cadmium	0.39	mg/kg	1	J	U	Yes	S4VEM
Calcium	392	mg/kg	1	UE	UJ	Yes	S4VEM
Chromium	42.6	mg/kg	1	E	J	Yes	S4VEM
Cobalt	7.7	mg/kg	1			Yes	S4VEM
Copper	91.3	mg/kg	1	NE	J	Yes	S4VEM
Iron	59500	mg/kg	1	E	J	Yes	S4VEM
Lead	17.1	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	392	mg/kg	1	JE	UJ	Yes	S4VEM
Manganese	891	mg/kg	1	E	J	Yes	S4VEM
Nickel	14.3	mg/kg	1			Yes	S4VEM
Potassium	73.2	mg/kg	1	J	J	Yes	S4VEM
Sodium	203	mg/kg	1	J	J	Yes	S4VEM
Vanadium	123	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	23.0	mg/kg	1			Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM38	Method:	Hg	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO21	pH:	2	Sample Date:	02/12/2014	Sample Time:	11:50:00
% Moisture :				% Solids :	91.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	325	mg/kg	200	D		Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM38	Method:	ICP_MS	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO21	pH:	2	Sample Date:	02/12/2014	Sample Time:	11:50:00
% Moisture :				% Solids :	91.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	18.6	mg/kg	25	JND	UJ	Yes	S4VEM
Arsenic	54.6	mg/kg	25	D		Yes	S4VEM
Selenium	46.6	mg/kg	25	UD	U	Yes	S4VEM
Silver	9.3	mg/kg	25	JD	U	Yes	S4VEM
Thallium	9.3	mg/kg	25	UD	U	Yes	S4VEM

Case No:	44058	Contract:	EPW09038	SDG No:	MJGM19	Lab Code:	CHEM
Sample Number:	MJGM38	Method:	ICP_AES	Matrix:	Soil	MA Number:	DEFAULT
Sample Location:	SO21	pH:	2	Sample Date:	02/12/2014	Sample Time:	11:50:00
% Moisture :				% Solids :	91.3		

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	2740	mg/kg	1	E	J	Yes	S4VEM
Barium	26.1	mg/kg	1	E	J	Yes	S4VEM
Beryllium	0.54	mg/kg	1			Yes	S4VEM
Cadmium	1.1	mg/kg	1			Yes	S4VEM
Calcium	1580	mg/kg	1	E	J	Yes	S4VEM
Chromium	73.9	mg/kg	1	E	J	Yes	S4VEM
Cobalt	30.2	mg/kg	1			Yes	S4VEM
Copper	201	mg/kg	1	NE	J	Yes	S4VEM
Iron	86000	mg/kg	10	ED	J	Yes	S4VEM
Lead	27.6	mg/kg	1	N	J+	Yes	S4VEM
Magnesium	617	mg/kg	1	E	J	Yes	S4VEM
Manganese	2050	mg/kg	1	E	J	Yes	S4VEM
Nickel	32.9	mg/kg	1			Yes	S4VEM
Potassium	380	mg/kg	1	U	U	Yes	S4VEM
Sodium	213	mg/kg	1	J	J	Yes	S4VEM
Vanadium	159	mg/kg	1	NE	J+	Yes	S4VEM
Zinc	111	mg/kg	1			Yes	S4VEM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE OF
ENVIRONMENTAL ASSESSMENT

March 25, 2014

MEMORANDUM

SUBJECT: Data Validation Report for Metals Analysis of Samples Collected for Black Butte Mine Phase 1 RI – Storm Sampling Event, Cottage Grove, OR, Case 43983, SDG: MJGLD9

FROM: Don Matheny, Chemist
OEA, Environmental Services Unit

TO: Richard Muza, Remedial Project Manager
Office of Environmental Clean-up, USEPA R10

CC: Mary Lou Fox, CDM

The quality assurance (QA) review of the analytical data generated from the analysis of twenty (20) waters collected from the above referenced site has been completed. These samples were analyzed for Total Metals by The Chemtech Consulting Group located in Mountainside, NJ.

Sample analyses were evaluated following EPA's Stage 4 Data Validation Electronic/Manual Process (S4VEM). The validation was conducted according to the Quality Control Specifications outlined in:

- *QAPP for Black Butte Mine Phase 1 Remedial Investigation – Surface Water Storm Sampling & Sediment Sampling QAPP, Cottage Grove, OR,* (December, 2012)
- USEPA CLP Statement of Work for Inorganic Superfund Methods (ISM01.3)
- National Functional Guidelines for Inorganic Superfund Data Review (EPA-540-R-10-011)
- Guidance for Labeling Externally Validated Laboratory Analytical Data (EPA-540-R08-005)

Some data may be qualified using the reviewer's professional judgment. The conclusions presented herein are based on the information provided for the review. A summary of samples evaluated in this validation report and the pertinent dates for sample collection, laboratory sample receipt and analyses is attached along with the validated data.

I. QUALITY CONTROL RESULTS SUMMARY

Quality Control Test	Result Ranges	Outliers?	Evaluation Criteria
Blanks	Detects Reported	Y*	ND, ≤ RL or < 10xSample
Matrix Spike (MJGLF3)	81 – 100%	N	75 – 125%
Sample Duplicate (MJGLF3)	≤ %8 or < CRQL	N	≤ 20% RPD or ± CRQL
Field Duplicates (MJGLE3, MJGLF7, MJGLG5)	≤ 16% or ≥ 2xCRQL	Y*	≤ 50% RPD or ± 2xCRQL
LCS (blank spike)	98 - 130%	N	70 – 130%; Sb 50-150%
Serial Dilution (MJGLF3)	≤ 137%	Y*	≤ 10%

*See the "*Data Qualifications*" section below for excursions and qualification of affected data.

II. DATA QUALIFICATIONS

Summary of Validation Qualifiers Applied

After the manual and electronic data review, the following data qualifications were applied:

Blanks
The following samples have analyte results ≥ MDLs but ≤ CRQLs. The associated instrument, preparation and/or field blank results are ≥ MDLs but ≤ CRQLs. Detected analytes are qualified U and the results reported at the CRQLs.
Barium – MJGLE5, MJGLE9 **Cadmium –** MJGLE3, MJGLF3, MJGLG7 **Cobalt –** MJGLE1, MJGLE3, MJGLE5, MJGLE7, MJGLE9, MJGLH1 **Iron** - MJGLD9 **Magnesium , Sodium -** MJGLF9, MJGLG3, MJGLG5, MJGLG7, MJGLG9, MJGLH1, MJGLH3, MJGLH5, MJGLH7, MJGLE1, MJGLE3, MJGLE5, MJGLE7, MJGLE9, MJGLF1, MJGLF3, MJGLF5, MJGLF7, MJGLG1 **Thallium** - MJGLE5, MJGLE7, MJGLE9, MJGLF1, MJGLF3, MJGLF5, MJGLF7, MJGLG1, MJGLF9, MJGLG7, MJGLG9, MJGLH1
The following samples have analyte results with associated field blank results ≥ CRQLs. Detected analytes ≥ CRQLs and < 10x the blank results are qualified J+. Detected analytes < CRQLs are qualified U and the results reported at the CRQLs.
Chromium – MJGLE1, MJGLE3, MJGLE5, MJGLE7, MJGLE9, MJGLF1, MJGLF3, MJGLF5, MJGLF7, MJGLF9, MJGLG1, MJGLG3, MJGLG5, MJGLG9, MJGLH1, MJGLH3, MJGLH5, MJGLH7 **Copper -** MJGLE1, MJGLE3, MJGLE5, MJGLE7, MJGLE9, MJGLF1, MJGLF3, MJGLF5, MJGLF7, MJGLF9, MJGLG1, MJGLG3, MJGLG5, MJGLG9, MJGLH1, MJGLH3, MJGLH5, MJGLH7 **Nickel –** MJGLE1, MJGLE3, MJGLE5, MJGLE7, MJGLE9, MJGLF1, MJGLF3, MJGLF5, MJGLF7, MJGLF9, MJGLG1, MJGLG3, MJGLG9, MJGLH1, MJGLH3, MJGLH5, MJGLH7 **Lead, Zinc -** MJGLE1, MJGLE3, MJGLE5, MJGLE7, MJGLE9, MJGLF1, MJGLF3, MJGLF5, MJGLF7, MJGLF9, MJGLG1, MJGLG3, MJGLG5, MJGLG7, MJGLG9, MJGLH1, MJGLH3, MJGLH5, MJGLH7

Detection Limits
The following samples have results ≥ MDLs but ≤ CRQLs. Detected analytes are qualified J.
Aluminum – MJGLD9 **Arsenic –** MJGLE5, MJGLE9, MJGLH3, MJGLH7 **Barium** – MJGLD9 **Cadmium –** MJGLD9, MJGLE3, MJGLF3, MJGLG7 **Cobalt** – MJGLD9 **Silver –** MJGLE5, MJGLF1, MJGLF7, MJGLF9, MJGLG7, MJGLH5 **Vanadium -** MJGLE1, MJGLE3, MJGLE5, MJGLE7, MJGLE9, MJGLF9, MJGLG9, MJGLH1, MJGLH3, MJGLH5, MJGLH7

Duplicates
Of the three sets of field duplicates, one of the pairs had original sample results are < 5xCRQL and the absolute difference between duplicate and original samples are > 2xCRQL. Detected analytes reported below 5xCRQL were qualified J. Non-detects are qualified UJ. Only the single set of field duplicates were qualified.
Chromium, Cobalt, Nickel – MJGLG3, MJGLG5
Serial Dilution
The following ICP Serial Dilution samples have percent difference > 10% and initial sample results > 50xMDLs. The detected analytes in samples with results ≥ MDLs are qualified J. Non-detected analytes in samples are qualified UJ.
Copper, Zinc – All samples

Data Validation Qualifiers

The following is a list of data validation qualifiers applied to the sample result(s) and their definitions.

Data Validation Qualifiers	
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J	The associated value is an estimated quantity.
J+	The associated value is an estimated quantity but the result may be biased high.
J-	The associated value is an estimated quantity but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The data are unusable. The analyte may or may not be present in the sample.

III. SAMPLE INDEX

Sample Number	Matrix	Sampling Date	Date Received	ICP-AES Analysis	ICP-MS Analysis
MJGLD9	Water	2/13/2014	2/20/2014	2/20/2014	2/20/2014
MJGLE1	Water	2/13/2014	2/20/2014	2/20/2014	2/20/2014
MJGLE3	Water	2/13/2014	2/20/2014	2/20/2014	2/20/2014
MJGLE5	Water	2/13/2014	2/20/2014	2/20/2014	2/24/2014
MJGLE7	Water	2/13/2014	2/20/2014	2/20/2014	2/24/2014
MJGLE9	Water	2/13/2014	2/20/2014	2/20/2014	2/24/2014
MJGLF1	Water	2/14/2014	2/20/2014	2/20/2014	2/24/2014
MJGLF7	Water	2/14/2014	2/20/2014	2/20/2014	2/24/2014
MJGLF3	Water	2/14/2014	2/20/2014	2/20/2014	2/24/2014
MJGLF5	Water	2/14/2014	2/20/2014	2/20/2014	2/24/2014
MJGLF9	Water	2/14/2014	2/20/2014	2/20/2014	2/24/2014
MJGLG1	Water	2/14/2014	2/20/2014	2/20/2014	2/24/2014
MJGLG3	Water	2/14/2014	2/20/2014	2/20/2014	2/24/2014
MJGLG5	Water	2/14/2014	2/20/2014	2/20/2014	2/24/2014
MJGLG7	Water	2/14/2014	2/20/2014	2/20/2014	2/24/2014
MJGLG9	Water	2/14/2014	2/20/2014	2/20/2014	2/24/2014
MJGLH1	Water	2/15/2014	2/20/2014	2/20/2014	2/24/2014
MJGLH3	Water	2/15/2014	2/20/2014	2/20/2014	2/24/2014
MJGLH5	Water	2/15/2014	2/20/2014	2/20/2014	2/24/2014
MJGLH7	Water	2/15/2014	2/20/2014	2/20/2014	2/24/2014

Field Duplicates are as follows: MJGLE1 – MJGLE3; MJGLF1 – MJGLF7; MJGLG3 – MJGLG5.
Sample MJGLD9 is a preservation/bottle blank.

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLD9	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	Bottle/Preservative Blank	pH:	2	Sample Date:	02/13/2014	Sample Time:	17:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5000	ug/L	1	U	U	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	5000	ug/L	1	U	U	Yes	S4VEM
Manganese	15.0	ug/L	1	U	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	U	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLD9	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	Bottle/Preservative Blank	pH:	2	Sample Date:	02/13/2014	Sample Time:	17:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	7.2	ug/L	1	J	J	Yes	S4VEM
Arsenic	1.0	ug/L	1	U	U	Yes	S4VEM
Barium	0.98	ug/L	1	J	J	Yes	S4VEM
Cadmium	0.28	ug/L	1	J	J	Yes	S4VEM
Chromium	2.3	ug/L	1			Yes	S4VEM
Cobalt	0.11	ug/L	1	J	J	Yes	S4VEM
Copper	3.7	ug/L	1	E	J	Yes	S4VEM
Lead	15.6	ug/L	1			Yes	S4VEM
Nickel	5.6	ug/L	1			Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	U	U	Yes	S4VEM
Zinc	25.0	ug/L	1	E	J	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLE1	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/13/2014	Sample Time:	19:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	558	ug/L	1			Yes	S4VEM
Arsenic	2.1	ug/L	1			Yes	S4VEM
Barium	12.6	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.6	ug/L	1	E	J+	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	2.2	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	1.8	ug/L	1	J	J	Yes	S4VEM
Zinc	5.7	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLE1	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/13/2014	Sample Time:	19:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	10900	ug/L	1			Yes	S4VEM
Iron	865	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	34.9	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLE3	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/13/2014	Sample Time:	20:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	10500	ug/L	1			Yes	S4VEM
Iron	894	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	31.3	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLE3	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/13/2014	Sample Time:	20:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	491	ug/L	1			Yes	S4VEM
Arsenic	2.0	ug/L	1			Yes	S4VEM
Barium	12.6	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	3.0	ug/L	1		J+	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.9	ug/L	1	E	J+	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	2.9	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	1.7	ug/L	1	J	J	Yes	S4VEM
Zinc	5.9	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLE5	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/13/2014	Sample Time:	18:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	6210	ug/L	1			Yes	S4VEM
Iron	1070	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	64.8	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLE5	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/13/2014	Sample Time:	18:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	486	ug/L	1			Yes	S4VEM
Arsenic	0.50	ug/L	1	J	J	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	3.0	ug/L	1		J+	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	3.9	ug/L	1	E	J+	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	2.2	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	0.064	ug/L	1	J	J	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	0.98	ug/L	1	J	J	Yes	S4VEM
Zinc	17.3	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLE7	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/13/2014	Sample Time:	18:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	358	ug/L	1			Yes	S4VEM
Arsenic	1.1	ug/L	1			Yes	S4VEM
Barium	22.4	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.3	ug/L	1		J+	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	3.3	ug/L	1	E	J+	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	2.0	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	0.61	ug/L	1	J	J	Yes	S4VEM
Zinc	9.0	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLE7	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/13/2014	Sample Time:	18:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5750	ug/L	1			Yes	S4VEM
Iron	921	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	36.0	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLE9	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/13/2014	Sample Time:	17:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	459	ug/L	1			Yes	S4VEM
Arsenic	0.37	ug/L	1	J	J	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.5	ug/L	1		J+	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	3.3	ug/L	1	E	J+	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	2.5	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	1.1	ug/L	1	J	J	Yes	S4VEM
Zinc	3.8	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLE9	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/13/2014	Sample Time:	17:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5740	ug/L	1			Yes	S4VEM
Iron	713	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	57.7	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLF1	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	09:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	3410	ug/L	1			Yes	S4VEM
Arsenic	12.9	ug/L	1			Yes	S4VEM
Barium	48.4	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	6.5	ug/L	1		J+	Yes	S4VEM
Cobalt	6.8	ug/L	1			Yes	S4VEM
Copper	16.1	ug/L	1	E	J+	Yes	S4VEM
Lead	1.3	ug/L	1		J+	Yes	S4VEM
Nickel	6.9	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	0.083	ug/L	1	J	J	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	11.8	ug/L	1			Yes	S4VEM
Zinc	14.3	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLF1	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	09:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	10600	ug/L	1			Yes	S4VEM
Iron	7190	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	507	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLF3	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/14/2014	Sample Time:	09:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	9300	ug/L	1			Yes	S4VEM
Iron	11700	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	828	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
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OFFICE OF
ENVIRONMENTAL ASSESSMENT

March 14, 2014

MEMORANDUM

SUBJECT: Data Validation Report for Metals Analysis of Samples Collected for Black Butte Mine Phase 1 RI – Storm Sampling Event, Cottage Grove, OR, Case 43983, SDG: MJGLE0

FROM: Don Matheny, Chemist
OEA, Environmental Services Unit

TO: Richard Muza, Remedial Project Manager
Office of Environmental Clean-up, USEPA R10

CC: Mary Lou Fox, CDM

The quality assurance (QA) review of the analytical data generated from the analysis of twenty (20) waters collected from the above referenced site has been completed. These samples were analyzed for Dissolved Metals by The Chemtech Consulting Group located in Mountainside, NJ.

Sample analyses were evaluated following EPA's Stage 4 Data Validation Electronic/Manual Process (S4VEM). The validation was conducted according to the Quality Control Specifications outlined in:

- *QAPP for Black Butte Mine Phase 1 Remedial Investigation – Surface Water Storm Sampling & Sediment Sampling QAPP, Cottage Grove, OR,* (December, 2012)
- USEPA CLP Statement of Work for Inorganic Superfund Methods (ISM01.3)
- National Functional Guidelines for Inorganic Superfund Data Review (EPA-540-R-10-011)
- Guidance for Labeling Externally Validated Laboratory Analytical Data (EPA-540-R08-005)

Some data may be qualified using the reviewer's professional judgment. The conclusions presented herein are based on the information provided for the review. A summary of samples evaluated in this validation report and the pertinent dates for sample collection, laboratory sample receipt and analyses is attached along with the validated data.

I. QUALITY CONTROL RESULTS SUMMARY

Quality Control Test	Result Ranges	Outliers?	Evaluation Criteria
Blanks	Detects Reported	Y*	ND, ≤ RL or < 10xSample
Matrix Spike (MJGLF4)	100 – 119%	N	75 – 125%
Sample Duplicate (MJGLF4)	≤ %13 or < CRQL	N	≤ 20% RPD or ± CRQL
Field Duplicates (MJGLE4, MJGLF8, MJGLG6)	≤ 12% or ≥ 2xCRQL	Y*	≤ 50% RPD or ± 2xCRQL
LCS (blank spike)	100 - 126%	N	70 – 130%; Sb 50-150%
Serial Dilution (MJGLF4)	2%	N	≤ 10%

*See the "*Data Qualifications*" section below for excursions and qualification of affected data.

II. DATA QUALIFICATIONS

Summary of Validation Qualifiers Applied

After the manual and electronic data review, the following data qualifications were applied:

Blanks
The following samples have analyte results ≥ MDLs but ≤ CRQLs. The associated instrument, preparation and/or field blank results are ≥ MDLs but ≤ CRQLs. Detected analytes are qualified U and the results reported at the CRQLs.
Aluminum – MJGLE6, MJGLF8, MJGLH2, MJGLH6 **Cadmium –** MJGLE6, MJGLE8, MJGLF0, MJGLF2, MJGLF4, MJGLF6, MJGLG0, MJGLG4, MJGLG6, MJGLG8, MJGLH0, MJGLH2, MJGLH4, MJGLE2, MJGLE4, MJGLJ0 **Calcium -** MJGLE0 **Chromium –** MJGLE2, MJGLE4, MJGLE6, MJGLE8, MJGLF0, MJGLF2, MJGLF4, MJGLF8, MJGLG0, MJGLG4, MJGLG6, MJGLG8, MJGLH0, MJGLH2, MJGLH4, MJGLH6, MJGLJ0 **Copper –** MJGLE4, MJGLE6, MJGLE8, MJGLF0, MJGLF2, MJGLF4, MJGLF8, MJGLG8, MJGLH2, MJGLH4, MJGLH6, MJGLE2, MJGLJ0 **Iron** - MJGLE0, MJGLE2, MJGLE6, MJGLF8, MJGLH2, MJGLH6 **Lead –** MJGLE4, MJGLE6, MJGLE8, MJGLF0, MJGLF2, MJGLF4, MJGLF6, MJGLF8, MJGLG0, MJGLG4, MJGLG6, MJGLG8, MJGLH0, MJGLH2, MJGLH6, MJGLE2, MJGLJ0 **Magnesium** - MJGLE2, MJGLE4, MJGLE6, MJGLE8, MJGLF0, MJGLF2, MJGLF4, MJGLF6, MJGLF8, MJGLG0, MJGLG2, MJGLG4, MJGLG6, MJGLG8, MJGLH0, MJGLH2, MJGLH4, MJGLH6, MJGLJ0 **Manganese** - MJGLE0, MJGLE2, MJGLE4, MJGLE6, MJGLE8, MJGLF0, MJGLF2, MJGLF8, MJGLH2, MJGLH4, MJGLH6, MJGLJ0 **Nickel –** MJGLE4, MJGLE6, MJGLE8, MJGLF0, MJGLF2, MJGLF4, MJGLF8, MJGLG0, MJGLG4, MJGLG6, MJGLG8, MJGLH0, MJGLH4, MJGLH6, MJGLE2, MJGLJ0 **Silver -** MJGLG4 **Sodium** – All samples **Thallium** - MJGLF4, MJGLF8, MJGLG0, MJGLG8, MJGLJ0, MJGLE0, MJGLE4 **Zinc** - MJGLE6, MJGLF0, MJGLF8
The following samples have analyte results ≥ or < CRQLs. The associated instrument, preparation and/or field blank results are ≥ CRQLs. Detected analytes ≥ CRQLs are qualified J+. Detected analytes < CRQLs are qualified U and the results reported at the CRQLs.
Chromium –MJGLF6, MJGLG2 **Zinc –** MJGLE2, MJGLE4, MJGLE8, MJGLF2, MJGLF4, MJGLF6, MJGLG0, MJGLG2, MJGLG4, MJGLG6, MJGLG8, MJGLH0, MJGLH2, MJGLH4, MJGLH6, MJGLJ0

Detection Limits
The following samples have results ≥ MDLs but ≤ CRQLs. Detected analytes are qualified J.
Aluminum, Cadmium, Copper, Lead, Nickel, Silver – MJGLE0 **Arsenic -** MJGLE6, MJGLE8, MJGLF0, MJGLF2, MJGLF4, MJGLF6, MJGLF8, MJGLG4, MJGLH0, MJGLH2, MJGLH6, MJGLE2, MJGLE4 **Barium -** MJGLE6, MJGLF0, MJGLF2, MJGLF4, MJGLF6, MJGLF8, MJGLG4, MJGLG6, MJGLH0, MJGLH2, MJGLH4, MJGLH6, MJGLE2, MJGLE4, MJGLJ0 **Cobalt -** MJGLE4, MJGLE8, MJGLF2, MJGLF4, MJGLF6, MJGLG0, MJGLG2, MJGLG4, MJGLG6, MJGLG8, MJGLH0, MJGLH4, MJGLE2, MJGLJ0 **Vanadium -** MJGLE4, MJGLE6, MJGLE8, MJGLF2, MJGLF4, MJGLF6, MJGLF8, MJGLG0, MJGLG2, MJGLG4, MJGLG6, MJGLG8, MJGLH0, MJGLH4, MJGLH6, MJGLE2, MJGLJ0
Duplicates
The following Field Duplicate and original sample results are ≤ 5xCRQL and the absolute difference between duplicate and original samples are > 2xCRQL. Detected analytes reported below 5xCRQL were qualified J. Non-detects are qualified UJ.
Aluminum – MJGLE2, MJGLE6, MJGLF0, MJGLF2, MJGLF8, MJGLH2, MJGLH6

Data Validation Qualifiers

The following is a list of data validation qualifiers applied to the sample result(s) and their definitions.

Data Validation Qualifiers	
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J	The associated value is an estimated quantity.
J+	The associated value is an estimated quantity but the result may be biased high.
J-	The associated value is an estimated quantity but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The data are unusable. The analyte may or may not be present in the sample.

III. SAMPLE INDEX

Sample Number	Matrix	Sampling Date	Date Received	ICP-AES Analysis	ICP-MS Analysis
MJGLE0	Water	2/13/2014	2/20/2014	2/20/2014	2/20/2014
MJGLE2	Water	2/13/2014	2/20/2014	2/20/2014	2/20/2014
MJGLE4	Water	2/13/2014	2/20/2014	2/20/2014	2/20/2014
MJGLE6	Water	2/13/2014	2/20/2014	2/20/2014	2/20/2014
MJGLE8	Water	2/13/2014	2/20/2014	2/20/2014	2/20/2014
MJGLF0	Water	2/13/2014	2/20/2014	2/20/2014	2/20/2014
MJGLF2	Water	2/14/2014	2/20/2014	2/20/2014	2/20/2014
MJGLF8	Water	2/14/2014	2/20/2014	2/20/2014	2/20/2014
MJGLF4	Water	2/14/2014	2/20/2014	2/20/2014	2/20/2014
MJGLF6	Water	2/14/2014	2/20/2014	2/20/2014	2/20/2014
MJGLG0	Water	2/14/2014	2/20/2014	2/20/2014	2/20/2014
MJGLG2	Water	2/14/2014	2/20/2014	2/20/2014	2/20/2014
MJGLG4	Water	2/14/2014	2/20/2014	2/20/2014	2/20/2014
MJGLG6	Water	2/14/2014	2/20/2014	2/20/2014	2/20/2014
MJGLG8	Water	2/14/2014	2/20/2014	2/20/2014	2/20/2014
MJGLH0	Water	2/14/2014	2/20/2014	2/20/2014	2/20/2014
MJGLH2	Water	2/15/2014	2/20/2014	2/20/2014	2/20/2014
MJGLH4	Water	2/15/2014	2/20/2014	2/20/2014	2/20/2014
MJGLH6	Water	2/15/2014	2/20/2014	2/20/2014	2/20/2014
MJGLJ0	Water	2/15/2014	2/20/2014	2/20/2014	2/20/2014

Field Duplicates are as follows: MJGLE2 – MJGLE4; MJGLF2 – MJGLF8; MJGLG4 – MJGLG6.
Sample MJGLE0 is a filter blank.

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLE0	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	Filter Blank	pH:	2	Sample Date:	02/13/2014	Sample Time:	19:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	1.7	ug/L	1	J	J	Yes	S4VEM
Arsenic	1.0	ug/L	1	U	U	Yes	S4VEM
Barium	10.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	0.93	ug/L	1	J	J	Yes	S4VEM
Chromium	3.0	ug/L	1			Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	0.27	ug/L	1	J	J	Yes	S4VEM
Lead	0.38	ug/L	1	J	J	Yes	S4VEM
Nickel	0.23	ug/L	1	J	J	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	0.059	ug/L	1	J	J	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	U	U	Yes	S4VEM
Zinc	2.5	ug/L	1			Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLE0	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	Filter Blank	pH:	2	Sample Date:	02/13/2014	Sample Time:	19:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5000	ug/L	1	J	U	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	5000	ug/L	1	U	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLE2	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/13/2014	Sample Time:	19:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	11400	ug/L	1			Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLE2	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/13/2014	Sample Time:	19:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	37.2	ug/L	1		J	Yes	S4VEM
Arsenic	0.76	ug/L	1	J	J	Yes	S4VEM
Barium	9.2	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	0.24	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	0.18	ug/L	1	J	J	Yes	S4VEM
Zinc	3.8	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLE4	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/13/2014	Sample Time:	20:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	110	ug/L	1			Yes	S4VEM
Arsenic	0.95	ug/L	1	J	J	Yes	S4VEM
Barium	8.1	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	0.053	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	0.27	ug/L	1	J	J	Yes	S4VEM
Zinc	2.6	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLE4	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/13/2014	Sample Time:	20:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	11300	ug/L	1			Yes	S4VEM
Iron	138	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLE6	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/13/2014	Sample Time:	18:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	6100	ug/L	1			Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLE6	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/13/2014	Sample Time:	18:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	20	ug/L	1	J	UJ	Yes	S4VEM
Arsenic	0.30	ug/L	1	J	J	Yes	S4VEM
Barium	3.2	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	0.21	ug/L	1	J	J	Yes	S4VEM
Zinc	2.0	ug/L	1		U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLE8	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/13/2014	Sample Time:	18:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	157	ug/L	1			Yes	S4VEM
Arsenic	0.47	ug/L	1	J	J	Yes	S4VEM
Barium	14.7	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	0.11	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	0.26	ug/L	1	J	J	Yes	S4VEM
Zinc	4.6	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLE8	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/13/2014	Sample Time:	18:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5830	ug/L	1			Yes	S4VEM
Iron	217	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLF0	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/13/2014	Sample Time:	17:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	75.5	ug/L	1		J	Yes	S4VEM
Arsenic	0.24	ug/L	1	J	J	Yes	S4VEM
Barium	3.5	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1		U	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	U	U	Yes	S4VEM
Zinc	2.0	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLF0	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/13/2014	Sample Time:	17:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	6140	ug/L	1			Yes	S4VEM
Iron	142	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLF2	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	09:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	8720	ug/L	1			Yes	S4VEM
Iron	134	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLF2	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	09:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	72.5	ug/L	1		J	Yes	S4VEM
Arsenic	0.94	ug/L	1	J	J	Yes	S4VEM
Barium	6.6	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	0.11	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	0.26	ug/L	1	J	J	Yes	S4VEM
Zinc	2.1	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLF4	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/14/2014	Sample Time:	09:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5000	ug/L	1		U	Yes	S4VEM
Iron	263	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	20.2	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLF4	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/14/2014	Sample Time:	09:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	169	ug/L	1			Yes	S4VEM
Arsenic	0.30	ug/L	1	J	J	Yes	S4VEM
Barium	3.8	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	0.17	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	0.83	ug/L	1	J	J	Yes	S4VEM
Zinc	2.3	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLF6	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/14/2014	Sample Time:	09:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	300	ug/L	1			Yes	S4VEM
Arsenic	0.43	ug/L	1	J	J	Yes	S4VEM
Barium	5.1	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	6.0	ug/L	1		J+	Yes	S4VEM
Cobalt	0.86	ug/L	1	J	J	Yes	S4VEM
Copper	2.7	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	27.2	ug/L	1			Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	1.0	ug/L	1	J	J	Yes	S4VEM
Zinc	7.1	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLF6	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/14/2014	Sample Time:	09:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5210	ug/L	1			Yes	S4VEM
Iron	521	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	37.4	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLF8	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	10:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	8900	ug/L	1			Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLF8	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	10:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	20	ug/L	1	J	UJ	Yes	S4VEM
Arsenic	0.65	ug/L	1	J	J	Yes	S4VEM
Barium	6.5	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	0.40	ug/L	1	J	J	Yes	S4VEM
Zinc	2.0	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLG0	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	10:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	6030	ug/L	1			Yes	S4VEM
Iron	488	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	17.5	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLG0	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	10:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	372	ug/L	1			Yes	S4VEM
Arsenic	1.0	ug/L	1			Yes	S4VEM
Barium	16.1	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	0.27	ug/L	1	J	J	Yes	S4VEM
Copper	2.3	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	1.1	ug/L	1	J	J	Yes	S4VEM
Zinc	3.7	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLG2	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	19:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	505	ug/L	1			Yes	S4VEM
Arsenic	2.2	ug/L	1			Yes	S4VEM
Barium	12.8	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.1	ug/L	1		J+	Yes	S4VEM
Cobalt	0.86	ug/L	1	J	J	Yes	S4VEM
Copper	3.4	ug/L	1			Yes	S4VEM
Lead	1.4	ug/L	1			Yes	S4VEM
Nickel	2.7	ug/L	1			Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	2.2	ug/L	1	J	J	Yes	S4VEM
Zinc	10.2	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLG2	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	19:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	8650	ug/L	1			Yes	S4VEM
Iron	839	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	46.7	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLG4	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/14/2014	Sample Time:	17:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	256	ug/L	1			Yes	S4VEM
Arsenic	0.44	ug/L	1	J	J	Yes	S4VEM
Barium	4.7	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	0.26	ug/L	1	J	J	Yes	S4VEM
Copper	2.1	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	0.60	ug/L	1	J	J	Yes	S4VEM
Zinc	4.4	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLG4	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/14/2014	Sample Time:	17:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5140	ug/L	1			Yes	S4VEM
Iron	673	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	31.1	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLG6	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/14/2014	Sample Time:	18:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5180	ug/L	1			Yes	S4VEM
Iron	596	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	33.0	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLG6	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/14/2014	Sample Time:	18:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	286	ug/L	1			Yes	S4VEM
Arsenic	1.0	ug/L	1	U	U	Yes	S4VEM
Barium	4.8	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	0.28	ug/L	1	J	J	Yes	S4VEM
Copper	2.5	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	0.53	ug/L	1	J	J	Yes	S4VEM
Zinc	5.1	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLG8	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	18:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	274	ug/L	1			Yes	S4VEM
Arsenic	1.0	ug/L	1			Yes	S4VEM
Barium	13.3	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	0.22	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	0.70	ug/L	1	J	J	Yes	S4VEM
Zinc	2.9	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLG8	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	18:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5540	ug/L	1			Yes	S4VEM
Iron	387	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	16.0	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLH0	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/14/2014	Sample Time:	17:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5160	ug/L	1			Yes	S4VEM
Iron	652	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	35.9	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLH0	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/14/2014	Sample Time:	17:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	389	ug/L	1			Yes	S4VEM
Arsenic	0.53	ug/L	1	J	J	Yes	S4VEM
Barium	5.7	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	0.34	ug/L	1	J	J	Yes	S4VEM
Copper	2.1	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	1.3	ug/L	1	J	J	Yes	S4VEM
Zinc	3.4	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLH2	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/15/2014	Sample Time:	10:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	20	ug/L	1	J	UJ	Yes	S4VEM
Arsenic	0.85	ug/L	1	J	J	Yes	S4VEM
Barium	6.7	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.1	ug/L	1			Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	U	U	Yes	S4VEM
Zinc	4.0	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLH2	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/15/2014	Sample Time:	10:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	8520	ug/L	1			Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLH4	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/15/2014	Sample Time:	09:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	143	ug/L	1			Yes	S4VEM
Arsenic	1.0	ug/L	1	U	U	Yes	S4VEM
Barium	4.2	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	0.12	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.7	ug/L	1			Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	0.16	ug/L	1	J	J	Yes	S4VEM
Zinc	4.0	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLH4	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/15/2014	Sample Time:	09:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5490	ug/L	1			Yes	S4VEM
Iron	248	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLH6	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/15/2014	Sample Time:	09:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5230	ug/L	1			Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLH6	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/15/2014	Sample Time:	09:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	20	ug/L	1	J	UJ	Yes	S4VEM
Arsenic	0.40	ug/L	1	J	J	Yes	S4VEM
Barium	8.3	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	0.18	ug/L	1	J	J	Yes	S4VEM
Zinc	2.4	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLJ0	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/15/2014	Sample Time:	08:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	140	ug/L	1			Yes	S4VEM
Arsenic	1.0	ug/L	1	U	U	Yes	S4VEM
Barium	4.0	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	0.13	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	0.43	ug/L	1	J	J	Yes	S4VEM
Zinc	5.7	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLE0	Lab Code:	CHEM
Sample Number:	MJGLJ0	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/15/2014	Sample Time:	08:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5370	ug/L	1			Yes	S4VEM
Iron	230	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

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OFFICE OF
ENVIRONMENTAL ASSESSMENT

March 25, 2014

MEMORANDUM

SUBJECT: Data Validation Report for Metals Analysis of Samples Collected for Black Butte Mine Phase 1 RI – Storm Sampling Event, Cottage Grove, OR, Case 43983, SDG: MJGLH8

FROM: Don Matheny, Chemist
OEA, Environmental Services Unit

TO: Richard Muza, Remedial Project Manager
Office of Environmental Clean-up, USEPA R10

CC: Mary Lou Fox, CDM

The quality assurance (QA) review of the analytical data generated from the analysis of five (5) waters collected from the above referenced site has been completed. These samples were analyzed for Total Metals by The Chemtech Consulting Group located in Mountainside, NJ.

Sample analyses were evaluated following EPA's Stage 4 Data Validation Electronic/Manual Process (S4VEM). The validation was conducted according to the Quality Control Specifications outlined in:

- *QAPP for Black Butte Mine Phase 1 Remedial Investigation – Surface Water Storm Sampling & Sediment Sampling QAPP, Cottage Grove, OR,* (December, 2012)
- USEPA CLP Statement of Work for Inorganic Superfund Methods (ISM01.3)
- National Functional Guidelines for Inorganic Superfund Data Review (EPA-540-R-10-011)
- Guidance for Labeling Externally Validated Laboratory Analytical Data (EPA-540-R08-005)

Some data may be qualified using the reviewer's professional judgment. The conclusions presented herein are based on the information provided for the review. A summary of samples evaluated in this validation report and the pertinent dates for sample collection, laboratory sample receipt and analyses is attached along with the validated data.

I. QUALITY CONTROL RESULTS SUMMARY

Quality Control Test	Result Ranges	Outliers?	Evaluation Criteria
Blanks	Detects Reported	Y*	ND, ≤ RL or < 10xSample
Matrix Spike (MJGLJ2)	90 – 124%	N	75 – 125%
Sample Duplicate (MJGLJ2)	≤ %11 or > CRQL	Y*	≤ 20% RPD or ± CRQL
Field Duplicates (MJGLE3, MJGLF7, MJGLG5)	≤ 16% or ≥ 2xCRQL	Y*	≤ 50% RPD or ± 2xCRQL
LCS (blank spike)	92 - 120%	N	70 – 130%; Sb 50-150%
Serial Dilution (MJGLJ2)	≤ 3%	N	≤ 10%

*See the "*Data Qualifications*" section below for excursions and qualification of affected data.

II. DATA QUALIFICATIONS

Summary of Validation Qualifiers Applied

After the manual and electronic data review, the following data qualifications were applied:

Blanks
The following samples have analyte results ≥ MDLs but ≤ CRQLs. The associated instrument, preparation and/or field blank results are ≥ MDLs but ≤ CRQLs. Detected analytes are qualified U and the results reported at the CRQLs.
Aluminum – MJGLH9 **Barium –** MJGLH9, MJGLJ2, MJGLJ4 **Cadmium –** MJGLH8, MJGLH9, MJGLJ6 **Calcium** - MJGLH9, MJGLJ4, MJGLJ6 **Cobalt –** MJGLH8, MJGLJ2, MJGLJ4 **Iron** - MJGLH9 **Magnesium** - MJGLH8, MJGLJ2, MJGLJ4, MJGLJ6 **Manganese** – MJGLH9 **Sodium** – All samples **Thallium -** MJGLH8, MJGLJ4 **Vanadium -** MJGLH8, MJGLJ2, MJGLJ4, MJGLJ6
The following samples have analyte results ≥ or < CRQLs. The associated instrument, preparation and/or field blank results are ≥ CRQLs. Detected analytes ≥ CRQLs and < 10 times the field blank are qualified J+. Detected analytes < CRQLs are qualified U and the results reported at the CRQLs.
Chromium – MJGLH8, MJGLH9, MJGLJ2, MJGLJ4 **Copper, Lead, Nickel, Zinc** – All samples
Detection Limits
The following samples have results ≥ MDLs but ≤ CRQLs. Detected analytes are qualified J.
Arsenic – MJGLJ2, MJGLJ6 **Silver -** MJGLH8, MJGLH9, MJGLJ2
Duplicates
The following Duplicate and original sample results are > 5xCRQL and the RPD is > 20% or were ≤ 5xCRQL and the absolute difference between duplicate and original samples are > CRQL. The original sample results are ≥ MDLs. Detected analytes are qualified J. Non-detected analytes are qualified UJ.
Chromium – All samples
Field Duplicate exceedances were limited to the SDG of the originating samples and only affected 1 of 3 sample pairs. No further data qualification was applied to the remaining samples.

Data Validation Qualifiers

The following is a list of data validation qualifiers applied to the sample result(s) and their definitions.

Data Validation Qualifiers	
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J	The associated value is an estimated quantity.
J+	The associated value is an estimated quantity but the result may be biased high.
J-	The associated value is an estimated quantity but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The data are unusable. The analyte may or may not be present in the sample.

III. SAMPLE INDEX

Sample Number	Matrix	Sampling Date	Date Received	ICP-AES Analysis	ICP-MS Analysis
MJGLH8	Water	2/16/2014	2/20/2014	2/20/2014	2/21/2014
MJGLH9	Water	2/15/2014	2/20/2014	2/20/2014	2/21/2014
MJGLJ2	Water	2/16/2014	2/20/2014	2/20/2014	2/21/2014
MJGLJ4	Water	2/16/2014	2/20/2014	2/20/2014	2/21/2014
MJGLJ6	Water	2/16/2014	2/20/2014	2/20/2014	2/21/2014

Field Duplicates were analyzed and reported in a separate SDG. These sample pairs were as follows: MJGLE1 – MJGLE3; MJGLF1 – MJGLF7; MJGLG3 – MJGLG5.
Sample MJGLD9 is a preservation/bottle blank (also reported in a separate SDG).

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLH8	Lab Code:	CHEM
Sample Number:	MJGLH8	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/16/2014	Sample Time:	11:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	663	ug/L	1			Yes	S4VEM
Arsenic	2.5	ug/L	1			Yes	S4VEM
Barium	12.2	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	3.6	ug/L	1	*	J+	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	3.2	ug/L	1		J+	Yes	S4VEM
Lead	1.1	ug/L	1		J+	Yes	S4VEM
Nickel	2.2	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	0.074	ug/L	1	J	J	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	7.0	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLH8	Lab Code:	CHEM
Sample Number:	MJGLH8	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/16/2014	Sample Time:	11:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	8240	ug/L	1			Yes	S4VEM
Iron	943	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	43.5	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLH8	Lab Code:	CHEM
Sample Number:	MJGLH9	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	Precip Station	pH:	2	Sample Date:	02/15/2014	Sample Time:	19:45:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5000	ug/L	1	J	U	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	5000	ug/L	1	U	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLH8	Lab Code:	CHEM
Sample Number:	MJGLH9	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	Precip Station	pH:	2	Sample Date:	02/15/2014	Sample Time:	19:45:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	20	ug/L	1	J	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	U	U	Yes	S4VEM
Barium	10	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.6	ug/L	1	*	J+	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.2	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	0.065	ug/L	1	J	J	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	U	U	Yes	S4VEM
Zinc	6.3	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLH8	Lab Code:	CHEM
Sample Number:	MJGLJ2	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/16/2014	Sample Time:	10:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	519	ug/L	1			Yes	S4VEM
Arsenic	0.64	ug/L	1	J	J	Yes	S4VEM
Barium	10	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J*	UJ	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.8	ug/L	1		J+	Yes	S4VEM
Lead	1.4	ug/L	1		J+	Yes	S4VEM
Nickel	1.5	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	0.11	ug/L	1	J	J	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	5.9	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLH8	Lab Code:	CHEM
Sample Number:	MJGLJ2	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/16/2014	Sample Time:	10:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5460	ug/L	1			Yes	S4VEM
Iron	759	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	44.5	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLH8	Lab Code:	CHEM
Sample Number:	MJGLJ4	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/16/2014	Sample Time:	11:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	475	ug/L	1			Yes	S4VEM
Arsenic	1.4	ug/L	1			Yes	S4VEM
Barium	22.7	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J*	UJ	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	4.0	ug/L	1		J+	Yes	S4VEM
Lead	1.3	ug/L	1		J+	Yes	S4VEM
Nickel	3.5	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	6.7	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLH8	Lab Code:	CHEM
Sample Number:	MJGLJ4	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/16/2014	Sample Time:	11:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5000	ug/L	1	J	U	Yes	S4VEM
Iron	1040	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	67.9	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLH8	Lab Code:	CHEM
Sample Number:	MJGLJ6	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/16/2014	Sample Time:	10:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	555	ug/L	1			Yes	S4VEM
Arsenic	0.54	ug/L	1	J	J	Yes	S4VEM
Barium	10	ug/L	1	J	U	Yes	S4VEM
Cadmium	0.16	ug/L	1	J	J	Yes	S4VEM
Chromium	71.9	ug/L	1	*	J	Yes	S4VEM
Cobalt	1.0	ug/L	1		U	Yes	S4VEM
Copper	5.4	ug/L	1		J+	Yes	S4VEM
Lead	4.8	ug/L	1		J+	Yes	S4VEM
Nickel	49.2	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	12.0	ug/L	1		J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLH8	Lab Code:	CHEM
Sample Number:	MJGLJ6	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/16/2014	Sample Time:	10:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5000	ug/L	1	J	U	Yes	S4VEM
Iron	819	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	39.3	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE OF
ENVIRONMENTAL ASSESSMENT

March 13, 2014

MEMORANDUM

SUBJECT: Data Validation Report for Metals Analysis of Samples Collected for Black Butte Mine Phase 1 RI – Storm Sampling Event, Cottage Grove, OR, Case 43983, SDG: MJGLJ1

FROM: Don Matheny, Chemist
OEA, Environmental Services Unit

TO: Richard Muza, Remedial Project Manager
Office of Environmental Clean-up, USEPA R10

CC: Mary Lou Fox, CDM

The quality assurance (QA) review of the analytical data generated from the analysis of four (4) waters collected from the above referenced site has been completed. These samples were analyzed for Dissolved Metals by The Chemtech Consulting Group located in Mountainside, NJ.

Sample analyses were evaluated following EPA's Stage 4 Data Validation Electronic/Manual Process (S4VEM). The validation was conducted according to the Quality Control Specifications outlined in:

- *QAPP for Black Butte Mine Phase 1 Remedial Investigation – Surface Water Storm Sampling & Sediment Sampling QAPP, Cottage Grove, OR,* (December, 2012)
- USEPA CLP Statement of Work for Inorganic Superfund Methods (ISM01.3)
- National Functional Guidelines for Inorganic Superfund Data Review (EPA-540-R-10-011)
- Guidance for Labeling Externally Validated Laboratory Analytical Data (EPA-540-R08-005)

Some data may be qualified using the reviewer's professional judgment. The conclusions presented herein are based on the information provided for the review. A summary of samples evaluated in this validation report and the pertinent dates for sample collection, laboratory sample receipt and analyses is attached along with the validated data.

I. QUALITY CONTROL RESULTS SUMMARY

Quality Control Test	Result Ranges	Outliers?	Evaluation Criteria
Blanks	Detects Reported	Y*	ND, ≤ RL or < 10xSample
Matrix Spike (MJGLJ3)	82 – 107%	N	75 – 125%
Sample Duplicate (MJGLJ3)	≤ 7%; >CRQL	Y*	≤ 20% RPD or ± CRQL
Field Duplicates (MJGLE4, MJGLF8, MJGLG6)	≤ 12%; ≥ 2xCRQL	Y*	≤ 50% RPD or ± 2xCRQL
LCS (blank spike)	92 - 120%	N	70 – 130%; Sb 50-150%
Serial Dilution (MJGLJ3)	2%	N	≤ 10%

*See the "*Data Qualifications*" section below for excursions and qualification of affected data.

II. DATA QUALIFICATIONS

Summary of Validation Qualifiers Applied

After the manual and electronic data review, the following data qualifications were applied:

Blanks
The following samples have analyte results ≥ MDLs but ≤ CRQLs. The associated instrument, preparation and/or field blank results are ≥ MDLs but ≤ CRQLs. Detected analytes are qualified U and the results reported at the CRQLs.
Aluminum – MJGLJ5 **Cadmium –** MJGLJ1 **Calcium** – MJGLJ5 **Iron** - MJGLJ5 **Lead -** MJGLJ5 **Nickel –** MJGLJ1 **Silver –** MJGLJ3 **Thallium –** MJGLJ5, MJGLJ7, MJGLJ3 **Vanadium –** MJGLJ3 **Copper, Magnesium, Manganese, Sodium –** All samples
The following samples have analyte results ≥ or < CRQLs. The associated instrument, preparation and/or field blank results are ≥ CRQLs. Detected analytes ≥ CRQLs are qualified J+. Detected analytes < CRQLs are qualified U and the results reported at the CRQLs.
Chromium – MJGLJ1, MJGLJ3, MJGLJ5, MJGLJ7 **Zinc –** MJGLJ1, MJGLJ3, MJGLJ5, MJGLJ7
Detection Limits
The following samples have results ≥ MDLs but ≤ CRQLs. Detected analytes are qualified J.
Arsenic – MJGLJ1, MJGLJ5 **Barium, Cobalt –** All samples
Duplicates
The following Duplicate and original sample results are > 5xCRQL and the RPD is > 20% or were ≤ 5xCRQL and the absolute difference between duplicate and original samples are > CRQL. The original sample results are ≥ MDLs. Detected analytes are qualified J. Non-detected analytes are qualified UJ.
Zinc – All samples
The following Field Duplicate and original sample results are ≤ 5xCRQL and the absolute difference between duplicate and original samples are > 2xCRQL. Detected analytes reported below 5xCRQL were qualified J. Non-detects are qualified UJ.
Aluminum – MJGLJ1, MJGLJ5, MJGLJ7

Data Validation Qualifiers

The following is a list of data validation qualifiers applied to the sample result(s) and their definitions.

Data Validation Qualifiers	
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J	The associated value is an estimated quantity.
J+	The associated value is an estimated quantity but the result may be biased high.
J-	The associated value is an estimated quantity but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The data are unusable. The analyte may or may not be present in the sample.

III. SAMPLE INDEX

Sample Number	Matrix	Sampling Date	Date Received	ICP-AES Analysis	ICP-MS Analysis
MJGLJ1	Water	2/16/2014	2/20/2014	2/20/2014	2/21/2014
MJGLJ3	Water	2/16/2014	2/20/2014	2/20/2014	2/21/2014
MJGLJ5	Water	2/16/2014	2/20/2014	2/20/2014	2/21/2014
MJGLJ7	Water	2/16/2014	2/20/2014	2/20/2014	2/24/2014

Field Duplicates were analyzed and reported in a separate SDG. These sample pairs were as follows: MJGLE2 – MJGLE4; MJGLF2 – MJGLF8; MJGLG4 – MJGLG6.
Sample MJGLE0 is a filter blank (also reported in a separate SDG).

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLJ1	Lab Code:	CHEM
Sample Number:	MJGLJ1	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/16/2014	Sample Time:	11:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	80.7	ug/L	1		J	Yes	S4VEM
Arsenic	0.55	ug/L	1	J	J	Yes	S4VEM
Barium	7.2	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	0.086	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.9	ug/L	1			Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	U	U	Yes	S4VEM
Zinc	6.9	ug/L	1	*	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLJ1	Lab Code:	CHEM
Sample Number:	MJGLJ1	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/16/2014	Sample Time:	11:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	8160	ug/L	1			Yes	S4VEM
Iron	151	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLJ1	Lab Code:	CHEM
Sample Number:	MJGLJ3	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/16/2014	Sample Time:	10:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	117	ug/L	1			Yes	S4VEM
Arsenic	1.0	ug/L	1	U	U	Yes	S4VEM
Barium	4.0	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	0.11	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.2	ug/L	1			Yes	S4VEM
Nickel	1.4	ug/L	1			Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	5.4	ug/L	1	*	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLJ1	Lab Code:	CHEM
Sample Number:	MJGLJ3	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/16/2014	Sample Time:	10:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5370	ug/L	1			Yes	S4VEM
Iron	182	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLJ1	Lab Code:	CHEM
Sample Number:	MJGLJ5	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/16/2014	Sample Time:	11:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5000	ug/L	1	J	U	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLJ1	Lab Code:	CHEM
Sample Number:	MJGLJ5	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/16/2014	Sample Time:	11:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	20	ug/L	1	J	UJ	Yes	S4VEM
Arsenic	0.34	ug/L	1	J	J	Yes	S4VEM
Barium	6.4	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	4.5	ug/L	1		J+	Yes	S4VEM
Cobalt	0.18	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	9.7	ug/L	1			Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	U	U	Yes	S4VEM
Zinc	4.0	ug/L	1	*	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLJ1	Lab Code:	CHEM
Sample Number:	MJGLJ7	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/16/2014	Sample Time:	10:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5390	ug/L	1			Yes	S4VEM
Iron	132	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	15.0	ug/L	1	J	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLJ1	Lab Code:	CHEM
Sample Number:	MJGLJ7	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/16/2014	Sample Time:	10:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	53.7	ug/L	1		J	Yes	S4VEM
Arsenic	1.0	ug/L	1	U	U	Yes	S4VEM
Barium	3.4	ug/L	1	J	J	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	7.0	ug/L	1		J+	Yes	S4VEM
Cobalt	0.11	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	3.0	ug/L	1			Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	U	U	Yes	S4VEM
Zinc	4.5	ug/L	1	*	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLF3	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/14/2014	Sample Time:	09:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	5380	ug/L	1			Yes	S4VEM
Arsenic	5.0	ug/L	1			Yes	S4VEM
Barium	69.5	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	5.8	ug/L	1		J+	Yes	S4VEM
Cobalt	7.3	ug/L	1			Yes	S4VEM
Copper	31.3	ug/L	1	E	J+	Yes	S4VEM
Lead	1.6	ug/L	1		J+	Yes	S4VEM
Nickel	5.2	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	18.5	ug/L	1			Yes	S4VEM
Zinc	23.1	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLF5	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/14/2014	Sample Time:	09:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	8100	ug/L	1			Yes	S4VEM
Iron	6450	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	601	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLF5	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/14/2014	Sample Time:	09:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	2870	ug/L	1			Yes	S4VEM
Arsenic	2.9	ug/L	1			Yes	S4VEM
Barium	50.4	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	3.5	ug/L	1		J+	Yes	S4VEM
Cobalt	4.9	ug/L	1			Yes	S4VEM
Copper	19.5	ug/L	1	E	J+	Yes	S4VEM
Lead	1.2	ug/L	1		J+	Yes	S4VEM
Nickel	3.3	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	11.9	ug/L	1			Yes	S4VEM
Zinc	17.5	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLF7	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	10:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	3390	ug/L	1			Yes	S4VEM
Arsenic	13.6	ug/L	1			Yes	S4VEM
Barium	49.7	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	6.1	ug/L	1		J+	Yes	S4VEM
Cobalt	6.3	ug/L	1			Yes	S4VEM
Copper	16.3	ug/L	1	E	J+	Yes	S4VEM
Lead	1.3	ug/L	1		J+	Yes	S4VEM
Nickel	5.9	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	0.057	ug/L	1	J	J	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	12.0	ug/L	1			Yes	S4VEM
Zinc	13.7	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLF7	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	10:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	10300	ug/L	1			Yes	S4VEM
Iron	6920	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	473	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLF9	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	10:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	1330	ug/L	1			Yes	S4VEM
Arsenic	3.5	ug/L	1			Yes	S4VEM
Barium	32.4	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	J+	Yes	S4VEM
Cobalt	1.2	ug/L	1			Yes	S4VEM
Copper	7.7	ug/L	1	E	J+	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	2.1	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	0.075	ug/L	1	J	J	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	3.7	ug/L	1	J	J	Yes	S4VEM
Zinc	9.6	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLF9	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	10:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	6170	ug/L	1			Yes	S4VEM
Iron	2370	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	88.5	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLG1	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	19:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	2180	ug/L	1			Yes	S4VEM
Arsenic	7.9	ug/L	1			Yes	S4VEM
Barium	30.3	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	4.0	ug/L	1		J+	Yes	S4VEM
Cobalt	3.0	ug/L	1			Yes	S4VEM
Copper	10.4	ug/L	1	E	J+	Yes	S4VEM
Lead	1.6	ug/L	1		J+	Yes	S4VEM
Nickel	4.0	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	6.7	ug/L	1			Yes	S4VEM
Zinc	20.8	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLG1	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	19:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	9130	ug/L	1			Yes	S4VEM
Iron	3700	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	234	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLG3	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/14/2014	Sample Time:	17:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	1870	ug/L	1			Yes	S4VEM
Arsenic	1.9	ug/L	1			Yes	S4VEM
Barium	23.1	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.2	ug/L	1		J+	Yes	S4VEM
Cobalt	2.2	ug/L	1		J	Yes	S4VEM
Copper	9.9	ug/L	1	E	J+	Yes	S4VEM
Lead	1.5	ug/L	1		J+	Yes	S4VEM
Nickel	2.5	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.9	ug/L	1			Yes	S4VEM
Zinc	9.7	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLG3	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/14/2014	Sample Time:	17:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5920	ug/L	1			Yes	S4VEM
Iron	3420	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	233	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLG5	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/14/2014	Sample Time:	18:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	1680	ug/L	1			Yes	S4VEM
Arsenic	1.9	ug/L	1			Yes	S4VEM
Barium	23.1	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	12.5	ug/L	1		J+	Yes	S4VEM
Cobalt	4.8	ug/L	1		J	Yes	S4VEM
Copper	10.7	ug/L	1	E	J+	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	178	ug/L	1		J	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.1	ug/L	1			Yes	S4VEM
Zinc	8.5	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLG5	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/14/2014	Sample Time:	18:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	6070	ug/L	1			Yes	S4VEM
Iron	3500	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	243	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLG7	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	18:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	3740	ug/L	1			Yes	S4VEM
Arsenic	10.4	ug/L	1			Yes	S4VEM
Barium	95.1	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	36.5	ug/L	1			Yes	S4VEM
Cobalt	17.8	ug/L	1			Yes	S4VEM
Copper	41.9	ug/L	1	E	J	Yes	S4VEM
Lead	2.4	ug/L	1		J+	Yes	S4VEM
Nickel	732	ug/L	1			Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	0.079	ug/L	1	J	J	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	11.8	ug/L	1			Yes	S4VEM
Zinc	19.8	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLG7	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/14/2014	Sample Time:	18:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	7360	ug/L	1			Yes	S4VEM
Iron	5460	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	370	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLG9	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/14/2014	Sample Time:	17:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5800	ug/L	1			Yes	S4VEM
Iron	2750	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	253	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLG9	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/14/2014	Sample Time:	17:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	1160	ug/L	1			Yes	S4VEM
Arsenic	1.2	ug/L	1			Yes	S4VEM
Barium	22.7	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.7	ug/L	1		J+	Yes	S4VEM
Cobalt	1.9	ug/L	1			Yes	S4VEM
Copper	8.1	ug/L	1	E	J+	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	2.9	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	3.7	ug/L	1	J	J	Yes	S4VEM
Zinc	7.6	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLH1	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/15/2014	Sample Time:	10:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	8320	ug/L	1			Yes	S4VEM
Iron	1340	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	76.7	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLH1	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	2	Sample Date:	02/15/2014	Sample Time:	10:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	597	ug/L	1			Yes	S4VEM
Arsenic	3.0	ug/L	1			Yes	S4VEM
Barium	15.4	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	3.2	ug/L	1		J+	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	4.2	ug/L	1	E	J+	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	3.4	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	1.3	ug/L	1	J	J	Yes	S4VEM
Zinc	10.7	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLH3	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/15/2014	Sample Time:	09:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5580	ug/L	1			Yes	S4VEM
Iron	1740	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	99.2	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLH3	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	2	Sample Date:	02/15/2014	Sample Time:	09:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	998	ug/L	1			Yes	S4VEM
Arsenic	0.92	ug/L	1	J	J	Yes	S4VEM
Barium	12.3	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.4	ug/L	1		J+	Yes	S4VEM
Cobalt	1.0	ug/L	1			Yes	S4VEM
Copper	5.5	ug/L	1	E	J+	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.7	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	2.5	ug/L	1	J	J	Yes	S4VEM
Zinc	14.5	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLH5	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/15/2014	Sample Time:	09:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5660	ug/L	1			Yes	S4VEM
Iron	3540	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	153	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLH5	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	2	Sample Date:	02/15/2014	Sample Time:	09:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	1540	ug/L	1			Yes	S4VEM
Arsenic	4.8	ug/L	1			Yes	S4VEM
Barium	42.6	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.3	ug/L	1		J+	Yes	S4VEM
Cobalt	2.1	ug/L	1			Yes	S4VEM
Copper	10.1	ug/L	1	E	J+	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	2.0	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	0.099	ug/L	1	J	J	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	4.7	ug/L	1	J	J	Yes	S4VEM
Zinc	8.5	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLH7	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/15/2014	Sample Time:	08:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	773	ug/L	1			Yes	S4VEM
Arsenic	0.86	ug/L	1	J	J	Yes	S4VEM
Barium	12.4	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	3.8	ug/L	1		J+	Yes	S4VEM
Cobalt	1.0	ug/L	1			Yes	S4VEM
Copper	4.8	ug/L	1	E	J+	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	2.5	ug/L	1		J+	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	1.8	ug/L	1	J	J	Yes	S4VEM
Zinc	7.7	ug/L	1	E	J+	Yes	S4VEM

Case No:	43983	Contract:	EPW09038	SDG No:	MJGLD9	Lab Code:	CHEM
Sample Number:	MJGLH7	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	2	Sample Date:	02/15/2014	Sample Time:	08:10:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5530	ug/L	1			Yes	S4VEM
Iron	1120	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	94.0	ug/L	1			Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	J	U	Yes	S4VEM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: March 04, 2014

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

FROM: Stephanie Le, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: Phase 1 Storm Event #3 For Anions

Project Code: SFP-047F
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox – CDM Smith

The following is a quality assurance review of the results of 25 water samples for anions (fluoride, chloride, & sulfate) analysis. These samples were submitted for the Black Butte Mine: Phase 1 Storm Event #3 Project. The analyses were performed by ESAT chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

14064200	14064202	14064204	14064206	14064208	14064210	14064214
14064216	14064218	14064220	14064222	14064224	14064226	14064228
14064230	14064232	14064234	14064236	14064238	14064240	14064246
14074202	14074204	14074206	14074208			

Data Qualifications

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

The quality control measures which did not meet Laboratory/QAPP criteria are annotated in the title of each affected subsection with **"Laboratory/QAPP Criteria Not Met".**

For those tests for which the USEPA Region 10 Laboratory has been accredited by The NELAC Institute (TNI), all requirements of the current TNI Standard have been met. The Region 10 Laboratory's Quality System has also been accredited to the Standards of The NELAC Institute (TNI).

1. Sample Transport and Receipt – Laboratory/QAPP Criteria Not Met

Refer to the Corrective Action Notice dated 02/20/2014 for a record of observations made during sample receipt. These findings were administrative in nature and did not affect sample results.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations, where applicable.

3. Sample Preparation

Samples were prepared according to the SOP for these analytes for this type of matrix. No qualification of the data was required based on sample preparation.

4. Initial Calibration and Calibration Verification

The linear regression generated for the initial calibrations met method criteria. The low point of the calibration curve is usually the Minimum Reporting Level (MRL) of the method. All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the methods reported. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis

The method blanks did not contain detectable levels of reported analytes which would require data qualification.

7. Duplicate Analysis

Duplicate analysis was performed on samples 14064216 and 14074206. Sample results which were greater than 5 times of the MRL level were within the +/- 20% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on samples 14064216 and 14074206. Sample results were within the 80-120% recovery requirements.

No qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

No manual integrations were performed.

10. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the ‘U’ qualifier is attached.

11. Data Qualifiers

The U-qualifier was attached to the results which were below the MRL.

No qualification was required.

The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Stephanie Le at the Region 10 Laboratory, phone number (360) 871- 8715.

12. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DS), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analytes and the percent recoveries of the analytes are determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: June 5, 2014

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

From: Theresa McBride, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: RI Phase 1 Storm Event #3 For Low Level Mercury

Project Code: SFP-047F
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox – CDM Smith

The following is a quality assurance review of the results of the analysis of 56 samples (28 unfiltered, 28 filtered) for low level mercury. These samples were submitted for the Black Butte Mine: RI Phase 1, Storm Event #3 project. The analyses were performed by EPA chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

Total (unfiltered) mercury:

14064200	14064202	14064204	14064206	14064208	14064210	14064214
14064216	14064218	14064220	14064222	14064224	14064226	14064228
14064230	14064232	14064234	14064236	14064238	14064240	14064242
14064244	14074200	14074202	14074204	14074206	14074208	14074210

Dissolved (filtered) mercury:

14064203	14064205	14064207	14064209	14064211	14064213	14064215
14064217	14064219	14064221	14064223	14064225	14064227	14064229
14064231	14064233	14064235	14064237	14064239	14064241	14064243
14064245	14074201	14074203	14074205	14074207	14074209	14074211

Data Qualifications

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

The quality control measures which did not meet Laboratory/QAPP criteria are annotated in the title of each affected subsection with **"Laboratory/QAPP Criteria Not Met"**.

For those tests for which the USEPA Region 10 Laboratory has been accredited by The NELAC Institute (TNI), all requirements of the current TNI Standard have been met.

1. Sample Transport and Receipt - Laboratory/QAPP Criteria Not Met

Refer to the appended Corrective Action Notices dated 02/20/2014 for a record of observations made during sample receipt that may impact data quality. All issues were administrative in nature and do not affect data quality.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations.

3. Sample Preparation

Samples were prepared according to the method outlined in the SOP for this analyte for this type of matrix. No qualification of the data was required based on sample preparation.

4. Initial Calibration and Calibration Verification

The calibration factors generated for the initial calibration met method criteria. The low point of the calibration curve is usually the Minimum Reporting Level (MRL) of the method. All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the method. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis

The method blanks did not contain detectable levels of analyte which would require data qualification.

Method 1631E states that samples with results less than 5 times the concentration in the field blank must be reported as non-detects. All sample results exceeded all field blank results by at least five times. Therefore, no qualification of the data was required.

7. Duplicate Analysis

Duplicate analysis was performed on samples 14064204, 14064216, and 14074204 (unfiltered samples), and 14064205, 14064217, and 14064225 (filtered samples). Sample results which were greater than the MRL level were within the +/- 20% RPD requirement. No qualification was required based on duplicate analysis.

Note: According to the COC documentation, samples 14064218 and 14064220 were submitted to the lab as field duplicates. The RPD between these sample results was 133%. These samples were analyzed a second time to verify that there was not a laboratory error which led to the disparate results. The second analysis of both samples agreed within 10% of the first analysis, and the RPD between the second set of sample results was very similar (137%). Therefore, the difference between the two sample aliquots was not related to laboratory analysis. The two samples contained large quantities of sediment, thus it would have been very difficult to create two uniform field samples.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on samples 14064204, 14064216, and 14074204 (unfiltered samples), and 14064205, 14064217, and 14064225 (filtered samples). Spike results were within the 71-125% recovery and 24% relative percent difference (RPD) requirements. Results for spikes associated with sample 14064216 were reported as “NA” (Not Applicable) because the mercury concentration in the sample exceeded the spike amount by more than 4 times. No other

qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

All manual integrations have been reviewed and found to comply with acceptable integration practices.

10. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the 'U' qualifier is attached.

11. Data Qualifiers

The U qualifier was attached to all sample results that fall below the MRL. The NA qualifier was applied to matrix spikes for sample 14064216 (see Section 8 - Matrix Spike/Matrix Spike Duplicate Analysis). No other data qualification was required for this project. The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

NA - Not Applicable; the parameter was not included in the analysis, or there is no analytical result for this parameter. No value is reported with this qualification.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Katie Adams at the Region 10 Laboratory, phone number (360) 871-8748.

12. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DU), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analyte and the percent recovery of the analyte is determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the

analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: July 2, 2014

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

From: Stephanie Le, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: RI Phase 1 Storm Event #3
For Methyl Mercury

Project Code: SFP-047F
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox – CDM Smith

The following is a quality assurance review of the results of the analysis of 28 filtered and 28 water samples for methyl mercury. These samples were submitted for the Black Butte Mine: RI Phase 1 Storm Event #3 Project. The analyses were performed by EPA chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

Filtered (dissolved) samples:

14064203	14064205	14064207	14064209	14064211	14064213	14064215
14064217	14064219	14064221	14064223	14064225	14064227	14064229
14064231	14064233	14064235	14064237	14064239	14064241	14064243
14064245	14074201	14074203	14074205	14074207	14074209	14074211

Water (total) samples:

14064200	14064202	14064204	14064206	14064208	14064210	14064214
14064216	14064218	14064220	14064222	14064224	14064226	14064228
14064230	14064232	14064234	14064236	14064238	14064240	14064242
14064244	14074200	14074202	14074204	14074206	14074208	14074210

Data Qualifications

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). A method excursion was required. The excursion is discussed in the "Initial Calibration and Calibration Verification" section below.

The quality control measures which did not meet Laboratory/QAPP criteria are annotated in the title of each affected subsection with **"Laboratory/QAPP Criteria Not Met".** Additional information which may affect data usage is discussed in a "*NOTE:*" which concludes the affected section.

For those tests for which the USEPA Region 10 Laboratory has been accredited by The NELAC Institute (TNI), all requirements of the current TNI Standard have been met.

1. Sample Transport and Receipt -Laboratory/QAPP Criteria Not Met

Refer to the Corrective Action Notices dated 02/20/2014 for a record of observations made during sample receipt that may impact data quality. All issues were administrative in nature and do not affect data quality.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations.

3. Sample Preparation

Samples were prepared according to the method outlined in the SOP for this analyte for this type of matrix. No qualification of the data was required based on sample preparation.

Note: The total methylmercury result for sample 14064222 is less than the result for the corresponding dissolved sample, 14064223. Analysis of these samples was repeated and the total sample was again less than the dissolved sample.

4. Initial Calibration and Calibration Verification

The calibration factors generated for the initial calibrations met method criteria. The low point of the calibration curve is usually the Minimum Reporting Level (MRL) of the method. All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

Note: Method 1630 requires 5 nonzero data points in a calibration curve. The calibration curve used on analysis date 06/17/14 only contains 4 nonzero data points. The samples reported from this day of analysis were bracketed by acceptable calibration points and not impact on data quality is expected.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the method. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis -Laboratory/QAPP Criteria Not Met

The method blanks did not contain detectable levels of analyte which would require data qualification.

The method states that values less than or equal to five times the concentration in the field blank are not to be reported. Though the field blank measurement was less than the reporting limit, the analytical result was not less than 5 times the result for samples 14064202, 14064204, 14064206, 14064215, 14064221, 14064236, 14064239, and 14074202 which are therefore qualified (U), undetected.

No additional qualification was required based on blank analysis.

7. Duplicate Analysis

Duplicate analysis was performed on samples 14064216 (total), 14064224 (total), 14074204 (total), 14064217 (dissolved), 14064225 (dissolved), and 14074205 (dissolved). Sample results which were greater than the MRL level were within the +/- 35% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on samples 14064216 (total), 14064224 (total), 14074204 (total), 14064217 (dissolved), 14064225 (dissolved), and 14074205 (dissolved). Sample results were within the 65-135% recovery and

relative percent difference (RPD) requirements. No qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

No manual integrations were performed.

10. Interferences -Laboratory/QAPP Criteria Not Met

It is known that some conversion of inorganic mercury to methylmercury can occur during the distillation step of Method 1630, due to reaction of inorganic mercury with organic compounds in the sample. Because many samples from the project contained considerable levels of inorganic mercury, there was concern that this conversion could impact methylmercury results. Representative samples were spiked with inorganic mercury to observe the rate at which this conversion took place. Based on the results of this study, results for samples 14064208, 14064214, 14064222, 14064223, 14064224DU, 14064230, 14064231, 14064238, 14064239, and 14074206 were qualified (J), estimated, to reflect a possible high bias from conversion.

11. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the 'U' qualifier is attached.

12. Data Qualifiers

The (U) qualifier was attached to all sample results that fall below the MRL (14064200, 14064203, 14064205, 14064207, 14064209, 14064210, 14064211, 14064213, 14064217, 14064217DU, 14064219, 14064225, 14064225DU, 14064227, 14064229, 14064233, 14064235, 14064237, 14064240, 14064241, 14064242, 14064243, 14064245, 14074200, 14074201, 14074203, 14074204, 14074204DU, 14074205, 14074205DU, 14074207, 14074208, 14074209, 14074210, 14074211, IW060314ABL, IW060314BBL, IW060314CBL, IW061614ABL, IW061614BBL, IW061614CBL, IW061914ABL, IW061914BBL, IW061914CBL, IW061914DBL, IW062614ABL, IW062614BBL, IW062614CBL, and IW062614DBL). The (U) qualifier was also attached to the sample results which were not greater than 5 times the concentration in the field blank: 14064202, 14064204, 14064206, 14064215, 14064221, 14064236, 14064239, and 14074202.

Samples 14064208, 14064214, 14064222, 14064223, 14064224DU, 14064230, 14064231, 14064238, 14064239, and 14074206 were qualified (J), estimated, due to the potential for high bias from mercury conversion to methylmercury during distillation.

Below are the definitions for the codes used qualifying data from these analyses. When more than one quality issue was involved, the most restrictive qualifier has been attached to the data.

U - The analyte was not detected at or above the reported value.

J - The identification of the analyte is acceptable; however the reported value is an estimate.

UJ - The analyte was not detected at or above the reported value. The reported value is an estimate.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Katie Adams at the Region 10 Laboratory, phone number (360) 871-8784.

13. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DU), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent

difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analyte and the percent recovery of the analyte is determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: March 26, 2014

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

FROM: Stephanie Le, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: Phase 1 Storm Event #3
For Nitrate plus Nitrite

Project Code: SFP-047F
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox- CDM Smith

The following is a quality assurance review of the results of 25 water samples for nitrate plus nitrite analysis. These samples were submitted for the Black Butte Mine: Phase 1 Storm Event #3 Project. The analyses were performed by ESAT chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

14064200	14064202	14064204	14064206	14064208	14064210	14064214
14064216	14064218	14064220	14064222	14064224	14064226	14064228
14064230	14064232	14064234	14064236	14064238	14064240	14064246
14074202	14074204	14074206	14074208			

Data Qualifications:

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

The quality control measures which did not meet Laboratory/QAPP criteria are annotated in the title of each affected subsection with **"Laboratory/QAPP Criteria Not Met".**

For those tests for which the USEPA Region 10 Laboratory has been accredited by The NELAC Institute (TNI), all requirements of the current TNI Standard have been met. The Region 10 Laboratory's Quality System has also been accredited to the Standards of The NELAC Institute (TNI).

1. Sample Transport and Receipt – Laboratory/QAPP Criteria Not Met

Refer to the Corrective Action Notice dated 02/20/2014 for a record of observations made during sample receipt. These findings were administrative in nature and did not affect sample results.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations, where applicable.

3. Sample Preparation

Samples were prepared according to the SOP for these analytes for this type of matrix. No qualification of the data was required based on sample preparation.

4. Initial Calibration and Calibration Verification

The linear regression generated for the initial calibrations met method criteria. The low point of the calibration curve is usually the Minimum Reporting Level (MRL) of the method. All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the methods reported. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis

The method blanks did not contain detectable levels of reported alkalinity which would require data qualification

7. Duplicate Analysis

Duplicate analysis was performed on samples 14064216 and 14064224. Sample results which were greater than 5 times of the MRL level were within the ± 20% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on samples 14064216 and 14064224. Sample results were within the 75-125% recovery requirements. No qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

No manual integrations were performed for these methods.

10. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the 'U' qualifier is attached.

11. Data Qualifiers

The U-qualifier was attached to the results which were below the MRL. No other qualification was required for this analysis.

The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Stephanie Le at the Region 10 Laboratory, phone number (360) 871- 8715.

12. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DS), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analytes and the percent recoveries of the analytes are determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
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Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: March 03, 2014

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

FROM: Stephanie Le, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: Phase 1 Storm Event #3
For Total Suspended Solids

Project Code: SFP-047F
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox- CDM Smith

The following is a quality assurance review of the results of 24 water samples for Total Suspended Solids (TSS) analyses. These samples were submitted for the Black Butte Mine: Phase 1 Storm Event #3 Project. The analyses were performed by ESAT chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

14064200	14064202	14064204	14064206	14064208	14064210	14064214
14064216	14064218	14064220	14064222	14064224	14064226	14064228
14064230	14064232	14064234	14064236	14064238	14064240	
14074202	14074204	14074206	14074208			

Data Qualifications:

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

The quality control measures which did not meet Laboratory/QAPP criteria are annotated in the title of each affected subsection with **"Laboratory/QAPP Criteria Not Met".**

For those tests for which the USEPA Region 10 Laboratory has been accredited by The NELAC Institute (TNI), all requirements of the current TNI Standard have been met. The Region 10 Laboratory's Quality System has also been accredited to the Standards of The NELAC Institute (TNI).

1. Sample Transport and Receipt – Laboratory/QAPP Criteria Not Met

Refer to the Corrective Action Notice dated 02/20/2014 for a record of observations made during sample receipt. These findings were administrative in nature and did not affect sample results.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations, where applicable.

3. Sample Preparation

Samples were prepared according to the SOP for these analytes for this type of matrix. No qualification of the data was required based on sample preparation.

4. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the methods reported. No qualification was required based on laboratory control sample analysis.

5. Blank Analysis

The method blanks did not contain detectable levels of reported analytes which would require data qualification.

6. Duplicate Analysis

Duplicate analysis was performed on samples 14064216 and 14074206. Sample results which were greater than 5 times of the MRL level were within the ± 20% RPD requirement. No qualification was required based on duplicate analysis.

7. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses are not applicable to TSS analysis.

8. Instrument Peak Integrations

No manual integrations were performed for these methods.

9. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the 'U' qualifier is attached.

10. Data Qualifiers

The U-qualifier was attached to the results which were below the MRL. No other qualification was required. The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Stephanie Le at the Region 10 Laboratory, phone number (360) 871- 8715.

11. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DS), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analytes and the percent recoveries of the analytes are determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: March 03, 2014

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

FROM: Stephanie Le, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: Phase 1 Storm Event #3 For Alkalinity

Project Code: SFP-047F
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox- CDM Smith

The following is a quality assurance review of the results of 24 water samples for alkalinity analysis. These samples were submitted for the Black Butte Mine: Phase 1 Storm Event #3 Project. The analyses were performed by ESAT chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

14064202	14064204	14064206	14064208	14064210	14064214	14064216
14064218	14064220	14064222	14064224	14064226	14064228	14064230
14064232	14064234	14064236	14064238	14064240	14064246	
14074202	14074204	14074206	14074208			

Data Qualifications:

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

The quality control measures which did not meet Laboratory/QAPP criteria are annotated in the title of each affected subsection with **"Laboratory/QAPP Criteria Not Met".**

For those tests for which the USEPA Region 10 Laboratory has been accredited by The NELAC Institute (TNI), all requirements of the current TNI Standard have been met. The Region 10 Laboratory's Quality System has also been accredited to the Standards of The NELAC Institute (TNI).

1. Sample Transport and Receipt – Laboratory/QAPP Criteria Not Met

Refer to the Corrective Action Notice dated 02/20/2014 for a record of observations made during sample receipt. These findings were administrative in nature and did not affect sample results.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations, where applicable.

3. Sample Preparation

Samples were prepared according to the SOP for these analytes for this type of matrix. No qualification of the data was required based on sample preparation.

4. Initial Calibration and Calibration Verification

All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the methods reported. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis

The method blanks did not contain detectable levels of reported alkalinity which would require data qualification

7. Duplicate Analysis

Duplicate analysis was performed on samples 14064216 and 14074206. Sample results which were greater than 5 times of the MRL level were within the ± 20% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on samples 14064216 and 14074206. Sample results were within the 75-125% recovery requirements. No qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

No manual integrations were performed for these methods.

10. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the 'U' qualifier is attached.

11. Data Qualifiers

The U-qualifier was attached to the results which were below the MRL. No other qualification was required for this analysis.

The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Stephanie Le at the Region 10 Laboratory, phone number (360) 871- 8715.

12. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DS), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analytes and the percent recoveries of the analytes are determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage

Black Butte Mine Superfund Site
March 2014 Precipitation Sampling
Data Validation Report

Laboratory: Eurofins Frontier Global Sciences

Matrix Water (Precipitation)

Sample Delivery Group (SDG) Numbers and Samples in SDGs:

SDG	Sample
1402480	14064246

Collection date: 2/15/2014

Analysis/Methods: Methyl-Mercury by EPA 1630, Modified
Low-Level Mercury by EPA 1631E

Validation to the Stage 4 level was performed in accordance with EPA methods1630 and 1631E, the Black Butte Mine Phase 1 Remedial Investigation - Surface Water Storm Sampling and Sediment Sampling QAPP, the laboratory's Standar Operating Procedure, EPA National Functional Guidelines for Inorganic Superfund Data Review (2010), and Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use.

Methyl-Mercury by EPA 1630, Modified

Precision:	**Yes No N/A**
Field Duplicates relative percent difference (RPD) criteria met? (control limits RPD ≤ 50%)	**N/A**
Matrix Spike/Matrix Spike Duplicates (MS/MSD) RPD criteria of 24% met?	**N/A**
Lab Control Sample/Lab Control Sample Duplicate (LCS/LCSD) or RPD criteria of 25% met?	**Yes**

Accuracy:	**Yes No N/A**
Calibration Factor RSD < 15%?	**Yes**
Is the Initial Precision and Recovery(IPR) sample or Initial Calibration verification (ICV) within 79-121%?	**Yes**
Are Ongoing Precision and Recovery (OPR) or Continuing Calibration Verification (CCV) solution recoveries within 77-123%?	**Yes**
Are the ethylation blanks < 0.050 ng/L?	**Yes**
Were the method blank results < 0.050 ng/L?	**Yes**
Lab Control Sample/Lab Control Sample Duplicate (LCS/LCSD) or Quality Control Sample/Quality Control Sample Duplicate (QCS/QCSD) RPD criteria of 25% met?	**Yes**
Lowest standard meet recovery criteria of 65-135% ?	**Yes**

Comments (note deviations): Field duplicates are not practical for the precipitation sampler and due to limited volume, a matrix spike/matrix spike duplicate set was not done. Due to a lack of Certified Reference Material for water, a Laboratory Control Sample/Laboratory Control Sample duplicate set was performed per Eurofins/Frontier Global SOP.

Low-Level Mercury by EPA 1631E

Precision:	**Yes No N/A**
Field Duplicates RPD criteria met? (control limits RPD ≤ 50%)	**N/A**
Matrix Spike/Matrix Spike Duplicates (MS/MSD) RPD criteria of 24% met?	**N/A**
LCS/LCSD or QCS/QCSD RPD criteria of 24% met?	**Yes**

Accuracy:	**Yes No N/A**
Calibration Factor RSD < 15%?	**Yes**
Is the IPR or ICV sample within 79-121%?	**Yes**
Are Ongoing Precision and Recovery (OPR) or Continuing Calibration Verification (CCV) solution recoveries within 77-123%?	**Yes**
Are the ethylation blanks < 0.050 ng/L?	**Yes**
Were the method blank results < 0.050 ng/L?	**Yes**
LCS/LCSD or QCS/QCSD analyses meet recovery criteria of 70-130%?	**Yes**
Lowest standard meet recovery criteria of 75-125% ?	**Yes**

Comments (note deviations): Field duplicates are not practical for the precipitation sampler and due to limited volume, a matrix spike/matrix spike duplicate set was not done. Due to a lack of Certified Reference Material for water, a Laboratory Control Sample/Laboratory Control Sample duplicate set was performed.

Representativeness:	**Yes No N/A**
Were sampling procedures and design criteria met?	**Yes**
Were holding times met?	**Yes**
Were preservation criteria met? (4 °C ± 2 °C)	**See Note**
Were Chain-of-Custody records complete and provided in data package?	**Yes**

Comments (note deviations): The precipitation sample is collected in the sampler in a large glass jug with hydrochloric acid preservative and is shipped back to the laboratory with the used sampling train in a cooler with foam packing designed for secure packing of the sample and sampling train (space in the cooler for ice). The laboratory noted that chilling of the sample during the return to the laboratory was not necessary.

Completeness (90%):	**Yes No N/A**
Are all data in this SDG useable?	**Yes**

Comments (note deviations): None

Sensitivity:	**Yes No N/A**
Are MDLs present and reported?	**Yes**
All results within the linear range of the instrument?	**Yes**

Comments (note deviations): EPA Methods 1631E for low-level mercury and 1630 for methyl-mercury state that results below the Minimum Level (ML) should be reported as < ML unless otherwise required by a regulatory/ permitting authority or permit. Results are not typically reported below the ML with J qualifiers.

Data Validator: Mary Lou Fox Date: 7/15/2014

Data Reviewer: Kimberly Zilis Date: 8/5/2014

Black Butte Mine Superfund Site
February 2014 3rd Storm Event Surface Water Sampling
Data Validation Report

Laboratory:	AmTest Laboratories
Matrix:	Surface Water

Sample Delivery Group (SDG) Numbers and Samples in SDGs:

SDG	Samples
14-A1843	14064203
	14064205
	14064207
	14064209
	14064211
	14064212
	14064215
	14064217
	14064219
	14064221
	14064223
	14064225
	14064227
	14064229
	14064231
	14064233
	14064235
	14064237
	14064239
	14064241
	14074203
	14074205
	14074207
	14074209

Collection dates:	February 13, 14, and15 2014
Analysis/Methods:	DOC SW-846 415.3 UV_{254} SW-848 415.3 $SUVA_{254}$ SW-846 415.3

Validation to the Stage 4 (S4VM) level was performed in accordance with the methods and the Black Butte Mine Phase 1 Remedial Investigation - Surface Water Storm Sampling and Sediment Sampling QAPP,EPA National Functional Guidelines for Inorganic Superfrund Data Review(2010), and EPA Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use.

Dissolved Organic Carbon (DOC) SW-846 415.3

Precision:	**Yes No N/A**
Were the Field Duplicate relative percent differences (RPD) ≤ 50%?	**Yes**
Were the Matrix Spike Duplicate RPDs ≤ 20%?	**NA**

Comments: (note deviations): None

Accuracy:	**Yes No N/A**
Were the Matrix Spike criteria met? (frequency ≥ 5% and laboratory determined control limits)	**Yes**
Standard References Material criteria met?	**Yes**
Were the ICAL criteria met? Method requirement: $r^2 \geq 0.993$	**Yes**
Were the CCV criteria met? Method requirement: %D's for low-level, ± 50%; mid-level, ± 20%; high-level ± 15%?	**Yes**

Comments (note deviations): None

UV Absorption at 254 nanometers SW-846 415.3

Precision:	**Yes No N/A**
Were the Field Duplicate relative percent differences (RPD) ≤ 50%?	**Yes**
Were the laboratory duplicate RPDs ≤ 20%	**Yes**

Comments: (note deviations): None

Accuracy:	**Yes No N/A**
Standard References Material criteria met?	**Yes**
Were the Laboratory Method Blank results all < CRQL?	**Yes**

Comments (note deviations): The relative percent difference (RPD) for the UV254 result in sample 0214BBM-DC1-SW-002 and its field duplicate exceeded the QAPP specified control limit of 50%. Because a total of three field duplicates were submitted and the remaining two field duplicates met the control limits, only sample 0214BBM-DC1-SW-002 and its field duplicate (0214BBM-DC1-SW-302) have been qualified as estimated (J).

$SUVA_{254}$ SW 846-415.3

Note: The $SUVA_{254}$ value is determined by dividing the UV_{254} result by the DOC result with a conversion of centimeters to meters. The laboratory performed the calculations for the $SUVA_{254}$ corrrectly. Because the DOC result is used in the calculation of the $SUVA_{254}$, the results for the $SUVA_{254}$ have been qualified J-.

Comparability:	**Yes No N/A**
Were analytical procedures and methods followed as defined in the QAPP or field change documentation?	**Yes**

Comments (note deviations): None

Completeness (90%):	**Yes No N/A**
Are all data in this SDG usable?	**Yes**

Comments (note deviations): None

Sensitivity:

	Yes	No	N/A
Do the reporting limits meet project requirements?	**Yes**		
Are results within the linear range of the instrument?	**Yes**		

Comments (note deviations): None

Data Validator: Mary Lou Fox Date: 7/25/2014

Data Reviewer: Kimberly Zilis Date: 8/5/2014

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: November 18, 2013

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

FROM: Stephanie Le, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of Black Butte Mine: Phase 1 Storm Event 2
For Total Organic Carbon

Project Code: SFP-047B
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox - CDM Smith

The following is a quality assurance review of the results of the analysis of 27 soil samples for Total Organic Carbon (TOC). These samples were submitted for the Black Butte Mine: Phase 1 Storm Event 2 project. The analyses were performed by ESAT chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

13404204	13404205	13404206	13404207	13404208	13404209	13404210
13404211	13404212	13404216	13404217	13404218	13404219	13404220
13404221	13404222	13404223	13404224	13404228	13404229	13404230
13404231	13404232	13404233	13404234	13404235	13404236	

Data Qualifications

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

The quality control measures which did not meet Laboratory/QAPP criteria are annotated in the title of each affected subsection with **"Laboratory/QAPP Criteria Not Met."**

For those tests for which the USEPA Region 10 Laboratory has been accredited by the National Environmental Laboratory Accreditation Conference (NELAC), all requirements of the current NELAC Standard have been met. The Region 10 Laboratory's Quality System has also been accredited to the standards of the National Environmental Laboratory Accreditation Conference (NELAC).

1. Sample Transport and Receipt – Laboratory/QAPP Criteria Not Met

Refer to the appended Corrective Action Notice dated 10/24/2013 for a record of observations made during sample receipt. The findings were administrative in nature and do not affect sample results.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations.

3. Sample Preparation

Samples were prepared according to the method outlined in the SOP for these analytes for this type of matrix. No qualification of the data was required based on sample preparation.

4. Initial Calibration and Calibration Verification

The initial calibration met method criteria. All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the method. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis

The method blanks did not contain detectable levels of analyte which would require data qualification.

7. Duplicate Analysis

Duplicate analysis was performed on samples 13404209 and 13404231. Sample results which were greater than five times the MRL level were within the ± 20% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on samples 13404209 and 13404231. Sample results were within the ± 25% recovery and relative percent difference (RPD) requirements. No qualification was required based on matrix spike analyses.

9. Reporting Limits

All sample results that fall below the Minimum Reporting Limit (MRL) are assigned the value of the MRL and the 'U' qualifier is attached.

10. Data Qualifiers

The (U) qualifier was attached to the sample results that were below the MRL. No other qualification was required. The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Stephanie Le at the Region 10 Laboratory, phone number (360) 871- 8715.

11. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DS), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analyte(s) and the percent recovery of the analyte(s) is (are) determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: November 19, 2013

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

From: Stephanie Le, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of Black Butte Mine: Phase 1 Storm Event 2
For Anions (Sulfate) in solid samples

Project Code: SFP-047B
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox - CDM Smith

The following is a quality assurance review of the results of the analysis of 10 solid samples for Anions (Sulfate). These samples were submitted for the Black Butte Mine: Phase 1 Storm Event 2 Project. The analyses were performed by EPA Region 10 ESAT Contractors at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

13404200	13404201	13404202	13404203	13404213	13404214	13404215
13404225	13404226	13404227				

Data Qualifications

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

The quality control measures which did not meet Laboratory/QAPP criteria are annotated in the title of each affected subsection with **"Laboratory/QAPP Criteria Not Met."**

For those tests for which the USEPA Region 10 Laboratory has been accredited by the National Environmental Laboratory Accreditation Conference (NELAC), all requirements of the current NELAC Standard have been met. The Region 10 Laboratory's Quality System has been accredited to the standards of the National Environmental Laboratory Accreditation Conference (NELAC).

1. Sample Transport and Receipt – Laboratory/QAPP Criteria Not Met

Refer to the appended Corrective Action Notice dated 10/24/2013 for a record of observations made during sample receipt. The findings were administrative in nature and do not affect sample results.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations.

3. Sample Preparation

Samples were prepared according to the method outlined in the SOP for this analytes for this type of matrix. No qualification of the data was required based on sample preparation.

4. Initial Calibration and Calibration Verification

The quadratic regression generated for the initial calibration met method criteria. The low point of the calibration curve is usually the Minimum Reporting Level (MRL) of the method. All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the method. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis

The method blank did not contain detectable levels of analyte which would require data qualification.

7. Duplicate Analysis

Duplicate analysis was performed on sample 13404203. Sample results which were greater than five times the MRL level were within the ± 20% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on sample 13404203. Sample results were within the 75-125% recovery and relative percent difference (RPD) requirements. No qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

All manual integrations have been reviewed and found to comply with acceptable integration practices.

10. Additional Information

Due to a computer time glitch, several QC samples were initially recorded to have an analysis date and time of 5/28/2003. This glitch was documented and analytical dates and times adjusted based on subsequent analyses which occurred while synchronized with the EPA time system (and the known analytical run time). We attest that the reported analysis date and time most correctly reflects the actual date and time of analysis:

Tony Morris, Laboratory IT Manager Theresa McBride, Inorganic Chemist / Laboratory IT Backup

11. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the ‘U’ qualifier is attached.

12. Data Qualifiers

The (U) qualifier was attached to the results which fall below the reporting limit. No other qualification was required. The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Stephanie Le at the Region 10 Laboratory, phone number (360) 871-8715.

13. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DU), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analyte(s) and the percent recovery of the analyte is determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
ENVIRONMENTAL ASSESSMENT

January 13, 2013

MEMORANDUM

SUBJECT: Data Validation Report for Metals Analysis of Samples Black Butte Mine Phase 1 RI – Surface & Ground Water Sampling, Cottage Grove, OR, Case 43965, SDG: MJSZ41

FROM: Don Matheny, Chemist DM
OEA, Environmental Services Unit

TO: Richard Muza, Remedial Project Manager
Office of Environmental Clean-up, USEPA R10

CC: Mary Lou Fox, CDM

The quality assurance (QA) review of the analytical data generated from the analysis of twelve (12) ground waters collected from the above referenced site has been completed. These samples were analyzed for Dissolved Metals by the Chemtech Consulting Group located in Mountainside, NJ.

Sample analyses were evaluated following EPA's Stage 4 Data Validation Electronic/Manual Process (S4VEM). The validation was conducted according to the Quality Control Specifications outlined in:

- *QAPP for Black Butte Mine Phase 1 Remedial Investigation – Soil, Groundwater Investigation & Summer Quarter Baseline Surface Water Sampling, Cottage Grove, OR,* (June, 2013)
- USEPA CLP Statement of Work for Inorganic Superfund Methods (ISM01.3)
- National Functional Guidelines for Inorganic Superfund Data Review (EPA-540-R-10-011)
- Guidance for Labeling Externally Validated Laboratory Analytical Data (EPA-540-R08-005)

Some data may be qualified using the reviewer's professional judgment. The conclusions presented herein are based on the information provided for the review. A summary of samples evaluated in this validation report and the pertinent dates for sample collection, laboratory sample receipt and analyses is attached along with the validated data.

I. QUALITY CONTROL RESULTS SUMMARY

Quality Control Test	Result Ranges	Outliers?	Evaluation Criteria
Blanks	Reported Detects	Y*	< MDL, ≤ RL or < 10xSample
Matrix Spike (MJSZ49)	89 – 98%	N	75 – 125%
Sample Duplicate (MJSZ49)	≤ 3%	N	≤ 20% RPD or ± CRQL
Field Duplicates (MJSZ46)	≤ 4%	N	≤ 50% RPD or ± 2xCRQL
LCS (blank spike)	97 - 109%	N	70 – 130%; Ag, Sb 50-150%
Serial Dilution (MJSZ49)	≤ 5%	N	≤ 10%

*See the "*Data Qualifications*" section below for excursions and qualification of affected data.

II. DATA QUALIFICATIONS

Summary of Validation Qualifiers Applied

After the manual and electronic data review, the following data qualifications were applied:

Blanks
The following samples have analyte results ≥ MDLs but ≤ CRQLs. The associated instrument and/or prep blank results are ≥ MDLs but ≤ CRQLs. Detected analytes are qualified U and the results reported at the CRQLs.
Aluminum - MJSZ42 **Antimony** - MJSZ42, MJSZ48, MJSZ50 **Calcium** - MJSZ44 **Iron -** MJSZ51, MJSZ52, MJSZ43, MJSZ48 **Magnesium** - MJSZ49D, MJSZ51, MJSZ41, MJSZ42, MJSZ49 **Thallium** - MJSZ41, MJSZ45, MJSZ50
The following samples have analyte results < 10x the associated Field Blank. Analytes > CRQLs are qualified J+ and analytes ≤ CRQLs are qualified U and the results reported at the CRQLs.
Barium – MJSZ41, MJSZ43, MJSZ49, MJSZ49D, MJSZ51 **Lead –** MJSZ41, MJSZ42, MJSZ43, MJSZ45 - MJSZ52
Detection Limits
The following samples have results ≥ MDLs but ≤ CRQLs. Detected analytes are qualified J.
Arsenic - MJSZ41, MJSZ43, MJSZ49, MJSZ52, MJSZ49D **Barium -** MJSZ42, MJSZ44, MJSZ45, MJSZ46, MJSZ47, MJSZ48, MJSZ50, MJSZ52 **Cobalt –** MJSZ41, MJSZ45, MJSZ46, MJSZ47, MJSZ51 **Nickel –**MJSZ41, MJSZ42, MJSZ43, MJSZ47 - MJSZ52 **Sodium –**MJSZ41, MJSZ42, MJSZ51, MJSZ52 **Zinc -** MJSZ42, MJSZ50, MJSZ52

Data Validation Qualifiers

The following is a list of data validation qualifiers applied to the sample result(s) and their definitions.

Data Validation Qualifiers	
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J	The associated value is an estimated quantity.
J+	The associated value is an estimated quantity but the result may be biased high.
J-	The associated value is an estimated quantity but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The data are unusable. The analyte may or may not be present in the sample.

III. SAMPLE INDEX

Sample Number	Matrix	Sampling Date	Date Received	ICP-AES Analysis	ICP-MS Analysis
MJSZ41	Water (D)	11/9/2013	11/14/2013	11/18/2013	11/18/2013
MJSZ42	Water (D)	11/9/2013	11/14/2013	11/18/2013	11/18/2013
MJSZ43	Water (D)	11/9/2013	11/14/2013	11/18/2013	11/18/2013
MJSZ44	Water (D)	11/10/2013	11/14/2013	11/18/2013	11/18/2013
MJSZ45	Water (D)	11/10/2013	11/14/2013	11/18/2013	11/18/2013
MJSZ46	Water (D)	11/10/2013	11/14/2013	11/18/2013	11/18/2013
MJSZ47	Water (D)	11/10/2013	11/14/2013	11/18/2013	11/18/2013
MJSZ48	Water (D)	11/10/2013	11/14/2013	11/18/2013	11/18/2013
MJSZ49	Water (D)	11/10/2013	11/14/2013	11/18/2013	11/18/2013
MJSZ50	Water (D)	11/11/2013	11/14/2013	11/18/2013	11/18/2013
MJSZ51	Water (D)	11/2/2013	11/14/2013	11/18/2013	11/18/2013
MJSZ52	Water (D)	11/11/2013	11/14/2013	11/18/2013	11/18/2013

Sample MJSZ46 is the Field Duplicate for MJSZ5.
Sample MJSZ44 is a field filter blank.

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ41	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-12	pH:	2	Sample Date:	11/09/2013	Sample Time:	11:55:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	200	ug/L	1	U	U	Yes	S4VEM
Barium	200	ug/L	1	J	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	9810	ug/L	1			Yes	S4VEM
Chromium	10.0	ug/L	1	U	U	Yes	S4VEM
Copper	25.0	ug/L	1	U	U	Yes	S4VEM
Iron	180	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	30.6	ug/L	1			Yes	S4VEM
Nickel	1.0	ug/L	1	J	J	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Selenium	35.0	ug/L	1	U	U	Yes	S4VEM
Silver	10.0	ug/L	1	U	U	Yes	S4VEM
Sodium	4610	ug/L	1	J	J	Yes	S4VEM
Vanadium	50.0	ug/L	1	U	U	Yes	S4VEM
Zinc	60.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ41	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-12	pH:	2	Sample Date:	11/09/2013	Sample Time:	11:55:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	2.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	0.41	ug/L	1	J	J	Yes	S4VEM
Cobalt	0.084	ug/L	1	J	J	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ42	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-9	pH:	2	Sample Date:	11/09/2013	Sample Time:	15:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	200	ug/L	1	J	U	Yes	S4VEM
Barium	26.6	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	13300	ug/L	1			Yes	S4VEM
Chromium	10.0	ug/L	1	U	U	Yes	S4VEM
Copper	25.0	ug/L	1	U	U	Yes	S4VEM
Iron	9990	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	863	ug/L	1			Yes	S4VEM
Nickel	17.1	ug/L	1	J	J	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Selenium	35.0	ug/L	1	U	U	Yes	S4VEM
Silver	10.0	ug/L	1	U	U	Yes	S4VEM
Sodium	4280	ug/L	1	J	J	Yes	S4VEM
Vanadium	50.0	ug/L	1	U	U	Yes	S4VEM
Zinc	13.6	ug/L	1	J	J	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ42	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-9	pH:	2	Sample Date:	11/09/2013	Sample Time:	15:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	2.0	ug/L	1	J	U	Yes	S4VEM
Arsenic	7.1	ug/L	1			Yes	S4VEM
Cobalt	3.2	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ43	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-13	pH:	2	Sample Date:	11/09/2013	Sample Time:	16:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	2.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	0.89	ug/L	1	J	J	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ43	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-13	pH:	2	Sample Date:	11/09/2013	Sample Time:	16:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	200	ug/L	1	U	U	Yes	S4VEM
Barium	200	ug/L	1	J	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	28500	ug/L	1			Yes	S4VEM
Chromium	10.0	ug/L	1	U	U	Yes	S4VEM
Copper	25.0	ug/L	1	U	U	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	6810	ug/L	1			Yes	S4VEM
Manganese	58.0	ug/L	1			Yes	S4VEM
Nickel	0.46	ug/L	1	J	J	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Selenium	35.0	ug/L	1	U	U	Yes	S4VEM
Silver	10.0	ug/L	1	U	U	Yes	S4VEM
Sodium	8310	ug/L	1			Yes	S4VEM
Vanadium	50.0	ug/L	1	U	U	Yes	S4VEM
Zinc	60.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ44	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	Filter Blank	pH:	2	Sample Date:	11/10/2013	Sample Time:	19:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	200	ug/L	1	U	U	Yes	S4VEM
Barium	1.8	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5000	ug/L	1	J	U	Yes	S4VEM
Chromium	10.0	ug/L	1	U	U	Yes	S4VEM
Copper	25.0	ug/L	1	U	U	Yes	S4VEM
Iron	100	ug/L	1	U	U	Yes	S4VEM
Magnesium	5000	ug/L	1	U	U	Yes	S4VEM
Manganese	15.0	ug/L	1	U	U	Yes	S4VEM
Nickel	40.0	ug/L	1	U	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Selenium	35.0	ug/L	1	U	U	Yes	S4VEM
Silver	10.0	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	U	U	Yes	S4VEM
Vanadium	50.0	ug/L	1	U	U	Yes	S4VEM
Zinc	60.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ44	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	Filter Blank	pH:	2	Sample Date:	11/10/2013	Sample Time:	19:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	2.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Lead	1.7	ug/L	1			Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ45	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-5	pH:	2	Sample Date:	11/10/2013	Sample Time:	14:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	2.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	15.0	ug/L	1			Yes	S4VEM
Cobalt	0.48	ug/L	1	J	J	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ45	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-5	pH:	2	Sample Date:	11/10/2013	Sample Time:	14:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	200	ug/L	1	U	U	Yes	S4VEM
Barium	102	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	34100	ug/L	1			Yes	S4VEM
Chromium	10.0	ug/L	1	U	U	Yes	S4VEM
Copper	25.0	ug/L	1	U	U	Yes	S4VEM
Iron	1480	ug/L	1			Yes	S4VEM
Magnesium	6120	ug/L	1			Yes	S4VEM
Manganese	164	ug/L	1			Yes	S4VEM
Nickel	40.0	ug/L	1	U	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Selenium	35.0	ug/L	1	U	U	Yes	S4VEM
Silver	10.0	ug/L	1	U	U	Yes	S4VEM
Sodium	10900	ug/L	1			Yes	S4VEM
Vanadium	50.0	ug/L	1	U	U	Yes	S4VEM
Zinc	60.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ46	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-5	pH:	2	Sample Date:	11/10/2013	Sample Time:	14:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	2.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	14.7	ug/L	1			Yes	S4VEM
Cobalt	0.41	ug/L	1	J	J	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ46	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-5	pH:	2	Sample Date:	11/10/2013	Sample Time:	14:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	200	ug/L	1	U	U	Yes	S4VEM
Barium	96.5	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	33200	ug/L	1			Yes	S4VEM
Chromium	10.0	ug/L	1	U	U	Yes	S4VEM
Copper	25.0	ug/L	1	U	U	Yes	S4VEM
Iron	1420	ug/L	1			Yes	S4VEM
Magnesium	5980	ug/L	1			Yes	S4VEM
Manganese	161	ug/L	1			Yes	S4VEM
Nickel	40.0	ug/L	1	U	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Selenium	35.0	ug/L	1	U	U	Yes	S4VEM
Silver	10.0	ug/L	1	U	U	Yes	S4VEM
Sodium	10900	ug/L	1			Yes	S4VEM
Vanadium	50.0	ug/L	1	U	U	Yes	S4VEM
Zinc	60.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ47	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-7	pH:	2	Sample Date:	11/10/2013	Sample Time:	11:25:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	2	ug/L	1	U	U	Yes	S4VEM
Arsenic	1	ug/L	1	U	U	Yes	S4VEM
Cobalt	0.35	ug/L	1	J	J	Yes	S4VEM
Lead	1.2	ug/L	1		J+	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ47	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-7	pH:	2	Sample Date:	11/10/2013	Sample Time:	11:25:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	200	ug/L	1	U	U	Yes	S4VEM
Barium	57.1	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	27600	ug/L	1			Yes	S4VEM
Chromium	10.0	ug/L	1	U	U	Yes	S4VEM
Copper	25.0	ug/L	1	U	U	Yes	S4VEM
Iron	123	ug/L	1			Yes	S4VEM
Magnesium	5730	ug/L	1			Yes	S4VEM
Manganese	146	ug/L	1			Yes	S4VEM
Nickel	0.53	ug/L	1	J	J	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Selenium	35.0	ug/L	1	U	U	Yes	S4VEM
Silver	10.0	ug/L	1	U	U	Yes	S4VEM
Sodium	5350	ug/L	1			Yes	S4VEM
Vanadium	50.0	ug/L	1	U	U	Yes	S4VEM
Zinc	60.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ48	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-6	pH:	2	Sample Date:	11/10/2013	Sample Time:	18:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	200	ug/L	1	U	U	Yes	S4VEM
Barium	19.3	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	32200	ug/L	1			Yes	S4VEM
Chromium	10.0	ug/L	1	U	U	Yes	S4VEM
Copper	25.0	ug/L	1	U	U	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	21200	ug/L	1			Yes	S4VEM
Manganese	691	ug/L	1			Yes	S4VEM
Nickel	5.0	ug/L	1	J	J	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Selenium	35.0	ug/L	1	U	U	Yes	S4VEM
Silver	10.0	ug/L	1	U	U	Yes	S4VEM
Sodium	7270	ug/L	1			Yes	S4VEM
Vanadium	50.0	ug/L	1	U	U	Yes	S4VEM
Zinc	60.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ48	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-6	pH:	2	Sample Date:	11/10/2013	Sample Time:	18:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	2.0	ug/L	1	J	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	2.5	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ49	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-8	pH:	2	Sample Date:	11/10/2013	Sample Time:	12:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	2.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	0.59	ug/L	1	J	J	Yes	S4VEM
Cobalt	2.5	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ49	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-8	pH:	2	Sample Date:	11/10/2013	Sample Time:	12:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	200	ug/L	1	U	U	Yes	S4VEM
Barium	200	ug/L	1	J	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	9370	ug/L	1			Yes	S4VEM
Chromium	10.0	ug/L	1	U	U	Yes	S4VEM
Copper	25.0	ug/L	1	U	U	Yes	S4VEM
Iron	589	ug/L	1			Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	244	ug/L	1			Yes	S4VEM
Nickel	19.4	ug/L	1	J	J	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Selenium	35.0	ug/L	1	U	U	Yes	S4VEM
Silver	10.0	ug/L	1	U	U	Yes	S4VEM
Sodium	7620	ug/L	1			Yes	S4VEM
Vanadium	50.0	ug/L	1	U	U	Yes	S4VEM
Zinc	60.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ50	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-3	pH:	2	Sample Date:	11/11/2013	Sample Time:	10:35:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	2.0	ug/L	1	J	U	Yes	S4VEM
Arsenic	14.7	ug/L	1			Yes	S4VEM
Cobalt	1.6	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ50	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-3	pH:	2	Sample Date:	11/11/2013	Sample Time:	10:35:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	200	ug/L	1	U	U	Yes	S4VEM
Barium	41.7	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	23700	ug/L	1			Yes	S4VEM
Chromium	10.0	ug/L	1	U	U	Yes	S4VEM
Copper	25.0	ug/L	1	U	U	Yes	S4VEM
Iron	5110	ug/L	1			Yes	S4VEM
Magnesium	5830	ug/L	1			Yes	S4VEM
Manganese	388	ug/L	1			Yes	S4VEM
Nickel	0.76	ug/L	1	J	J	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Selenium	35.0	ug/L	1	U	U	Yes	S4VEM
Silver	10.0	ug/L	1	U	U	Yes	S4VEM
Sodium	6810	ug/L	1			Yes	S4VEM
Vanadium	50.0	ug/L	1	U	U	Yes	S4VEM
Zinc	11.3	ug/L	1	J	J	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ51	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-4	pH:	2	Sample Date:	11/02/2013	Sample Time:	17:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	200	ug/L	1	U	U	Yes	S4VEM
Barium	200	ug/L	1	J	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	6010	ug/L	1			Yes	S4VEM
Chromium	10.0	ug/L	1	U	U	Yes	S4VEM
Copper	25.0	ug/L	1	U	U	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	5000	ug/L	1	J	U	Yes	S4VEM
Manganese	24.9	ug/L	1			Yes	S4VEM
Nickel	0.91	ug/L	1	J	J	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Selenium	35.0	ug/L	1	U	U	Yes	S4VEM
Silver	10.0	ug/L	1	U	U	Yes	S4VEM
Sodium	3120	ug/L	1	J	J	Yes	S4VEM
Vanadium	50.0	ug/L	1	U	U	Yes	S4VEM
Zinc	60.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ51	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-4	pH:	2	Sample Date:	11/02/2013	Sample Time:	17:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	2.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	0.10	ug/L	1	J	J	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ52	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-2	pH:	2	Sample Date:	11/11/2013	Sample Time:	13:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	2.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	0.30	ug/L	1	J	J	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43965	Contract:	EPW09038	SDG No:	MJSZ41	Lab Code:	CHEM
Sample Number:	MJSZ52	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	MW-2	pH:	2	Sample Date:	11/11/2013	Sample Time:	13:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	200	ug/L	1	U	U	Yes	S4VEM
Barium	22.6	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	31700	ug/L	1			Yes	S4VEM
Chromium	10.0	ug/L	1	U	U	Yes	S4VEM
Copper	25.0	ug/L	1	U	U	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	7910	ug/L	1			Yes	S4VEM
Manganese	15.0	ug/L	1	U	U	Yes	S4VEM
Nickel	0.57	ug/L	1	J	J	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Selenium	35.0	ug/L	1	U	U	Yes	S4VEM
Silver	10.0	ug/L	1	U	U	Yes	S4VEM
Sodium	4580	ug/L	1	J	J	Yes	S4VEM
Vanadium	50.0	ug/L	1	U	U	Yes	S4VEM
Zinc	10.1	ug/L	1	J	J	Yes	S4VEM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: December 10, 2013

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

FROM: Stephanie Le, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: R1 Phase 1B GW Event 2 For Anions

Project Code: SFP-047E
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox – CDM Smith

The following is a quality assurance review of the results of 11 water samples for anions (fluoride, chloride, & sulfate) analysis. These samples were submitted for the Black Butte Mine: R1 Phase 1B GW Event 2 Project. The analyses were performed by ESAT chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

13444300	13444303					
13454300	13454302	13454304	13454306	13454308	13454310	13454313
13454315	13454317					

Data Qualifications

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

All measures of quality control met Laboratory/QAPP criteria.

For those tests for which the USEPA Region 10 Laboratory has been accredited by the National Environmental Laboratory Accreditation Conference (NELAC), all requirements of the current NELAC Standard have been met. The Region 10 Laboratory's Quality System has been accredited to the standards of the National Environmental Laboratory Accreditation Conference (NELAC).

1. Sample Transport and Receipt

Upon sample receipt, all conditions met Laboratory/QAPP requirements for this project.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations, where applicable.

3. Sample Preparation

Samples were prepared according to the SOP for these analytes for this type of matrix. No qualification of the data was required based on sample preparation.

4. Initial Calibration and Calibration Verification

The linear regression generated for the initial calibrations met method criteria. The low point of the calibration curve is usually the Minimum Reporting Level (MRL) of the method. All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the methods reported. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis

The method blanks did not contain detectable levels of reported analytes which would require data qualification.

7. Duplicate Analysis

Duplicate analysis was performed on samples 13444300, 13454300, 13454308, and 13454310. Sample results which were greater than 5 times of the MRL level were within the +/- 20% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on samples 13444300, 13454300, 13454308, and 13454310. Sample results were within the 80-120% recovery requirements.

No qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

No manual integrations were performed.

10. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the ‘U’ qualifier is attached.

11. Data Qualifiers

The U-qualifier was attached to the results which were below the MRL.

No qualification was required.

The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Stephanie Le at the Region 10 Laboratory, phone number (360) 871- 8715.

12. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DS), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analytes and the percent recoveries of the analytes are determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: February 25, 2014

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

From: Katie Adams, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: RI Phase 1, 1B groundwater For Low Level Mercury

Project Code: SFP-047E
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox – CDM Smith

The following is a quality assurance review of the results of the analysis of thirteen filtered samples for low level mercury. These samples were submitted for the Black Butte Mine: RI Phase 1, 1B groundwater Project. The analyses were performed by EPA chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

13444301	13444302	13444304				
13454303	13454305	13454307	13454309	13454311	13454312	13454314
13454316	13454318					

Data Qualifications

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

The quality control measures which did not meet Laboratory/QAPP criteria are annotated in the title of each affected subsection with **"Laboratory/QAPP Criteria Not Met"**.

For those tests for which the USEPA Region 10 Laboratory has been accredited by The NELAC Institute (TNI), all requirements of the current TNI Standard have been met.

1. Sample Transport and Receipt

Upon sample receipt, all conditions met Laboratory/QAPP requirements for this project.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review

met method holding time recommendations.

3. Sample Preparation

Samples were prepared according to the method outlined in the SOP for this analyte for this type of matrix. No qualification of the data was required based on sample preparation.

4. Initial Calibration and Calibration Verification

The calibration factors generated for the initial calibration met method criteria. The low point of the calibration curve is usually the Minimum Reporting Level (MRL) of the method. All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the method. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis - Laboratory/QAPP Criteria Not Met

The method blanks did not contain detectable levels of analyte which would require data qualification.

Method 1631E states that samples with results less than 5X the field blank must be reported as non-detects. Five times the field blank (Sample 13454312) concentration was equal to 2.24 ng/L for this project. The following samples contained less than this quantity of mercury and are therefore qualified (U), not detected: 13444304, 13454307, 13454309, 13454314, 13454316, 13454318, and 13454318DU.

7. Duplicate Analysis

Duplicate analysis was performed on samples 13454311 and 13454318. Sample results which were greater than five times the MRL level were within the +/- 20% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on samples 13454311 and 13454318. Sample results were within the 71-125% recovery and relative percent difference (RPD) requirements. No qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

No manual integrations were performed.

10. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the 'U' qualifier is attached.

11. Data Qualifiers

The U qualifier was attached to all sample results that fall below the MRL. No other data qualification was required for this project. The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data

quality objectives. Should questions arise regarding the data, contact Katie Adams at the Region 10 Laboratory, phone number (360) 871-8748.

12. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DU), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analyte and the percent recovery of the analyte is determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: April 29, 2014

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

From: Katie Adams, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: RI Phase 1, 1B Groundwater For Methylmercury

Project Code: SFP-047E
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox – CDM Smith

The following is a quality assurance review of the results of the analysis of 5 filtered water samples for methylmercury. These samples were submitted for the Black Butte Mine: RI Phase 1, 1B Groundwater Project. The analyses were performed by EPA chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

13454303 13454305 13454307 13454311 13454312

Data Qualifications

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). A method excursion was required. The excursion is discussed in the Initial Calibration and Calibration Verification section below.

All measures of quality control met Laboratory/QAPP criteria.

For those tests for which the USEPA Region 10 Laboratory has been accredited by The NELAC Institute (TNI), all requirements of the current TNI Standard have been met.

1. Sample Transport and Receipt

Upon sample receipt, all conditions met Laboratory/QAPP requirements for this project

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations.

3. Sample Preparation

Samples were prepared according to the method outlined in the SOP for this analyte for this type of matrix. No qualification of the data was required based on sample preparation.

4. Initial Calibration and Calibration Verification

The calibration factors generated for the initial calibration met method criteria. The low point of the calibration curve is usually the Minimum Reporting Level (MRL) of the method. All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

Note: Method 1630 requires 5 nonzero data points in a calibration curve. The calibration curve used on analysis date 01/15/14 only contains 4 nonzero data points. Only the field blank is reported from this analysis day; this method excursion is not expected to impact data quality.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the method. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis

The method blanks and field blank did not contain detectable levels of analyte which would require data qualification.

7. Duplicate Analysis

Duplicate analysis was performed on sample 13454311. Sample results which were greater than the MRL level were within the +/- 35% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on sample 13454311. Sample results were within the 65-135% recovery and relative percent difference (RPD) requirements. No qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

No manual integrations were performed.

10. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the 'U' qualifier is attached.

11. Data Qualifiers

No data qualification was required for this analysis.

The (U) qualifier is attached to the results which fall below the reporting limit. No other qualification was required. The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Katie Adams at the Region 10 Laboratory, phone number (360) 871-8748.

12. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DU), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analyte and the percent recovery of the analyte is determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
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QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: December 11, 2013

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

FROM: Stephanie Le, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: R1 Phase 1B GW Event 2
For Nitrate plus Nitrite

Project Code: SFP-047E
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox – CDM Smith

The following is a quality assurance review of the results of 11 water samples for nitrate plus nitrite analysis. These samples were submitted for the Black Butte Mine: R1 Phase 1B GW Event 2 Project. The analyses were performed by ESAT chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

13444300	13444303					
13454300	13454302	13454304	13454306	13454308	13454310	13454313
13454315	13454317					

Data Qualifications

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

All measures of quality control met Laboratory/QAPP criteria.

For those tests for which the USEPA Region 10 Laboratory has been accredited by the National Environmental Laboratory Accreditation Conference (NELAC), all requirements of the current NELAC Standard have been met. The Region 10 Laboratory's Quality System has been accredited to the standards of the National Environmental Laboratory Accreditation Conference (NELAC).

1. Sample Transport and Receipt

Upon sample receipt, all conditions met Laboratory/QAPP requirements for this project.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations, where applicable.

3. Sample Preparation

Samples were prepared according to the SOP for these analytes for this type of matrix. No qualification of the data was required based on sample preparation.

4. Initial Calibration and Calibration Verification

The linear regression generated for the initial calibrations met method criteria. The low point of the calibration curve is usually the Minimum Reporting Level (MRL) of the method. All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the methods reported. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis

The method blanks did not contain detectable levels of reported analytes which would require data qualification.

7. Duplicate Analysis

Duplicate analysis was performed on samples 13454302 and 13454310. Sample results which were greater than 5 times of the MRL level were within the +/- 20% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on samples 13454302 and 13454310. Sample results were within the 75-125% recovery requirements.

No qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

No manual integrations were performed.

10. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the ‘U’ qualifier is attached.

11. Data Qualifiers

The U-qualifier was attached to the results which were below the MRL.

No qualification was required.

The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Stephanie Le at the Region 10 Laboratory, phone number (360) 871- 8715.

12. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DS), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analytes and the percent recoveries of the analytes are determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: November 21, 2013

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

FROM: Stephanie Le, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: R1 Phase 1B GW Event #2
For Total Dissolved Solids

Project Code: SFP-047E
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox- CDM Smith

The following is a quality assurance review of the results of 11 water samples for Total Dissolved Solids (TDS) analysis. These samples were submitted for the Black Butte Mine: R1 Phase 1B GW Event #2 Sampling Project. The analyses were performed by ESAT chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

13444300	13444303					
13454300	13454302	13454304	13454306	13454308	13454310	13454313
13454315	13454317					

Data Qualifications:

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

All measures of quality control met Laboratory/QAPP criteria.

For those tests for which the USEPA Region 10 Laboratory has been accredited by the National Environmental Laboratory Accreditation Conference (NELAC), all requirements of the current NELAC Standard have been met. The Region 10 Laboratory's Quality System has been accredited to the standards of the National Environmental Laboratory Accreditation Conference (NELAC).

1. Sample Transport and Receipt

Upon sample receipt, all conditions met Laboratory/QAPP requirements for this project.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations, where applicable.

3. Sample Preparation

Samples were prepared according to the SOP for these analytes for this type of matrix. No qualification of the data was required based on sample preparation.

4. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the methods reported. No qualification was required based on laboratory control sample analysis.

5. Blank Analysis

The method blanks did not contain detectable levels of reported analytes which would require data qualification.

6. Duplicate Analysis

Duplicate analysis was performed on sample 13454310. Sample results which were greater than 5 times of the MRL level were within the ± 20% RPD requirement. No qualification was required based on duplicate analysis.

7. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses are not applicable to TDS analysis.

8. Instrument Peak Integrations

No manual integrations were performed for these methods.

9. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the 'U' qualifier is attached.

10. Data Qualifiers

The U-qualifier was attached to the results which were below the MRL. No other qualification was required. The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Stephanie Le at the Region 10 Laboratory, phone number (360) 871- 8715.

11. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DS), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analytes and the percent recoveries of the analytes are determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: December 10, 2013

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

FROM: Stephanie Le, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: R1 Phase 1B GW Event 2 For Alkalinity

Project Code: SFP-047E
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox- CDM Smith

The following is a quality assurance review of the results of 10 water samples for alkalinity analysis. These samples were submitted for the Black Butte Mine: R1 Phase 1B GW Event 2 Project. The analyses were performed by ESAT chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

13444300	13444303					
13454302	13454304	13454306	13454308	13454310	13454313	13454315
13454317						

Data Qualifications:

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

All measures of quality control met Laboratory/QAPP criteria.

For those tests for which the USEPA Region 10 Laboratory has been accredited by the National Environmental Laboratory Accreditation Conference (NELAC), all requirements of the current NELAC Standard have been met. The Region 10 Laboratory's Quality System has been accredited to the standards of the National Environmental Laboratory Accreditation Conference (NELAC).

1. Sample Transport and Receipt

Upon sample receipt, all conditions met Laboratory/QAPP requirements for this project.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations, where applicable.

3. Sample Preparation

Samples were prepared according to the SOP for these analytes for this type of matrix. No qualification of the data was required based on sample preparation.

4. Initial Calibration and Calibration Verification

All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the methods reported. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis

The method blanks did not contain detectable levels of reported alkalinity which would require data qualification

7. Duplicate Analysis

Duplicate analysis was performed on sample 13454310. Sample results which were greater than 5 times of the MRL level were within the ± 20% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on sample 13454310. Sample results were within the 75-125% recovery requirements. No qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

No manual integrations were performed for these methods.

10. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the 'U' qualifier is attached.

11. Data Qualifiers

The U-qualifier was attached to the results which were below the MRL. No other qualification was required for this analysis.

The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Stephanie Le at the Region 10 Laboratory, phone number (360) 871- 8715.

12. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

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Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analytes and the percent recoveries of the analytes are determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage

Black Butte Mine Superfund Site
November 2013 Groundwater Sampling
Data Validation Report

Laboratory:	AmTest Laboratories
Matrix:	Groundwater

Sample Delivery Group (SDG) Number and Samples in SDGs:

SDG	Samples
13-A01877	13444301
	13444302
	13444303
	13454303
	13454305
	13454307
	13454309
	12454311
	13454314
	13454316
	13454318
	13454319

Collection dates:	November 9, 10 and 11, 2013
Analysis/Method:	DOC SW-846 415.3

Validation to the Stage 4 (S4VM) level was performed in accordance with the methods and the Black Butte Mine Phase 1 Remedial Investigation -Soil, Groundwater Investigation, and Summer Quarter Baseline Surface Water Sampling QAPP, EPA National Functional Guidelines for Inorganic Superfrund Data Review(2010), and EPA Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use.

Dissolved Organic Carbon (DOC) SW-846 415.3

Precision:	**Yes No N/A**
Were the Field Duplicate relative percent differences (RPD) ≤ 50%?	**Yes**
Were the Matrix Spike Duplicate RPDs ≤ 20%?	**NA**

Comments: (note deviations): None

Accuracy:	**Yes No N/A**
Were the Matrix Spike/Matrix Spike Duplicates criteria met? (frequency ≥ 5% and laboratory determined control limits)	**Yes**
Standard References Material criteria met?	**Yes**
Were the Laboratory Method Blank results all < RL?	**Yes**
Were the ICAL criteria met? Method requirement: $r^2 \geq 0.993$	**Yes**
Were the CCV criteria met? Method requirement: %D's for low-level, ± 50%; mid-level, ± 20%; high-level ± 15%?	**Yes**

Comments (note deviations): DOC was detected in the rinsate blank above the reporting level at 1.3 mg/L. DOC was present in all samples at levels less than 10 times the level in the filter blank and the DOC results for all samples have been qualifiedas undetected (U) of biased high (J+).

Comparability:	**Yes No N/A**
Were analytical procedures and methods followed as defined in the QAPP or field change documentation?	**Yes**

Comments (note deviations): None

Completeness (90%):	**Yes No N/A**
Are all data in this SDG usable?	**Yes**

Comments (note deviations): None

Sensitivity:

	Yes	No	N/A
Do the reporting limits meet project requirements?	**Yes**		
Are results within the linear range of the instrument?	**Yes**		

Comments (note deviations): None

Data Validator: Mary Lou Fox Date: 7/15/2014

Data Reviewer: Kimberly Zilis Date: 8/5/2014

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
ENVIRONMENTAL ASSESSMENT

January 13, 2014

MEMORANDUM

SUBJECT: Data Validation Report for Metals Analysis of Samples Collected for Black Butte Mine Phase 1 RI – Storm Sampling Event, Cottage Grove, OR, Case 43881, SDG: MJSJN8

FROM: Don Matheny, Chemist
OEA, Environmental Services Unit

TO: Richard Muza, Remedial Project Manager
Office of Environmental Clean-up, USEPA R10

CC: Mary Lou Fox, CDM

The quality assurance (QA) review of the analytical data generated from the analysis of twenty (20) waters collected from the above referenced site has been completed. These samples were analyzed for Total Metals by A4 Scientific located in The Woodlands, TX.

Sample analyses were evaluated following EPA's Stage 4 Data Validation Electronic/Manual Process (S4VEM). The validation was conducted according to the Quality Control Specifications outlined in:

- *QAPP for Black Butte Mine Phase 1 Remedial Investigation – Surface Water Storm Sampling & Sediment Sampling QAPP, Cottage Grove, OR,* (December, 2012)
- USEPA CLP Statement of Work for Inorganic Superfund Methods (ISM01.3)
- National Functional Guidelines for Inorganic Superfund Data Review (EPA-540-R-10-011)
- Guidance for Labeling Externally Validated Laboratory Analytical Data (EPA-540-R08-005)

Some data may be qualified using the reviewer's professional judgment. The conclusions presented herein are based on the information provided for the review. A summary of samples evaluated in this validation report and the pertinent dates for sample collection, laboratory sample receipt and analyses is attached along with the validated data.

I. QUALITY CONTROL RESULTS SUMMARY

Quality Control Test	Result Ranges	Outliers?	Evaluation Criteria
Blanks	Detects Reported	Y*	ND, ≤ RL or < 10xSample
Matrix Spike (MJSJQ0)	86 – 109%	N	75 – 125%
Sample Duplicate (MJSJQ0)	≤ 8%	N	≤ 20% RPD or ± CRQL
Field Duplicates (MJSJQ6, MJSJS2)	≤ 10%	N	≤ 50% RPD or ± 2xCRQL
LCS (blank spike)	90 - 111%	N	70 – 130%; Sb 50-150%
Serial Dilution (MJSJQ0)	≤ 9%	N	≤ 10%

*See the "*Data Qualifications*" section below for excursions and qualification of affected data.

II. DATA QUALIFICATIONS

Summary of Validation Qualifiers Applied

After the manual and electronic data review, the following data qualifications were applied:

Blanks
The following samples have analyte results ≥ MDLs but ≤ CRQLs. The associated instrument and/or preparation blank results are ≥ MDLs but ≤ CRQLs. Detected analytes are qualified U and the results reported at the CRQLs.
Aluminum - MJSJN8, MJSJP0, MJSJP4, MJSJR2 **Arsenic** - MJSJQ4, MJSJQ6, MJSJP2, MJSJP4, MJSJP6, MJSJS2, MJSJS8, MJSJT2, MJSJR2, MJSJR8, MJSJQ0, MJSJQ0D **Chromium** - MJSJQ4, MJSJQ6, MJSJP0, MJSJP2, MJSJP6, MJSJP8, MJSJS2, MJSJS4, MJSJQ0, MJSJQ0D **Cobalt** - MJSJN8, MJSJQ4, MJSJQ6, MJSJP0, MJSJP8, MJSJS2, MJSJS4, MJSJQ0, MJSJQ0D **Copper** - MJSJQ4, MJSJQ6, MJSJP0, MJSJP2, MJSJP6, MJSJP8, MJSJS6, MJSJS8, MJSJT2, MJSJQ0, MJSJQ0D **Iron -** MJSJP0, MJSJR2 **Lead -** MJSJQ8, MJSJS2, MJSJS4, MJSJS6, MJSJS8, MJSJR0, MJSJR4, MJSJR6, MJSJR8, MJSJQ0, MJSJQ0D **Nickel** - MJSJQ4, MJSJQ6, MJSJP0, MJSJP2, MJSJP4, MJSJP6, MJSJP8, MJSJS4, MJSJS6, MJSJS8, MJSJT2, MJSJR0, MJSJR2, MJSJR4, MJSJR6, MJSJR8, MJSJQ0, MJSJQ0D **Silver** - MJSJS6 **Thallium** - MJSJS6, MJSJS8, MJSJQ0, MJSJQ0D **Vanadium** - MJSJQ4, MJSJQ6, MJSJQ8, MJSJP0, MJSJP2, MJSJP6, MJSJP8, MJSJS2, MJSJS4, MJSJS6, MJSJS8, MJSJT2, MJSJR0, MJSJR4, MJSJR6, MJSJR8, MJSJQ0, MJSJQ0D **Zinc -** MJSJP0, MJSJP2, MJSJP6, MJSJP8, MJSJQ0, MJSJQ0D, MJSJQ4, MJSJS2, MJSJS8, MJSJT2
Detection Limits
The following samples have results ≥ MDLs but ≤ CRQLs. Detected analytes are qualified J.
Chromium – MJSJS6, MJSJS8, MJSJT2, MJSJR0, MJSJR4, MJSJR6, MJSJR8 **Cobalt –** MJSJS6, MJSJS8, MJSJT2, MJSJR2, MJSJR4, MJSJR6, MJSJR8 **Magnesium -** MJSJQ0, MJSJQ0D, MJSJQ4, MJSJQ6, MJSJP2, MJSJP4, MJSJP6, MJSJS2, MJSJS4, MJSJS8, MJSJT2, MJSJR0, MJSJR2, MJSJR4, MJSJR6, MJSJR8 **Manganese -** MJSJQ4, MJSJQ6, MJSJP0, MJSJP2, MJSJP6 **Potassium -** MJSJQ0, MJSJQ0D, MJSJQ4, MJSJQ6, MJSJQ8, MJSJP0, MJSJP2, MJSJP4, MJSJP6, MJSJP8, MJSJS2, MJSJS4, MJSJS6, MJSJS8, MJSJT2, MJSJR0, MJSJR2, MJSJR4, MJSJR6, MJSJR8 **Sodium -** MJSJQ0, MJSJQ0D, MJSJQ4, MJSJQ6, MJSJQ8, MJSJP0, MJSJP2, MJSJP4, MJSJP6, MJSJP8, MJSJS2, MJSJS4, MJSJS6, MJSJS8, MJSJT2, MJSJR0, MJSJR2, MJSJR4, MJSJR6, MJSJR8 **Zinc –** MJSJN8

Data Validation Qualifiers

The following is a list of data validation qualifiers applied to the sample result(s) and their definitions.

Data Validation Qualifiers	
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J	The associated value is an estimated quantity.
J+	The associated value is an estimated quantity but the result may be biased high.
J-	The associated value is an estimated quantity but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The data are unusable. The analyte may or may not be present in the sample.

III. SAMPLE INDEX

Sample Number	Matrix	Sampling Date	Date Received	ICP-AES Analysis	ICP-MS Analysis
MJSJN8	Water	11/10/2013	11/12/2013	11/27/2013	11/26-12/2/2013
MJSJP0	Water	11/6/2013	11/12/2013	11/27/2013	11/26-12/2/2013
MJSJP2	Water	11/6/2013	11/12/2013	11/27/2013	11/26-12/2/2013
MJSJP4	Water	11/6/2013	11/12/2013	11/27/2013	11/26-12/2/2013
MJSJP6	Water	11/6/2013	11/12/2013	11/27/2013	11/26-12/2/2013
MJSJP8	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/2/2013
MJSJQ0	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/2/2013
MJSJQ4	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/2/2013
MJSJQ6	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/2/2013
MJSJQ8	Water	11/7/2011	11/12/2013	11/27/2013	11/26-12/2/2013
MJSJR0	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJR2	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJR4	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJR6	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJR8	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJS2	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/2/2013
MJSJS4	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/2/2013
MJSJS6	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJS8	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJT2	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013

MJSJQ6 & MJSJS2 are field duplicates for samples MJSJQ4 & MJSJR8 respectively.
Sample MJSJN8 is a field blank.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
ENVIRONMENTAL ASSESSMENT

January 13, 2014

MEMORANDUM

SUBJECT: Data Validation Report for Metals Analysis of Samples Collected for Black Butte Mine Phase 1 RI – Storm Sampling Event, Cottage Grove, OR, Case 43881, SDG: MJSJQ1

FROM: Don Matheny, Chemist DM
OEA, Environmental Services Unit

TO: Richard Muza, Remedial Project Manager
Office of Environmental Clean-up, USEPA R10

CC: Mary Lou Fox, CDM

The quality assurance (QA) review of the analytical data generated from the analysis of twenty (20) waters collected from the above referenced site has been completed. These samples were analyzed for Dissolved Metals by A4 Scientific located in The Woodlands, TX.

Sample analyses were evaluated following EPA's Stage 4 Data Validation Electronic/Manual Process (S4VEM). The validation was conducted according to the Quality Control Specifications outlined in:

- *QAPP for Black Butte Mine Phase 1 Remedial Investigation – Surface Water Storm Sampling & Sediment Sampling QAPP, Cottage Grove, OR,* (December, 2012)
- USEPA CLP Statement of Work for Inorganic Superfund Methods (ISM01.3)
- National Functional Guidelines for Inorganic Superfund Data Review (EPA-540-R-10-011)
- Guidance for Labeling Externally Validated Laboratory Analytical Data (EPA-540-R08-005)

Some data may be qualified using the reviewer's professional judgment. The conclusions presented herein are based on the information provided for the review. A summary of samples evaluated in this validation report and the pertinent dates for sample collection, laboratory sample receipt and analyses is attached along with the validated data.

I. QUALITY CONTROL RESULTS SUMMARY

Quality Control Test	Result Ranges	Outliers?	Evaluation Criteria
Blanks	Detects Reported	Y*	ND, ≤ RL or < 10xSample
Matrix Spike (MJSJQ1)	77 – 113%	N	75 – 125%
Sample Duplicate (MJSJQ1)	± CRQL	N	≤ 20% RPD or ± CRQL
Field Duplicates (MJSJQ7, MJSJS3)	± 2xCRQL	N	≤ 50% RPD or ± 2xCRQL
LCS (blank spike)	91 - 116%	N	70 – 130%; Sb 50-150%
Serial Dilution (MJSJQ1)	NA (Sa<50xMDL)	N	≤ 10%

*See the "*Data Qualifications*" section below for excursions and qualification of affected data.

II. DATA QUALIFICATIONS

Summary of Validation Qualifiers Applied

After the manual and electronic data review, the following data qualifications were applied:

Blanks
The following samples have analyte results ≥ MDLs but ≤ CRQLs. The associated instrument, preparation and/or field blank results are ≥ MDLs but ≤ CRQLs. Detected analytes are qualified U and the results reported at the CRQLs.
Aluminum - MJSJQ1, MJSJQ1D, MJSJQ5, MJSJQ7, MJSJW5, MJSJP1, MJSJP3, MJSJP5, MJSJP7, MJSJP9, MJSJS9, MJSJR1, MJSJR3, MJSJQ9 **Arsenic** - MJSJQ1, MJSJQ1D, MJSJQ5, MJSJQ7, MJSJP3, MJSJP7, MJSJS3, MJSJS5, MJSJS9, MJSJT3, MJSJR1, MJSJR3, MJSJR5, MJSJR9 **Barium** - MJSJQ1, MJSJQ1D, MJSJQ5, MJSJQ7, MJSJP3, MJSJP7, MJSJS3, MJSJS5, MJSJS9, MJSJT3, MJSJR1, MJSJR5, MJSJR9 **Chromium** - MJSJP1, MJSJP3, MJSJP9, MJSJS3, MJSJS5, MJSJS7, MJSJS9, MJSJT3, MJSJR1, MJSJR5, MJSJR7, MJSJR9, MJSJQ9 **Cobalt** - MJSJP1, MJSJP3, MJSJP9, MJSJS3, MJSJS5, MJSJS7, MJSJT3, MJSJR3, MJSJR5, MJSJR7, MJSJR9, MJSJQ9 **Copper** - MJSJQ1, MJSJQ1D, MJSJQ5, MJSJQ7, MJSJP1, MJSJP3, MJSJP7, MJSJP9, MJSJS3, MJSJS5, MJSJS7, MJSJS9, MJSJT3, MJSJR1, MJSJR3, MJSJR5, MJSJR9, MJSJQ9 **Iron** - MJSJQ1, MJSJQ1D, MJSJQ5, MJSJQ7, MJSJP3, MJSJP7, MJSJP9, MJSJS7, MJSJS9, MJSJR1, MJSJR3, MJSJQ9 **Lead** - MJSJP1, MJSJP3, MJSJR7 **Silver** - MJSJP1 **Thallium** - MJSJP1, MJSJP3 **Vanadium** - MJSJQ1, MJSJQ1D, MJSJQ5, MJSJQ7, MJSJP1, MJSJP3, MJSJP7, MJSJP9, MJSJS3, MJSJS5, MJSJS7, MJSJS9, MJSJT3, MJSJR1, MJSJR5, MJSJR7, MJSJR9, MJSJQ9 **Zinc** – MJSJP1, MJSJP7, MJSJP9, MJSJQ1, MJSJQ1D, MJSJQ5, MJSJQ7, MJSJQ9, MJSJR1, MJSJR5, MJSJR7, MJSJR9, MJSJS7, MJSJS9, MJSJT3
Detection Limits
The following samples have results ≥ MDLs but ≤ CRQLs. Detected analytes are qualified J.
Chromium – MJSJQ1, MJSJQ1D, MJSJQ5, MJSJQ7 **Cobalt –** MJSJQ5, MJSJQ7 **Magnesium** - MJSJQ1, MJSJQ1D, MJSJQ5, MJSJQ7, MJSJP3, MJSJP5, MJSJP7, MJSJS3, MJSJS5, MJSJS9, MJSJT3, MJSJR1, MJSJR3, MJSJR5, MJSJR7, MJSJR9, MJSJQ9 **Manganese** - MJSJQ1, MJSJQ1D, MJSJQ5, MJSJQ7, MJSJP1, MJSJP3, MJSJP5, MJSJP9, MJSJS3, MJSJS7, MJSJS9, MJSJT3, MJSJR1, MJSJR5, MJSJR9, MJSJQ9 **Nickel –** MJSJQ1, MJSJQ1D, - MJSJQ5, MJSJQ7, MJSJP1, MJSJP3, MJSJP5, MJSJP7, MJSJP9, MJSJS3, MJSJS5, MJSJS7, MJSJS9, MJSJT3, MJSJR1, MJSJR3, MJSJR5, MJSJR7, MJSJR9, MJSJQ9 **Potassium -** MJSJQ1, MJSJQ1D, MJSJQ5, MJSJQ7, MJSJP1, MJSJP3, MJSJP5, MJSJP7, MJSJP9, MJSJS3, MJSJS5, MJSJS7, MJSJS9, MJSJT3, MJSJR1, MJSJR3, MJSJR5, MJSJR7, MJSJR9, MJSJQ9 **Sodium** - MJSJQ1, MJSJQ1D, MJSJQ5, MJSJQ7, MJSJP1, MJSJP3, MJSJP5, MJSJP7, MJSJP9, MJSJS3, MJSJS5, MJSJS7, MJSJS9, MJSJT3, MJSJR1, MJSJR3, MJSJR5, MJSJR7, MJSJR9, MJSJQ9 **Zinc –** MJSJW5

Data Validation Qualifiers

The following is a list of data validation qualifiers applied to the sample result(s) and their definitions.

Data Validation Qualifiers	
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J	The associated value is an estimated quantity.
J+	The associated value is an estimated quantity but the result may be biased high.
J-	The associated value is an estimated quantity but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The data are unusable. The analyte may or may not be present in the sample.

III. SAMPLE INDEX

Sample Number	Matrix	Sampling Date	Date Received	ICP-AES Analysis	ICP-MS Analysis
MJSJP1	Water	11/6/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJP3	Water	11/6/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJP5	Water	11/6/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJP7	Water	11/6/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJP9	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJQ1	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJQ5	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJQ7	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJQ9	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJR1	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJR3	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJR5	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJR7	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJR9	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJS3	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJS5	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJS7	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJS9	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJT3	Water	11/7/2013	11/12/2013	11/27/2013	11/26-12/3/2013
MJSJW5	Water	11/10/2013	11/12/2013	11/27/2013	11/26-12/3/2013

MJSJQ7 & MJSJS3 are field duplicates for samples MJSJQ5 & MJSJR9 respectively.
Sample MJSJW5 is a filter blank.

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJP1	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/06/2013	Sample Time:	16:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Magnesium	7240	ug/L	1			Yes	S4VEM
Potassium	493	ug/L	1	J	J	Yes	S4VEM
Sodium	4860	ug/L	1	J	J	Yes	S4VEM
Manganese	11.7	ug/L	1	J	J	Yes	S4VEM
Calcium	32200	ug/L	1			Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Iron	100	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJP1	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/06/2013	Sample Time:	16:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	0.42	ug/L	1	J	J	Yes	S4VEM
Barium	21.3	ug/L	1			Yes	S4VEM
Arsenic	1.5	ug/L	1			Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Aluminum	20.0	ug/L	1	J	UJ	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJP3	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/06/2013	Sample Time:	15:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Potassium	704	ug/L	1	J	J	Yes	S4VEM
Calcium	10600	ug/L	1			Yes	S4VEM
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Sodium	4510	ug/L	1	J	J	Yes	S4VEM
Manganese	3.7	ug/L	1	J	J	Yes	S4VEM
Magnesium	2240	ug/L	1	J	J	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJP3	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/06/2013	Sample Time:	15:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	J		Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	0.17	ug/L	1	J	J	Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Aluminum	20.0	ug/L	1	J	UJ	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJP5	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	1.5	Sample Date:	11/06/2013	Sample Time:	17:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	U	U	Yes	S4VEM
Barium	14.0	ug/L	1			Yes	S4VEM
Copper	2.0	ug/L	1	U	U	Yes	S4VEM
Zinc	20.9	ug/L	1			Yes	S4VEM
Vanadium	5.0	ug/L	1	U	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Aluminum	20.0	ug/L	1	J	UJ	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	0.15	ug/L	1	J	J	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJP5	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	1.5	Sample Date:	11/06/2013	Sample Time:	17:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Magnesium	2790	ug/L	1	J	J	Yes	S4VEM
Potassium	639	ug/L	1	J	J	Yes	S4VEM
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Manganese	5.6	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Iron	100	ug/L	1	U	U	Yes	S4VEM
Sodium	3200	ug/L	1	J	J	Yes	S4VEM
Calcium	7680	ug/L	1			Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJP7	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/06/2013	Sample Time:	15:45:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	0.054	ug/L	1	J	J	Yes	S4VEM
Chromium	2.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Aluminum	20.0	ug/L	1	J	UJ	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJP7	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/06/2013	Sample Time:	15:45:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Sodium	4320	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Potassium	536	ug/L	1	J	J	Yes	S4VEM
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Manganese	15.0	ug/L	1	U	U	Yes	S4VEM
Magnesium	2180	ug/L	1	J	J	Yes	S4VEM
Calcium	10300	ug/L	1			Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJP9	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	11:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM
Aluminum	20.0	ug/L	1	J	UJ	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Barium	20.3	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	0.33	ug/L	1	J	J	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	1.5	ug/L	1			Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJP9	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	11:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Calcium	29000	ug/L	1			Yes	S4VEM
Magnesium	6500	ug/L	1			Yes	S4VEM
Potassium	677	ug/L	1	J	J	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Manganese	12.0	ug/L	1	J	J	Yes	S4VEM
Sodium	4430	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJQ1	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	12:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Potassium	681	ug/L	1	J	J	Yes	S4VEM
Calcium	8990	ug/L	1			Yes	S4VEM
Sodium	3810	ug/L	1	J	J	Yes	S4VEM
Manganese	4.0	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	1900	ug/L	1	J	J	Yes	S4VEM
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJQ1	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	12:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	0.15	ug/L	1	J	J	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Aluminum	20.0	ug/L	1	J	UJ	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	0.090	ug/L	1	J	J	Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJQ5	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	11:25:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Potassium	568	ug/L	1	J	J	Yes	S4VEM
Magnesium	1990	ug/L	1	J	J	Yes	S4VEM
Sodium	3910	ug/L	1	J	J	Yes	S4VEM
Calcium	9400	ug/L	1			Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Manganese	4.3	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJQ5	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	11:25:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Aluminum	20.0	ug/L	1	J	UJ	Yes	S4VEM
Chromium	0.19	ug/L	1	J	J	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	0.23	ug/L	1	J	J	Yes	S4VEM
Cobalt	0.11	ug/L	1	J	J	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJQ7	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	11:35:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Calcium	9880	ug/L	1			Yes	S4VEM
Magnesium	2080	ug/L	1	J	J	Yes	S4VEM
Manganese	4.7	ug/L	1	J	J	Yes	S4VEM
Potassium	584	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Sodium	4140	ug/L	1	J	J	Yes	S4VEM
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJQ7	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	11:35:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Aluminum	20.0	ug/L	1	J	UJ	Yes	S4VEM
Cobalt	0.070	ug/L	1	J	J	Yes	S4VEM
Chromium	0.17	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Nickel	0.12	ug/L	1	J	J	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJQ9	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	13:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Nickel	0.28	ug/L	1	J	J	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Barium	14.2	ug/L	1			Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM
Aluminum	20.0	ug/L	1	J	UJ	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	1.4	ug/L	1			Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJQ9	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	13:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Sodium	4320	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Magnesium	4970	ug/L	1	J	J	Yes	S4VEM
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Calcium	22300	ug/L	1			Yes	S4VEM
Manganese	8.2	ug/L	1	J	J	Yes	S4VEM
Potassium	746	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJR1	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	14:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Aluminum	20.0	ug/L	1	J	UJ	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Nickel	0.077	ug/L	1	J	J	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJR1	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	14:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Sodium	4240	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Manganese	6.0	ug/L	1	J	J	Yes	S4VEM
Magnesium	2050	ug/L	1	J	J	Yes	S4VEM
Potassium	701	ug/L	1	J	J	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Calcium	9770	ug/L	1			Yes	S4VEM
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJR3	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	15:05:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	20.0	ug/L	1	J	UJ	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Barium	16.8	ug/L	1			Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	U	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	U	U	Yes	S4VEM
Nickel	0.47	ug/L	1	J	J	Yes	S4VEM
Zinc	35.9	ug/L	1			Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJR3	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	15:05:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Iron	100	ug/L	1	J	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Sodium	3210	ug/L	1	J	J	Yes	S4VEM
Calcium	7510	ug/L	1			Yes	S4VEM
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Manganese	37.3	ug/L	1			Yes	S4VEM
Potassium	579	ug/L	1	J	J	Yes	S4VEM
Magnesium	2890	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJR5	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	13:25:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Potassium	629	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	9460	ug/L	1			Yes	S4VEM
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Manganese	11.2	ug/L	1	J	J	Yes	S4VEM
Magnesium	1990	ug/L	1	J	J	Yes	S4VEM
Iron	115	ug/L	1			Yes	S4VEM
Sodium	4050	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJR5	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	13:25:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Aluminum	29.5	ug/L	1		J	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	0.15	ug/L	1	J	J	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJR7	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	17:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Sodium	4550	ug/L	1	J	J	Yes	S4VEM
Calcium	20300	ug/L	1			Yes	S4VEM
Manganese	26.7	ug/L	1			Yes	S4VEM
Iron	347	ug/L	1			Yes	S4VEM
Potassium	581	ug/L	1	J	J	Yes	S4VEM
Magnesium	4570	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJR7	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	17:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Nickel	0.46	ug/L	1	J	J	Yes	S4VEM
Barium	16.8	ug/L	1			Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	2.5	ug/L	1			Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.2	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Aluminum	287	ug/L	2	D	R	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJR9	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	17:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Sodium	4160	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	9320	ug/L	1			Yes	S4VEM
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Potassium	605	ug/L	1	J	J	Yes	S4VEM
Iron	184	ug/L	1			Yes	S4VEM
Manganese	12.4	ug/L	1	J	J	Yes	S4VEM
Magnesium	1930	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJR9	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	17:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	63.0	ug/L	1		J	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	0.15	ug/L	1	J	J	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJS3	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	17:40:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Nickel	0.16	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	J		Yes	S4VEM
Aluminum	57.3	ug/L	1		J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJS3	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	17:40:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Calcium	8980	ug/L	1			Yes	S4VEM
Sodium	3950	ug/L	1	J	J	Yes	S4VEM
Magnesium	1910	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Potassium	629	ug/L	1	J	J	Yes	S4VEM
Iron	181	ug/L	1			Yes	S4VEM
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Manganese	12.7	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJS5	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	17:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Magnesium	1860	ug/L	1	J	J	Yes	S4VEM
Calcium	8720	ug/L	1			Yes	S4VEM
Iron	257	ug/L	1			Yes	S4VEM
Manganese	20.8	ug/L	1			Yes	S4VEM
Sodium	3810	ug/L	1	J	J	Yes	S4VEM
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Potassium	624	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJS5	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	17:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Nickel	0.24	ug/L	1	J	J	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Zinc	6.5	ug/L	1	U		Yes	S4VEM
Aluminum	80.3	ug/L	1		J	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJS7	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	22:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	1.4	ug/L	1			Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	0.40	ug/L	1	J	J	Yes	S4VEM
Aluminum	45.9	ug/L	1		J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Barium	17.5	ug/L	1			Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJS7	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	22:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Calcium	27500	ug/L	1			Yes	S4VEM
Magnesium	6200	ug/L	1			Yes	S4VEM
Manganese	11.5	ug/L	1	J	J	Yes	S4VEM
Sodium	4570	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Potassium	498	ug/L	1	J	J	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJS9	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	23:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Potassium	543	ug/L	1	J	J	Yes	S4VEM
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Calcium	8750	ug/L	1			Yes	S4VEM
Magnesium	1870	ug/L	1	J	J	Yes	S4VEM
Manganese	3.8	ug/L	1	J	J	Yes	S4VEM
Sodium	3840	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJS9	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	23:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	0.10	ug/L	1	J	J	Yes	S4VEM
Aluminum	20.0	ug/L	1	J	UJ	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJT3	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	23:05:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Iron	136	ug/L	1			Yes	S4VEM
Sodium	3900	ug/L	1	J	J	Yes	S4VEM
Calcium	8940	ug/L	1			Yes	S4VEM
Potassium	533	ug/L	1	J	J	Yes	S4VEM
Manganese	7.6	ug/L	1	J	J	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Magnesium	1900	ug/L	1	J	J	Yes	S4VEM
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJT3	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	23:05:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Nickel	0.10	ug/L	1	J	J	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Aluminum	44.1	ug/L	1		J	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJW5	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	Filter Blank	pH:	1.5	Sample Date:	11/10/2013	Sample Time:	23:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5000	ug/L	1	U	U	Yes	S4VEM
Magnesium	5000	ug/L	1	U	U	Yes	S4VEM
Manganese	15.0	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	U	U	Yes	S4VEM
Iron	100	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJQ1	Lab Code:	A4
Sample Number:	MJSJW5	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	Filter Blank	pH:	1.5	Sample Date:	11/10/2013	Sample Time:	23:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Nickel	1.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	U	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	U	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Aluminum	20.0	ug/L	1	J	UJ	Yes	S4VEM
Zinc	0.74	ug/L	1	U	J	Yes	S4VEM
Barium	10.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	U	U	Yes	S4VEM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE OF
ENVIRONMENTAL ASSESSMENT

January 13, 2014

MEMORANDUM

SUBJECT: Data Validation Report for Metals Analysis of Samples Collected for Black Butte Mine Phase 1 RI – Storm Sampling Event, Cottage Grove, OR, Case 43881, SDG: MJSJT4

FROM: Don Matheny, Chemist DM
OEA, Environmental Services Unit

TO: Richard Muza, Remedial Project Manager
Office of Environmental Clean-up, USEPA R10

CC: Mary Lou Fox, CDM

The quality assurance (QA) review of the analytical data generated from the analysis of five (5) waters collected from the above referenced site has been completed. These samples were analyzed for Total Metals by A4 Scientific located in The Woodlands, TX.

Sample analyses were evaluated following EPA's Stage 4 Data Validation Electronic/Manual Process (S4VEM). The validation was conducted according to the Quality Control Specifications outlined in:

- *QAPP for Black Butte Mine Phase 1 Remedial Investigation – Surface Water Storm Sampling & Sediment Sampling QAPP, Cottage Grove, OR,* (December, 2012)
- USEPA CLP Statement of Work for Inorganic Superfund Methods (ISM01.3)
- National Functional Guidelines for Inorganic Superfund Data Review (EPA-540-R-10-011)
- Guidance for Labeling Externally Validated Laboratory Analytical Data (EPA-540-R08-005)

Some data may be qualified using the reviewer's professional judgment. The conclusions presented herein are based on the information provided for the review. A summary of samples evaluated in this validation report and the pertinent dates for sample collection, laboratory sample receipt and analyses is attached along with the validated data.

I. QUALITY CONTROL RESULTS SUMMARY

Quality Control Test	Result Ranges	Outliers?	Evaluation Criteria
Blanks	Detects Reported	Y*	ND, ≤ RL or < 10xSample
Matrix Spike (MJSJT6)	77 – 113%	N	75 – 125%
Sample Duplicate (MJSJT6)	± CRQL	N	≤ 20% RPD or ± CRQL
Field Duplicates (MJSJW2)	± 2xCRQL	N	≤ 50% RPD or ± 2xCRQL
LCS (blank spike)	89 - 119%	N	70 – 130%; Sb 50-150%
Serial Dilution (MJSJT6)	≤ 1%	N	≤ 10%

*See the "*Data Qualifications*" section below for excursions and qualification of affected data.

II. DATA QUALIFICATIONS

Summary of Validation Qualifiers Applied

After the manual and electronic data review, the following data qualifications were applied:

Blanks
The following samples have analyte results ≥ MDLs but ≤ CRQLs. The associated instrument, preparation and/or field blank results are ≥ MDLs but ≤ CRQLs. Detected analytes are qualified U and the results reported at the CRQLs.
Aluminum - MJSJW4 **Arsenic** - MJSJT6D, MJSJT6, MJSJW0, MJSJW2 **Barium** - MJSJT6D, MJSJT6, MJSJW0, MJSJW2 **Chromium** - MJSJT6, MJSJT4, MJSJW0, MJSJW2 **Cobalt** - MJSJT6, MJSJT4, MJSJW0, MJSJW2 **Copper** - MJSJT6D, MJSJT6, MJSJT4, MJSJW0, MJSJW2 **Lead** – All samples **Silver** - MJSJW2 **Thallium** - MJSJT6 **Vanadium** - MJSJT6D, MJSJT6, MJSJT4, MJSJW0, MJSJW2 **Zinc** - MJSJT4, MJSJT6, MJSJT6D, MJSJW0, MJSJW2
Detection Limits
The following samples have results ≥ MDLs but ≤ CRQLs. Detected analytes are qualified J.
Manganese - MJSJW0, MJSJW2, MJSJT6, MJSJT6D **Magnesium** - MJSJW0, MJSJW2, MJSJT6, MJSJT6D **Potassium** - MJSJW0, MJSJW2, MJSJT6, MJSJT6D, MJSJT4 **Sodium** - MJSJW0, MJSJW2, MJSJT6, MJSJT6D, MJSJT4

Data Validation Qualifiers

The following is a list of data validation qualifiers applied to the sample result(s) and their definitions.

Data Validation Qualifiers	
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J	The associated value is an estimated quantity.
J+	The associated value is an estimated quantity but the result may be biased high.
J-	The associated value is an estimated quantity but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The data are unusable. The analyte may or may not be present in the sample.

III. SAMPLE INDEX

Sample Number	Matrix	Sampling Date	Date Received	ICP-AES Analysis	ICP-MS Analysis
MJSJT4	Water	11/8/2013	11/12/2013	11/26/2013	11/27-12/3/2013
MJSJT6	Water	11/8/2013	11/12/2013	11/26/2013	11/27-12/3/2013
MJSJW0	Water	11/8/2013	11/12/2013	11/27/2013	11/27-12/3/2013
MJSJW2	Water	11/8/2013	11/12/2013	11/27/2013	11/27-12/3/2013
MJSJW4	Water	11/7/2013	11/12/2013	11/27/2013	11/27-12/3/2013

MJSJW2 is the field duplicate for sample MJSJW0.
Sample MJSJN8 is a field blank (reported in a separate SDG).

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT4	Lab Code:	A4
Sample Number:	MJSJT4	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/08/2013	Sample Time:	10:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	30300	ug/L	1			Yes	S4VEM
Iron	171	ug/L	1			Yes	S4VEM
Magnesium	6750	ug/L	1			Yes	S4VEM
Manganese	16.0	ug/L	1			Yes	S4VEM
Potassium	554	ug/L	1	J	J	Yes	S4VEM
Sodium	4800	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT4	Lab Code:	A4
Sample Number:	MJSJT4	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/08/2013	Sample Time:	10:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	91.4	ug/L	1			Yes	S4VEM
Arsenic	1.5	ug/L	1			Yes	S4VEM
Barium	17.9	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT4	Lab Code:	A4
Sample Number:	MJSJT6	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/08/2013	Sample Time:	10:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	96.0	ug/L	1			Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	J	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT4	Lab Code:	A4
Sample Number:	MJSJT6	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/08/2013	Sample Time:	10:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	9380	ug/L	1			Yes	S4VEM
Iron	183	ug/L	1			Yes	S4VEM
Magnesium	2030	ug/L	1	J	J	Yes	S4VEM
Manganese	10.1	ug/L	1	J	J	Yes	S4VEM
Potassium	665	ug/L	1	J	J	Yes	S4VEM
Sodium	4170	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT4	Lab Code:	A4
Sample Number:	MJSJW0	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/08/2013	Sample Time:	10:55:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	57.5	ug/L	1			Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT4	Lab Code:	A4
Sample Number:	MJSJW0	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/08/2013	Sample Time:	10:55:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	9360	ug/L	1			Yes	S4VEM
Iron	184	ug/L	1			Yes	S4VEM
Magnesium	1940	ug/L	1	J	J	Yes	S4VEM
Manganese	10.2	ug/L	1	J	J	Yes	S4VEM
Potassium	589	ug/L	1	J	J	Yes	S4VEM
Sodium	4180	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT4	Lab Code:	A4
Sample Number:	MJSJW2	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/08/2013	Sample Time:	11:05:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	9640	ug/L	1			Yes	S4VEM
Iron	187	ug/L	1			Yes	S4VEM
Magnesium	2030	ug/L	1	J	J	Yes	S4VEM
Manganese	10.8	ug/L	1	J	J	Yes	S4VEM
Potassium	615	ug/L	1	J	J	Yes	S4VEM
Sodium	4350	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT4	Lab Code:	A4
Sample Number:	MJSJW2	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/08/2013	Sample Time:	11:05:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	54.9	ug/L	1			Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT4	Lab Code:	A4
Sample Number:	MJSJW4	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	Precip Station	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	23:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	20.0	ug/L	1	J	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	U	U	Yes	S4VEM
Barium	10.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.7	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	U	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	U	U	Yes	S4VEM
Zinc	18.5	ug/L	1			Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT4	Lab Code:	A4
Sample Number:	MJSJW4	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	Precip Station	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	23:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5000	ug/L	1	U	U	Yes	S4VEM
Iron	100	ug/L	1	U	U	Yes	S4VEM
Magnesium	5000	ug/L	1	U	U	Yes	S4VEM
Manganese	15.0	ug/L	1	U	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	U	U	Yes	S4VEM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
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OFFICE OF
ENVIRONMENTAL ASSESSMENT

January 14, 2014

MEMORANDUM

SUBJECT: Data Validation Report for Metals Analysis of Samples Collected for Black Butte Mine Phase 1 RI – Storm Sampling Event, Cottage Grove, OR, Case 43881, SDG: MJSJT5

FROM: Don Matheny, Chemist
OEA, Environmental Services Unit

TO: Richard Muza, Remedial Project Manager
Office of Environmental Clean-up, USEPA R10

CC: Mary Lou Fox, CDM

The quality assurance (QA) review of the analytical data generated from the analysis of four (4) waters collected from the above referenced site has been completed. These samples were analyzed for Dissolved Metals by A4 Scientific located in The Woodlands, TX.

Sample analyses were evaluated following EPA's Stage 4 Data Validation Electronic/Manual Process (S4VEM). The validation was conducted according to the Quality Control Specifications outlined in:

- *QAPP for Black Butte Mine Phase 1 Remedial Investigation – Surface Water Storm Sampling & Sediment Sampling QAPP, Cottage Grove, OR,* (December, 2012)
- USEPA CLP Statement of Work for Inorganic Superfund Methods (ISM01.3)
- National Functional Guidelines for Inorganic Superfund Data Review (EPA-540-R-10-011)
- Guidance for Labeling Externally Validated Laboratory Analytical Data (EPA-540-R08-005)

Some data may be qualified using the reviewer's professional judgment. The conclusions presented herein are based on the information provided for the review. A summary of samples evaluated in this validation report and the pertinent dates for sample collection, laboratory sample receipt and analyses is attached along with the validated data.

I. QUALITY CONTROL RESULTS SUMMARY

Quality Control Test	Result Ranges	Outliers?	Evaluation Criteria
Blanks	Detects Reported	Y*	ND, ≤ RL or < 10xSample
Matrix Spike (MJSJT7)	75 – 116%	N	75 – 125%
Sample Duplicate (MJSJT7)	± CRQL	N	≤ 20% RPD or ± CRQL
Field Duplicates (MJSJW3)	± 2xCRQL	N	≤ 50% RPD or ± 2xCRQL
LCS (blank spike)	95 - 116%	N	70 – 130%; Sb 50-150%
Serial Dilution (MJSJT7)	NA (Sa<50xMDL)	N	≤ 10%

*See the "*Data Qualifications*" section below for excursions and qualification of affected data.

II. DATA QUALIFICATIONS

Summary of Validation Qualifiers Applied

After the manual and electronic data review, the following data qualifications were applied:

Blanks
The following samples have analyte results ≥ MDLs but ≤ CRQLs. The associated instrument, preparation and/or field blank results are ≥ MDLs but ≤ CRQLs. Detected analytes are qualified U and the results reported at the CRQLs.
Aluminum - MJSJT7D, MJSJT5, MJSJT7 **Arsenic** - MJSJT7D, MJSJW1, MJSJW3, MJSJT7 **Barium -** MJSJT7D, MJSJW1, MJSJW3, MJSJT7 **Chromium -** All samples **Cobalt -** MJSJT5, MJSJW1, MJSJW3 **Iron** - MJSJT7, MJSJT7D, MJSJW1, MJSJW3 **Lead –** All samples **Silver** - MJSJT7D **Vanadium -** All samples **Zinc –** MJSJT5*
Detection Limits
The following samples have results ≥ MDLs but ≤ CRQLs. Detected analytes are qualified J.
Magnesium - MJSJT7, MJSJT7D, MJSJW1, MJSJW3 **Manganese** - MJSJT5, MJSJW1, MJSJW3 **Nickel -** MJSJT7, MJSJT7D, MJSJW1, MJSJW3 **Potassium -** All samples **Sodium -** All samples

* The low concentration standard for Zinc was not analyzed; however, the LCS was at 2xCRQL and had a recovery of 101%. Non-detects for Zinc were reported down to 2 ug/L (CRQL).

Data Validation Qualifiers

The following is a list of data validation qualifiers applied to the sample result(s) and their definitions.

Data Validation Qualifiers	
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J	The associated value is an estimated quantity.
J+	The associated value is an estimated quantity but the result may be biased high.
J-	The associated value is an estimated quantity but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	The data are unusable. The analyte may or may not be present in the sample.

III. SAMPLE INDEX

Sample Number	Matrix	Sampling Date	Date Received	ICP-AES Analysis	ICP-MS Analysis
MJSJT5	Water	11/8/2013	11/12/2013	11/26/2013	11/27-29/2013
MJSJT7	Water	11/8/2013	11/12/2013	11/26/2013	11/27-29/2013
MJSJW1	Water	11/8/2013	11/12/2013	11/26/2013	11/27-29/2013
MJSJW3	Water	11/8/2013	11/12/2013	11/26/2013	11/27-29/2013

MJSJW3 is a field duplicate for samples MJSJW1.
Sample MJSJW5 is a filter blank (reported in a separate SDG).

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT5	Lab Code:	A4
Sample Number:	MJSJT5	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/08/2013	Sample Time:	10:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	26400	ug/L	1			Yes	S4VEM
Iron	100	ug/L	1	U	U	Yes	S4VEM
Magnesium	5930	ug/L	1			Yes	S4VEM
Manganese	8.0	ug/L	1	J	J	Yes	S4VEM
Potassium	577	ug/L	1	J	J	Yes	S4VEM
Sodium	4100	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT5	Lab Code:	A4
Sample Number:	MJSJT5	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/08/2013	Sample Time:	10:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	20.0	ug/L	1	J	U	Yes	S4VEM
Arsenic	1.4	ug/L	1			Yes	S4VEM
Barium	18.8	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	4.5	ug/L	1			Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	J	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT5	Lab Code:	A4
Sample Number:	MJSJT7	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/08/2013	Sample Time:	10:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	9210	ug/L	1			Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	1960	ug/L	1	J	J	Yes	S4VEM
Manganese	15.0	ug/L	1	U	U	Yes	S4VEM
Potassium	934	ug/L	1	J	J	Yes	S4VEM
Sodium	4140	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT5	Lab Code:	A4
Sample Number:	MJSJT7	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/08/2013	Sample Time:	10:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	20.0	ug/L	1	J	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	0.098	ug/L	1	J	J	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT5	Lab Code:	A4
Sample Number:	MJSJW1	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/08/2013	Sample Time:	10:55:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	8080	ug/L	1			Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	1740	ug/L	1	J	J	Yes	S4VEM
Manganese	3.7	ug/L	1	J	J	Yes	S4VEM
Potassium	612	ug/L	1	J	J	Yes	S4VEM
Sodium	3580	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT5	Lab Code:	A4
Sample Number:	MJSJW1	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/08/2013	Sample Time:	10:55:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	22.0	ug/L	1			Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	0.12	ug/L	1	J	J	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT5	Lab Code:	A4
Sample Number:	MJSJW3	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/08/2013	Sample Time:	11:05:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	36.4	ug/L	1			Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	0.095	ug/L	1	J	J	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJT5	Lab Code:	A4
Sample Number:	MJSJW3	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/08/2013	Sample Time:	11:05:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	8560	ug/L	1			Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	1840	ug/L	1	J	J	Yes	S4VEM
Manganese	4.6	ug/L	1	J	J	Yes	S4VEM
Potassium	609	ug/L	1	J	J	Yes	S4VEM
Sodium	3760	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJN8	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	Bottle/Preservative Blank	pH:	1.5	Sample Date:	11/10/2013	Sample Time:	21:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	5000	ug/L	1	U	U	Yes	S4VEM
Iron	100	ug/L	1	U	U	Yes	S4VEM
Magnesium	5000	ug/L	1	U	U	Yes	S4VEM
Manganese	15.0	ug/L	1	U	U	Yes	S4VEM
Potassium	5000	ug/L	1	U	U	Yes	S4VEM
Sodium	5000	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJN8	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	Bottle/Preservative Blank	pH:	1.5	Sample Date:	11/10/2013	Sample Time:	21:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	20.0	ug/L	1	J	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	U	U	Yes	S4VEM
Barium	10.0	ug/L	1	U	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	U	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	1.0	ug/L	1	U	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	U	U	Yes	S4VEM
Zinc	0.70	ug/L	1	U	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJP0	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/06/2013	Sample Time:	16:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	40.0	ug/L	2	JD	U	Yes	S4VEM
Arsenic	1.5	ug/L	1			Yes	S4VEM
Barium	21.0	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJP0	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/06/2013	Sample Time:	16:50:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	30800	ug/L	1			Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	6900	ug/L	1			Yes	S4VEM
Manganese	12.3	ug/L	1	J	J	Yes	S4VEM
Potassium	501	ug/L	1	J	J	Yes	S4VEM
Sodium	4580	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJP2	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/06/2013	Sample Time:	15:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	9930	ug/L	1			Yes	S4VEM
Iron	109	ug/L	1			Yes	S4VEM
Magnesium	2100	ug/L	1	J	J	Yes	S4VEM
Manganese	4.6	ug/L	1	J	J	Yes	S4VEM
Potassium	557	ug/L	1	J	J	Yes	S4VEM
Sodium	4140	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJP2	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/06/2013	Sample Time:	15:15:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	42.5	ug/L	2	D		Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJP4	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	1.5	Sample Date:	11/06/2013	Sample Time:	17:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	20.0	ug/L	1	J	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	13.9	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	U	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	U	U	Yes	S4VEM
Zinc	20.8	ug/L	1			Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJP4	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	1.5	Sample Date:	11/06/2013	Sample Time:	17:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	7410	ug/L	1			Yes	S4VEM
Iron	100	ug/L	1	U	U	Yes	S4VEM
Magnesium	2680	ug/L	1	J	J	Yes	S4VEM
Manganese	15.0	ug/L	1	U	U	Yes	S4VEM
Potassium	655	ug/L	1	J	J	Yes	S4VEM
Sodium	3020	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJP6	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/06/2013	Sample Time:	15:45:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	10600	ug/L	1			Yes	S4VEM
Iron	111	ug/L	1			Yes	S4VEM
Magnesium	2200	ug/L	1	J	J	Yes	S4VEM
Manganese	4.8	ug/L	1	J	J	Yes	S4VEM
Potassium	571	ug/L	1	J	J	Yes	S4VEM
Sodium	4440	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJP6	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/06/2013	Sample Time:	15:45:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	28.8	ug/L	1			Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	U	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJP8	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	11:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	31500	ug/L	1			Yes	S4VEM
Iron	193	ug/L	1			Yes	S4VEM
Magnesium	6940	ug/L	1			Yes	S4VEM
Manganese	24.2	ug/L	1			Yes	S4VEM
Potassium	749	ug/L	1	J	J	Yes	S4VEM
Sodium	4840	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJP8	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	11:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	66.6	ug/L	2	D		Yes	S4VEM
Arsenic	1.6	ug/L	1			Yes	S4VEM
Barium	18.9	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJQ0	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	12:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	167	ug/L	2	D		Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJQ0	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	12:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	10200	ug/L	1			Yes	S4VEM
Iron	343	ug/L	1			Yes	S4VEM
Magnesium	2130	ug/L	1	J	J	Yes	S4VEM
Manganese	42.5	ug/L	1			Yes	S4VEM
Potassium	844	ug/L	1	J	J	Yes	S4VEM
Sodium	4420	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJQ4	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	11:25:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	9620	ug/L	1			Yes	S4VEM
Iron	150	ug/L	1			Yes	S4VEM
Magnesium	1990	ug/L	1	J	J	Yes	S4VEM
Manganese	11.1	ug/L	1	J	J	Yes	S4VEM
Potassium	597	ug/L	1	J	J	Yes	S4VEM
Sodium	4040	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJQ4	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	11:25:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	69.7	ug/L	2	D		Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJQ6	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	11:35:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	10700	ug/L	1			Yes	S4VEM
Iron	164	ug/L	1			Yes	S4VEM
Magnesium	2210	ug/L	1	J	J	Yes	S4VEM
Manganese	11.2	ug/L	1	J	J	Yes	S4VEM
Potassium	649	ug/L	1	J	J	Yes	S4VEM
Sodium	4560	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJQ6	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	11:35:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	48.5	ug/L	2	D		Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	6.0	ug/L	1			Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJQ8	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	13:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	23200	ug/L	1			Yes	S4VEM
Iron	1880	ug/L	1			Yes	S4VEM
Magnesium	5190	ug/L	1			Yes	S4VEM
Manganese	243	ug/L	1			Yes	S4VEM
Potassium	866	ug/L	1	J	J	Yes	S4VEM
Sodium	4530	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJQ8	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	13:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	437	ug/L	2	D		Yes	S4VEM
Arsenic	6.8	ug/L	1			Yes	S4VEM
Barium	31.1	ug/L	1			Yes	S4VEM
Cadmium	0.11	ug/L	1	J	J	Yes	S4VEM
Chromium	4.0	ug/L	1			Yes	S4VEM
Cobalt	1.9	ug/L	1			Yes	S4VEM
Copper	5.3	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	2.7	ug/L	1			Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	17.9	ug/L	1			Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJR0	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	14:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	10300	ug/L	1			Yes	S4VEM
Iron	1340	ug/L	1			Yes	S4VEM
Magnesium	2140	ug/L	1	J	J	Yes	S4VEM
Manganese	196	ug/L	1			Yes	S4VEM
Potassium	735	ug/L	1	J	J	Yes	S4VEM
Sodium	4180	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJR0	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	14:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	381	ug/L	2	D		Yes	S4VEM
Arsenic	1.3	ug/L	1			Yes	S4VEM
Barium	16.1	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	0.46	ug/L	1	J	J	Yes	S4VEM
Cobalt	1.2	ug/L	1			Yes	S4VEM
Copper	4.6	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	3.7	ug/L	1			Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJR2	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	15:05:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	7280	ug/L	1			Yes	S4VEM
Iron	100	ug/L	1	J	U	Yes	S4VEM
Magnesium	2800	ug/L	1	J	J	Yes	S4VEM
Manganese	40.9	ug/L	1			Yes	S4VEM
Potassium	613	ug/L	1	J	J	Yes	S4VEM
Sodium	3050	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJR2	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	FC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	15:05:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	40.0	ug/L	2	JD	U	Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	17.0	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	U	U	Yes	S4VEM
Cobalt	0.13	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	U	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	U	U	Yes	S4VEM
Zinc	35.3	ug/L	1			Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJR4	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	13:25:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	9490	ug/L	1			Yes	S4VEM
Iron	949	ug/L	1			Yes	S4VEM
Magnesium	2020	ug/L	1	J	J	Yes	S4VEM
Manganese	148	ug/L	1			Yes	S4VEM
Potassium	657	ug/L	1	J	J	Yes	S4VEM
Sodium	3760	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJR4	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	13:25:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	320	ug/L	2	D		Yes	S4VEM
Arsenic	1.1	ug/L	1			Yes	S4VEM
Barium	13.6	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	0.40	ug/L	1	J	J	Yes	S4VEM
Cobalt	0.89	ug/L	1	J	J	Yes	S4VEM
Copper	3.8	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	3.2	ug/L	1			Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJR6	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	17:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	285	ug/L	2	D		Yes	S4VEM
Arsenic	3.6	ug/L	1			Yes	S4VEM
Barium	19.6	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	0.55	ug/L	1	J	J	Yes	S4VEM
Cobalt	0.54	ug/L	1	J	J	Yes	S4VEM
Copper	3.0	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.4	ug/L	1	J		Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJR6	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	17:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	19600	ug/L	1			Yes	S4VEM
Iron	757	ug/L	1			Yes	S4VEM
Magnesium	4510	ug/L	1	J	J	Yes	S4VEM
Manganese	68.1	ug/L	1			Yes	S4VEM
Potassium	589	ug/L	1	J	J	Yes	S4VEM
Sodium	4290	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJR8	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	17:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	249	ug/L	2	D		Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	0.32	ug/L	1	J	J	Yes	S4VEM
Cobalt	0.38	ug/L	1	J	J	Yes	S4VEM
Copper	2.6	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.1	ug/L	1	J		Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJR8	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	17:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	8430	ug/L	1			Yes	S4VEM
Iron	607	ug/L	1			Yes	S4VEM
Magnesium	1800	ug/L	1	J	J	Yes	S4VEM
Manganese	61.2	ug/L	1			Yes	S4VEM
Potassium	576	ug/L	1	J	J	Yes	S4VEM
Sodium	3520	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJS2	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	17:40:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	246	ug/L	2	D		Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	2.6	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.7	ug/L	1			Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	J	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJS2	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	17:40:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	9160	ug/L	1			Yes	S4VEM
Iron	672	ug/L	1			Yes	S4VEM
Magnesium	1950	ug/L	1	J	J	Yes	S4VEM
Manganese	64.2	ug/L	1			Yes	S4VEM
Potassium	652	ug/L	1	J	J	Yes	S4VEM
Sodium	3880	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJS4	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	17:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	416	ug/L	2	D		Yes	S4VEM
Arsenic	1.1	ug/L	1			Yes	S4VEM
Barium	12.0	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	2.0	ug/L	1	J	U	Yes	S4VEM
Cobalt	1.0	ug/L	1	J	U	Yes	S4VEM
Copper	3.8	ug/L	1			Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.8	ug/L	1	J		Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJS4	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	17:20:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	8430	ug/L	1			Yes	S4VEM
Iron	957	ug/L	1			Yes	S4VEM
Magnesium	1810	ug/L	1	J	J	Yes	S4VEM
Manganese	114	ug/L	1			Yes	S4VEM
Potassium	610	ug/L	1	J	J	Yes	S4VEM
Sodium	3400	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJS6	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	22:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	125	ug/L	2	D		Yes	S4VEM
Arsenic	2.0	ug/L	1			Yes	S4VEM
Barium	19.2	ug/L	1			Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	0.39	ug/L	1	J	J	Yes	S4VEM
Cobalt	0.25	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	J	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.2	ug/L	1	J		Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJS6	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	DC1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	22:30:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	25100	ug/L	1			Yes	S4VEM
Iron	271	ug/L	1			Yes	S4VEM
Magnesium	5700	ug/L	1			Yes	S4VEM
Manganese	23.4	ug/L	1			Yes	S4VEM
Potassium	481	ug/L	1	J	J	Yes	S4VEM
Sodium	4090	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJS8	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	23:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	143	ug/L	2	D		Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	0.21	ug/L	1	J	J	Yes	S4VEM
Cobalt	0.16	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	J	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	J	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJS8	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GD1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	23:00:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	8090	ug/L	1			Yes	S4VEM
Iron	282	ug/L	1			Yes	S4VEM
Magnesium	1750	ug/L	1	J	J	Yes	S4VEM
Manganese	22.4	ug/L	1			Yes	S4VEM
Potassium	511	ug/L	1	J	J	Yes	S4VEM
Sodium	3430	ug/L	1	J	J	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJT2	Method:	ICP_MS	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	23:05:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	119	ug/L	2	D		Yes	S4VEM
Arsenic	1.0	ug/L	1	J	U	Yes	S4VEM
Barium	10.0	ug/L	1	J	U	Yes	S4VEM
Cadmium	1.0	ug/L	1	U	U	Yes	S4VEM
Chromium	0.28	ug/L	1	J	J	Yes	S4VEM
Cobalt	0.19	ug/L	1	J	J	Yes	S4VEM
Copper	2.0	ug/L	1	J	U	Yes	S4VEM
Lead	1.0	ug/L	1	U	U	Yes	S4VEM
Nickel	1.0	ug/L	1	J	U	Yes	S4VEM
Selenium	5.0	ug/L	1	U	U	Yes	S4VEM
Silver	1.0	ug/L	1	U	U	Yes	S4VEM
Thallium	1.0	ug/L	1	U	U	Yes	S4VEM
Vanadium	5.0	ug/L	1	J	U	Yes	S4VEM
Zinc	2.0	ug/L	1	U	U	Yes	S4VEM

Case No:	43881	Contract:	EPW09035	SDG No:	MJSJN8	Lab Code:	A4
Sample Number:	MJSJT2	Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	GU1	pH:	1.5	Sample Date:	11/07/2013	Sample Time:	23:05:00
% Moisture :				% Solids :			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Antimony	60.0	ug/L	1	U	U	Yes	S4VEM
Beryllium	5.0	ug/L	1	U	U	Yes	S4VEM
Calcium	9100	ug/L	1			Yes	S4VEM
Iron	348	ug/L	1			Yes	S4VEM
Magnesium	1900	ug/L	1	J	J	Yes	S4VEM
Manganese	25.5	ug/L	1			Yes	S4VEM
Potassium	552	ug/L	1	J	J	Yes	S4VEM
Sodium	3920	ug/L	1	J	J	Yes	S4VEM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: December 10, 2013

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

FROM: Stephanie Le, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: Phase 1 Storm Event 2 For Anions

Project Code: SFP-047B
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox – CDM Smith

The following is a quality assurance review of the results of 25 water samples for anions (fluoride, chloride, & sulfate) analysis. These samples were submitted for the Black Butte Mine: Phase 1 Storm Event 2 Project. The analyses were performed by ESAT chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

13444204	13444206	13444208	13444210	13444212	13444214	13444218
13444220	13444222	13444226	13444228	13444230	13444232	13444234
13444238	13444240	13444244	13444246	13444250	13444252	13444254
13444258	13444260	13444262	13445200			

Data Qualifications

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

The quality control measures which did not meet Laboratory/QAPP criteria are annotated in the title of each affected subsection with **"Laboratory/QAPP Criteria Not Met".**

For those tests for which the USEPA Region 10 Laboratory has been accredited by the National Environmental Laboratory Accreditation Conference (NELAC), all requirements of the current NELAC Standard have been met. The Region 10 Laboratory's Quality System has been accredited to the standards of the National Environmental Laboratory Accreditation Conference (NELAC).

1. Sample Transport and Receipt – Laboratory/QAPP Criteria Not Met

Refer to the Corrective Action Notices dated 11/13/2013 for a record of observations made during sample receipt. Results for sample 13444262 were qualified (J), estimated, because the pH was less than 2 on arrival.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations, where applicable.

3. Sample Preparation

Samples were prepared according to the SOP for these analytes for this type of matrix. No qualification of the data was required based on sample preparation.

4. Initial Calibration and Calibration Verification

The linear regression generated for the initial calibrations met method criteria. The low point of the calibration curve is usually the Minimum Reporting Level (MRL) of the method. All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the methods reported. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis

The method blanks did not contain detectable levels of reported analytes which would require data qualification.

7. Duplicate Analysis

Duplicate analysis was performed on samples 13444210, 13444214, 13444232, and 13444254. Sample results which were greater than 5 times of the MRL level were within the +/- 20% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on samples 13444210, 13444214, 13444232, and 13444254. Sample results were within the 80-120% recovery requirements.

No qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

No manual integrations were performed.

10. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the ‘U’ qualifier is attached.

11. Data Qualifiers

The U-qualifier was attached to the results which were below the MRL. Fluoride, chloride, and sulfate results for sample 13424262 were qualified (J), estimated, because the pH was less than 2 on arrival.

No other qualification was required.

The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

J - The identification of the analyte is acceptable; however the reported value is an estimate.

UJ - The analyte was not detected at or above the reported value. The reported value is an estimate.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Stephanie Le at the Region 10 Laboratory, phone number (360) 871- 8715.

12. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DS), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analytes and the percent recoveries of the analytes are determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: March 14, 2014

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

From: Theresa McBride, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of Black Butte Mine Phase 1 RI Storm event 2
For Low Level Mercury

Project Code: SFP-047B
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox - CDM Smith

The following is a quality assurance review of the results of the analysis of 52 water samples for Low Level Mercury. These samples were submitted for the Black Butte Mine Phase 1 RI Storm event 2 Project. The analyses were performed by EPA chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

Total (Unfiltered) Low Level Mercury

13444202	13444204	13444206	13444208	13444210	13444212	13444214
13444218	13444220	13444222	13444224	13444226	13444228	13444230
13444232	13444234	13444238	13444240	13444242	13444244	13444246
13444250	13444252	13444254	13444258	13444260		

Dissolved (Filtered) Low Level Mercury

13444203	13444205	13444207	13444209	13444211	13444213	13444215
13444219	13444221	13444223	13444225	13444227	13444229	13444231
13444233	13444235	13444239	13444241	13444243	13444245	13444247
13444251	13444253	13444255	13444259	13444261		

Data Qualifications

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

All measures of quality control met Laboratory/QAPP criteria.

For those tests for which the USEPA Region 10 Laboratory has been accredited by The NELAC Institute (TNI), all requirements of the current TNI Standard have been met.

1. Sample Transport and Receipt -Laboratory/QAPP Criteria Not Met

Refer to the appended Corrective Action Notice dated 10/24/2013 for a record of observations made during sample receipt. All errors were administrative in nature and did not affect the quality of sample results.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations.

3. Sample Preparation

Samples were prepared according to the method outlined in the SOP for this analyte for this type of matrix. No qualification of the data was required based on sample preparation.

4. Initial Calibration and Calibration Verification

The calibration factors generated for the initial calibration met method criteria. The low point of the calibration curve is usually the Minimum Reporting Level (MRL) of the method. All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the method. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis - Laboratory/QAPP Criteria Not Met

The method blanks did not contain detectable levels of analyte which would require data qualification.

One Field Blank sample (13444202) was not less than the MRL. This blank measured 104% of the 0.5 ng/L MRL level. The other field blank samples (13444203, 13444224, 13444225, 13444242 and 13444243) did not exceed the MRL, but were also elevated at 98%, 83%, 71%, 50% and 60% of the MRL, respectively.

The method states that values less than or equal to five times the concentration in the field blank are not to be reported.

Sample 13444202 was qualified (U), as its result was not greater than five times the apparent concentration in the field blank (itself).

7. Duplicate Analysis

Duplicate analysis was performed on samples 13444214, 13444230, 13444254, 13444255, 13444215, and 13444231. Sample results which were greater than the MRL level were within the +/- 20% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on samples 13444214, 13444230, 13444254, 13444255, 13444215, and 13444231. Sample results were within the 71-125% recovery and relative percent difference (RPD) requirements. No qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

No manual integrations were performed.

10. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the 'U' qualifier is attached.

11. Data Qualifiers

The (U) qualifier was attached to all results that fall below the MRL (13444203, 13444222, 13444224, 13444225, 13444232, 13444242, 13444243, IW012114ABL, IW012114BBL, IW012114CBL, IW012214ABL, IW012214BBL, IW012214CBL, IW012214DBL, IW012214EBL, and IW012214FBL).

The (U) qualifier was also attached to all sample results which were not greater than 5 times the concentration in the field blank: 13444202.

No other qualification was required. The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Katie Adams at the Region 10 Laboratory, phone number (360) 871- 8748.

12. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DU), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analyte and the percent recovery of the analyte is determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: April 29, 2014

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

From: Katie Adams, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of Black Butte Mine Phase 1 RI Storm Event 2
For Methylmercury

Project Code: SFP-047B
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox - CDM Smith

The following is a quality assurance review of the results of the analysis of 26 water samples for total methylmercury and 26 filtered water samples for dissolved methylmercury. These samples were submitted for the Black Butte Mine Phase 1 RI Storm Event 2 Project. The analyses were performed by EPA chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

Waters/Totals:

13444202	13444204	13444206	13444208	13444210	13444212	13444214
13444218	13444220	13444222	13444224	13444226	13444228	13444230
13444232	13444234	13444238	13444240	13444242	13444244	13444246
13444250	13444252	13444254	13444258	13444260		

Filtered/Dissolveds:

13444203	13444205	13444207	13444209	13444211	13444213	13444215
13444219	13444221	13444223	13444225	13444227	13444229	13444231
13444233	13444235	13444239	13444241	13444243	13444245	13444247
13444251	13444253	13444255	13444259	13444261		

Data Qualifications

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). A method excursion was required. The excursion is discussed in the Initial Calibration and Calibration Verification section below.

The quality control measures which did not meet Laboratory/QAPP criteria are annotated in the title of each affected subsection with **"Laboratory/QAPP Criteria Not Met".**

For those tests for which the USEPA Region 10 Laboratory has been accredited by The NELAC Institute (TNI), all requirements of the current TNI Standard have been met.

1. Sample Transport and Receipt -Laboratory/QAPP Criteria Not Met

Refer to the Corrective Action Notice dated 11/13/2013 for a record of observations made during sample receipt that may impact data quality. Findings do not affect the quality of the results.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations.

3. Sample Preparation

Samples were prepared according to the method outlined in the SOP for this analyte for this type of matrix. No qualification of the data was required based on sample preparation.

4. Initial Calibration and Calibration Verification

The calibration factors generated for the initial calibrations met method criteria. The low point of the calibration curve is usually the Minimum Reporting Level (MRL) of the method. All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

Note: Method 1630 requires 5 nonzero data points in a calibration curve. The calibration curve used on analysis date 01/15/14 only contains 4 nonzero data points. Only field blanks are reported from this analysis day; this method excursion is not expected to impact data quality. The calibration curve from 03/06/14 also contains only four points. The samples reported from this day of analysis were those bracketed by acceptable calibration points. Note that the method blanks analyzed this day (IW03/05/14ABL, BBL, CBL) had elevated reporting limits to reflect that the lowest point on the curve was dropped. Again, no impact on data quality is expected.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the method. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis

The method and field blanks did not contain detectable levels of analyte which would require data qualification.

7. Duplicate Analysis

Duplicate analysis was performed on samples 13444214, 13444215, 13444230, 13444250, 13444254, 13444255. Sample results which were greater than the MRL level were within the +/- 35% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on sample 13444214, 13444215, 13444230, 13444250, 13444254, 13444255. Sample results were within the 65-135% recovery and relative percent difference (RPD) requirements. No qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

No manual integrations were performed.

10. Interferences -Laboratory/QAPP Criteria Not Met

It is known that some conversion of inorganic mercury to methylmercury can occur during the distillation step of Method 1630, due to reaction of inorganic mercury with organic compounds in the sample. Because many samples from the project contained considerable levels of inorganic mercury, there was concern that this conversion could impact methylmercury results. Representative samples were spiked with inorganic mercury to observe the rate at which this conversion took place. Based on the results of this study, results for samples 13444214, 13444214DU, 13444226, 13444234, 13444238, and 13444246 were qualified (J), estimated, to reflect a possible high bias from conversion.

11. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the 'U' qualifier is attached.

12. Data Qualifiers

The (U) qualifier was attached to the results which fall below the reporting limit. No other qualification was required. The definition for the data qualifier is as follows:

Below are the definitions for the codes used qualifying data from these analyses. When more than one quality issue was involved, the most restrictive qualifier has been attached to the data.

U - The analyte was not detected at or above the reported value.

J - The identification of the analyte is acceptable; however the reported value is an estimate.

UJ - The analyte was not detected at or above the reported value. The reported value is an estimate.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Katie Adams at the Region 10 Laboratory, phone number (360) 871-8748.

13. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DU), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analyte and the percent recovery of the analyte is determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM
FOR INORGANIC CHEMICAL ANALYSES

DATE: December 11, 2013

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

FROM: Stephanie Le, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: Phase 1 Storm Event 2
For Nitrate plus Nitrite

Project Code: SFP-047B
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox – CDM Smith

The following is a quality assurance review of the results of 25 water samples for nitrate plus nitrite analysis. These samples were submitted for the Black Butte Mine: Phase 1 Storm Event 2 Project. The analyses were performed by ESAT chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

13444204	13444206	13444208	13444210	13444212	13444214	13444218
13444220	13444222	13444226	13444228	13444230	13444232	13444234
13444238	13444240	13444244	13444246	13444250	13444252	13444254
13444258	13444260	13445200				

13444262*

***"Results for this sample is not reported, see Section 1"**

Data Qualifications

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

The quality control measures which did not meet Laboratory/QAPP criteria are annotated in the title of each affected subsection with **"Laboratory/QAPP Criteria Not Met".**

For those tests for which the USEPA Region 10 Laboratory has been accredited by the National Environmental Laboratory Accreditation Conference (NELAC), all requirements of the current NELAC Standard have been met. The Region 10 Laboratory's Quality System has been accredited to the standards of the National Environmental Laboratory Accreditation Conference (NELAC).

1. Sample Transport and Receipt – Laboratory/QAPP Criteria Not Met

Refer to the Corrective Action Notice dated 11/13/2013 for a record of observations made during sample receipt. The container for sample13444262 was inadvertently preserved with nitric acid in the field. Due to the improper preservation, no result will be reported for this sample.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations, where applicable.

3. Sample Preparation

Samples were prepared according to the SOP for these analytes for this type of matrix. No qualification of the data was required based on sample preparation.

4. Initial Calibration and Calibration Verification

The linear regression generated for the initial calibrations met method criteria. The low point of the calibration curve is usually the Minimum Reporting Level (MRL) of the method. All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the methods reported. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis

The method blanks did not contain detectable levels of reported analytes which would require data qualification.

7. Duplicate Analysis

Duplicate analysis was performed on samples 13444214 and 13444254. Sample results which were greater than 5 times of the MRL level were within the +/- 20% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on samples 13444214 and 13444254. Sample results were within the 75-125% recovery requirements.

No qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

No manual integrations were performed.

10. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the ‘U’ qualifier is attached.

11. Data Qualifiers

The U-qualifier was attached to the results which were below the MRL. No result will be reported for sample 13444262 due to the improper preservation in the field.

No other qualification was required.

The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Stephanie Le at the Region 10 Laboratory, phone number (360) 871- 8715.

12. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DS), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analytes and the percent recoveries of the analytes are determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: November 21, 2013

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

FROM: Stephanie Le, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: Phase 1 Storm Event 2
For Total Suspended Solids

Project Code: SFP-047B
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox- CDM Smith

The following is a quality assurance review of the results of 24 water samples for Total Suspended Solids (TSS) analyses. These samples were submitted for the Black Butte Mine: Phase 1 Storm Event 2 Project. The analyses were performed by ESAT chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

13444204	13444206	13444208	13444210	13444212	13444214	13444218
13444220	13444222	13444226	13444228	13444230	13444232	13444234
13444238	13444240	13444244	13444246	13444250	13444252	13444254
13444258	13444260	13445200				

Data Qualifications:

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

All measures of quality control met Laboratory/QAPP criteria.

For those tests for which the USEPA Region 10 Laboratory has been accredited by the National Environmental Laboratory Accreditation Conference (NELAC), all requirements of the current NELAC Standard have been met. The Region 10 Laboratory's Quality System has been accredited to the standards of the National Environmental Laboratory Accreditation Conference (NELAC).

1. Sample Transport and Receipt

Upon sample receipt, all conditions met Laboratory/QAPP requirements for this project.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations, where applicable.

3. Sample Preparation

Samples were prepared according to the SOP for these analytes for this type of matrix. No qualification of the data was required based on sample preparation.

4. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the methods reported. No qualification was required based on laboratory control sample analysis.

5. Blank Analysis

The method blanks did not contain detectable levels of reported analytes which would require data qualification.

6. Duplicate Analysis

Duplicate analysis was performed on samples 13444214 and 13444254. Sample results which were greater than 5 times of the MRL level were within the ± 20% RPD requirement. No qualification was required based on duplicate analysis.

7. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses are not applicable to TSS analysis.

8. Instrument Peak Integrations

No manual integrations were performed for these methods.

9. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the 'U' qualifier is attached.

10. Data Qualifiers

The U-qualifier was attached to the results which were below the MRL. No other qualification was required. The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Stephanie Le at the Region 10 Laboratory, phone number (360) 871- 8715.

11. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DS), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analytes and the percent recoveries of the analytes are determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR INORGANIC CHEMICAL ANALYSES

DATE: July 2, 2014

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

From: Stephanie Le, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: RI Phase 1 Storm Event #3
For Methyl Mercury

Project Code: SFP-047F
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox – CDM Smith

The following is a quality assurance review of the results of the analysis of 28 filtered and 28 water samples for methyl mercury. These samples were submitted for the Black Butte Mine: RI Phase 1 Storm Event #3 Project. The analyses were performed by EPA chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

Filtered (dissolved) samples:

14064203	14064205	14064207	14064209	14064211	14064213	14064215
14064217	14064219	14064221	14064223	14064225	14064227	14064229
14064231	14064233	14064235	14064237	14064239	14064241	14064243
14064245	14074201	14074203	14074205	14074207	14074209	14074211

Water (total) samples:

14064200	14064202	14064204	14064206	14064208	14064210	14064214
14064216	14064218	14064220	14064222	14064224	14064226	14064228
14064230	14064232	14064234	14064236	14064238	14064240	14064242
14064244	14074200	14074202	14074204	14074206	14074208	14074210

Data Qualifications

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). A method excursion was required. The excursion is discussed in the "Initial Calibration and Calibration Verification" section below.

The quality control measures which did not meet Laboratory/QAPP criteria are annotated in the title of each affected subsection with **"Laboratory/QAPP Criteria Not Met".** Additional information which may affect data usage is discussed in a "*NOTE:*" which concludes the affected section.

For those tests for which the USEPA Region 10 Laboratory has been accredited by The NELAC Institute (TNI), all requirements of the current TNI Standard have been met.

1. Sample Transport and Receipt -Laboratory/QAPP Criteria Not Met

Refer to the Corrective Action Notices dated 02/20/2014 for a record of observations made during sample receipt that may impact data quality. All issues were administrative in nature and do not affect data quality.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations.

3. Sample Preparation

Samples were prepared according to the method outlined in the SOP for this analyte for this type of matrix. No qualification of the data was required based on sample preparation.

Note: The total methylmercury result for sample 14064222 is less than the result for the corresponding dissolved sample, 14064223. Analysis of these samples was repeated and the total sample was again less than the dissolved sample.

4. Initial Calibration and Calibration Verification

The calibration factors generated for the initial calibrations met method criteria. The low point of the calibration curve is usually the Minimum Reporting Level (MRL) of the method. All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

Note: Method 1630 requires 5 nonzero data points in a calibration curve. The calibration curve used on analysis date 06/17/14 only contains 4 nonzero data points. The samples reported from this day of analysis were bracketed by acceptable calibration points and not impact on data quality is expected.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the method. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis -Laboratory/QAPP Criteria Not Met

The method blanks did not contain detectable levels of analyte which would require data qualification.

The method states that values less than or equal to five times the concentration in the field blank are not to be reported. Though the field blank measurement was less than the reporting limit, the analytical result was not less than 5 times the result for samples 14064202, 14064204, 14064206, 14064215, 14064221, 14064236, 14064239, and 14074202 which are therefore qualified (U), undetected.

No additional qualification was required based on blank analysis.

7. Duplicate Analysis

Duplicate analysis was performed on samples 14064216 (total), 14064224 (total), 14074204 (total), 14064217 (dissolved), 14064225 (dissolved), and 14074205 (dissolved). Sample results which were greater than the MRL level were within the +/- 35% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on samples 14064216 (total), 14064224 (total), 14074204 (total), 14064217 (dissolved), 14064225 (dissolved), and 14074205 (dissolved). Sample results were within the 65-135% recovery and

relative percent difference (RPD) requirements. No qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

No manual integrations were performed.

10. Interferences -Laboratory/QAPP Criteria Not Met

It is known that some conversion of inorganic mercury to methylmercury can occur during the distillation step of Method 1630, due to reaction of inorganic mercury with organic compounds in the sample. Because many samples from the project contained considerable levels of inorganic mercury, there was concern that this conversion could impact methylmercury results. Representative samples were spiked with inorganic mercury to observe the rate at which this conversion took place. Based on the results of this study, results for samples 14064208, 14064214, 14064222, 14064223, 14064224DU, 14064230, 14064231, 14064238, 14064239, and 14074206 were qualified (J), estimated, to reflect a possible high bias from conversion.

11. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the 'U' qualifier is attached.

12. Data Qualifiers

The (U) qualifier was attached to all sample results that fall below the MRL (14064200, 14064203, 14064205, 14064207, 14064209, 14064210, 14064211, 14064213, 14064217, 14064217DU, 14064219, 14064225, 14064225DU, 14064227, 14064229, 14064233, 14064235, 14064237, 14064240, 14064241, 14064242, 14064243, 14064245, 14074200, 14074201, 14074203, 14074204, 14074204DU, 14074205, 14074205DU, 14074207, 14074208, 14074209, 14074210, 14074211, IW060314ABL, IW060314BBL, IW060314CBL, IW061614ABL, IW061614BBL, IW061614CBL, IW061914ABL, IW061914BBL, IW061914CBL, IW061914DBL, IW062614ABL, IW062614BBL, IW062614CBL, and IW062614DBL). The (U) qualifier was also attached to the sample results which were not greater than 5 times the concentration in the field blank: 14064202, 14064204, 14064206, 14064215, 14064221, 14064236, 14064239, and 14074202.

Samples 14064208, 14064214, 14064222, 14064223, 14064224DU, 14064230, 14064231, 14064238, 14064239, and 14074206 were qualified (J), estimated, due to the potential for high bias from mercury conversion to methylmercury during distillation.

Below are the definitions for the codes used qualifying data from these analyses. When more than one quality issue was involved, the most restrictive qualifier has been attached to the data.

U - The analyte was not detected at or above the reported value.

J - The identification of the analyte is acceptable; however the reported value is an estimate.

UJ - The analyte was not detected at or above the reported value. The reported value is an estimate.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Katie Adams at the Region 10 Laboratory, phone number (360) 871-8784.

13. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DU), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent

difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analyte and the percent recovery of the analyte is determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM
FOR INORGANIC CHEMICAL ANALYSES

DATE: December 10, 2013

TO: Rich Muza, Project Manager
Office of Environmental Cleanup, Site Cleanup Unit #2, US EPA Region 10

FROM: Stephanie Le, Chemist
Office of Environmental Assessment, US EPA Region 10 Laboratory

SUBJECT: Quality Assurance Review of the Black Butte Mine: Phase 1 Storm Event 2
For Alkalinity

Project Code: SFP-047B
Account Code: 2014T10P303DD210EKLA00

CC: Mary Lou Fox- CDM Smith

The following is a quality assurance review of the results of 24 water samples for alkalinity analysis. These samples were submitted for the Black Butte Mine: Phase 1 Storm Event 2 Project. The analyses were performed by ESAT chemists at the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

This review was conducted for the following samples:

13444204	13444206	13444208	13444210	13444212	13444214	13444218
13444220	13444222	13444226	13444228	13444230	13444232	13444234
13444238	13444240	13444244	13444246	13444250	13444252	13444254
13444258	13444260					

13444262*

***"Results for this sample is not reported, see Section 1"**

Data Qualifications:

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

The quality control measures which did not meet Laboratory/QAPP criteria are annotated in the title of each affected subsection with **"Laboratory/QAPP Criteria Not Met".**

For those tests for which the USEPA Region 10 Laboratory has been accredited by the National Environmental Laboratory Accreditation Conference (NELAC), all requirements of the current NELAC Standard have been met. The Region 10 Laboratory's Quality System has been accredited to the standards of the National Environmental Laboratory Accreditation Conference (NELAC).

1. Sample Transport and Receipt – Laboratory/QAPP Criteria Not Met

Refer to the Corrective Action Notice dated 11/13/2013 for a record of observations made during sample receipt. The container for sample13444262 was inadvertently preserved with nitric acid in the field. Due to the improper preservation, no result will be reported for this sample.

2. Sample Holding Times

The concentration of an analyte in a sample or sample extract may increase or decrease over time depending on the nature of the analyte. For this reason, holding time limits are recommended for samples. The samples covered by this review met method holding time recommendations, where applicable.

3. Sample Preparation

Samples were prepared according to the SOP for these analytes for this type of matrix. No qualification of the data was required based on sample preparation.

4. Initial Calibration and Calibration Verification

All calibration verification checks met the frequency and recovery criteria on the day of analysis. No qualification was required based on calibration or calibration verification.

5. Laboratory Control Samples

All laboratory control sample results met the recovery acceptance criteria for the methods reported. No qualification was required based on laboratory control sample analysis.

6. Blank Analysis

The method blanks did not contain detectable levels of reported alkalinity which would require data qualification

7. Duplicate Analysis

Duplicate analyses were performed on samples 13444214 and 13444254. Sample results which were greater than 5 times of the MRL level were within the ± 20% RPD requirement. No qualification was required based on duplicate analysis.

8. Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike analyses were performed on samples 13444214 and 13444254. Sample results were within the 75-125% recovery requirements. No qualification was required based on matrix spike analyses.

9. Instrument Peak Integrations

No manual integrations were performed for these methods.

10. Reporting Limits

All sample results that fall below the MRL are assigned the value of the MRL and the 'U' qualifier is attached.

11. Data Qualifiers

The U-qualifier was attached to the results which were below the MRL. No alkalinity result will be reported for sample 13444262 due to the improper preservation in the field. No other qualification was required for this analysis.

The definition for the data qualifier is as follows:

U - The analyte was not detected at or above the reported value.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Stephanie Le at the Region 10 Laboratory, phone number (360) 871- 8715.

12. Definitions

Accuracy - the degree of conformity of a measured or calculated quantity to its actual value.

Duplicate Analysis – when a duplicate of a sample (DS), a matrix spike (MSD), or a laboratory control sample (LCSD) is analyzed, it is possible to use the comparison of the results in terms of relative percent difference (RPD) to calculate precision.

Laboratory Control Sample (LCS) - a clean matrix spiked with known quantities of analytes. The LCS is processed with samples through every step of preparation and analysis. Measuring percent recovery of each analyte in the LCS provides a measurement of accuracy for the analyte in the project samples. A laboratory control sample is prepared and analyzed at a frequency no less than one for every 20 project samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Sample analyses performed to provide information about the effect of the sample matrix on analyte recovery and measurement within the project samples. To create the MS/MSD, a project sample is spiked with known quantities of analytes and the percent recoveries of the analytes are determined.

Method Blank- An analytical control that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination. A method blank is prepared and analyzed for every batch of samples at a minimum frequency of one per every 20 samples. To produce unqualified data, the result of the method blank analysis is required to be less than the MRL and less than 10 times the amount of analyte found in any project sample.

Minimum Reporting Level (MRL) - the smallest measured concentration of a substance that can be reliably measured using a given analytical method.

Peak Integrations - The output of many analytical instruments is a peak which represents the quantity of analyte in the sample. The instrument automatically integrates the peak area to provide the concentration of the analyte; however, sometimes these peaks need to be manually integrated by the analyst.

Precision – the degree of mutual agreement or repeatability among a series of individual results.

Relative Percent Difference – The difference between two sample results divided by their mean and expressed as a percentage

Black Butte Mine Superfund Site
November 2013 Precipitation Sampling
Data Validation Report

Laboratory: Eurofins Frontier Global Sciences

Matrix Water (Precipitation)

Sample Delivery Group (SDG) Numbers and Samples in SDGs:

SDG	Sample
1311283	13444262

Collection date: 11/7/2013

Analysis/Methods: Methyl-Mercury by EPA 1630, Modified
Low-Level Mercury by EPA 1631E

Validation to the Stage 4 level was performed in accordance with EPA methods1630 and 1631E, the Black Butte Mine Phase 1 Remedial Investigation - Surface Water Storm Sampling and Sediment Sampling QAPP, the laboratory's Standar Operating Procedure, EPA National Functional Guidelines for Inorganic Superfund Data Review (2010), and Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use.

Methyl-Mercury by EPA 1630, Modified

Precision:	**Yes No N/A**
Field Duplicates relative percent difference (RPD) criteria met? (control limits RPD ≤ 50%)	**N/A**
Matrix Spike/Matrix Spike Duplicates (MS/MSD) RPD criteria of 24% met?	**N/A**
Lab Control Sample/Lab Control Sample Duplicate (LCS/LCSD) or RPD criteria of 25% met?	**Yes**

Accuracy:	**Yes No N/A**
Calibration Factor RSD < 15%?	**Yes**
Is the Initial Precision and Recovery(IPR) sample or Initial Calibration verification (ICV) within 79-121%?	**Yes**
Are Ongoing Precision and Recovery (OPR) or Continuing Calibration Verification (CCV) solution recoveries within 77-123%?	**Yes**
Are the ethylation blanks < 0.050 ng/L?	**Yes**
Were the method blank results < 0.050 ng/L?	**Yes**
Lab Control Sample/Lab Control Sample Duplicate (LCS/LCSD) or Quality Control Sample/Quality Control Sample Duplicate (QCS/QCSD) RPD criteria of 25% met?	**Yes**
Lowest standard meet recovery criteria of 65-135% ?	**Yes**

Comments (note deviations): Field duplicates are not practical for the precipitation sampler and due to limited volume, a matrix spike/matrix spike duplicate set was not done. Due to a lack of Certified Reference Material for water, a Laboratory Control Sample/Laboratory Control Sample duplicate set was performed per Eurofins/Frontier Global SOP.

Low-Level Mercury by EPA 1631E

Precision:	**Yes No N/A**
Field Duplicates RPD criteria met? (control limits RPD ≤ 50%)	**N/A**
Matrix Spike/Matrix Spike Duplicates (MS/MSD) RPD criteria of 24% met?	**N/A**
LCS/LCSD or QCS/QCSD RPD criteria of 24% met?	**Yes**

Accuracy:	**Yes No N/A**
Calibration Factor RSD < 15%?	**Yes**
Is the IPR or ICV sample within 79-121%?	**Yes**
Are Ongoing Precision and Recovery (OPR) or Continuing Calibration Verification (CCV) solution recoveries within 77-123%?	**Yes**
Are the ethylation blanks < 0.050 ng/L?	**Yes**
Were the method blank results < 0.050 ng/L?	**Yes**
LCS/LCSD or QCS/QCSD analyses meet recovery criteria of 70-130%?	**Yes**
Lowest standard meet recovery criteria of 75-125% ?	**Yes**

Comments (note deviations): Field duplicates are not practical for the precipitation sampler and due to limited volume, a matrix spike/matrix spike duplicate set was not done. Due to a lack of Certified Reference Material for water, a Laboratory Control Sample/Laboratory Control Sample duplicate set was performed.

Representativeness:	**Yes No N/A**
Were sampling procedures and design criteria met?	**Yes**
Were holding times met?	**Yes**
Were preservation criteria met? (4 °C ± 2 °C)	**See Note**
Were Chain-of-Custody records complete and provided in data package?	**Yes**

Comments (note deviations): The precipitation sample is collected in the sampler in a large glass jug with hydrochloric acid preservative and is shipped back to the laboratory with the used sampling train in a cooler with foam packing designed for secure packing of the sample and sampling train (space in the cooler for ice). The laboratory noted that chilling of the sample during the return to the laboratory was not necessary.

Completeness (90%):	**Yes No N/A**
Are all data in this SDG useable?	**Yes**

Comments (note deviations): None

Sensitivity:	**Yes No N/A**
Are MDLs present and reported?	**Yes**
All results within the linear range of the instrument?	**Yes**

Comments (note deviations): EPA Methods 1631E for low-level mercury and 1630 for methyl-mercury state that results below the Minimum Level (ML) should be reported as < ML unless otherwise required by a regulatory/ permitting authority or permit. Results are not typically reported below the ML with J qualifiers.

Data Validator: Mary Lou Fox Date: 7/15/2014

Data Reviewer: Kimberly Zilis Date: 8/5/2014

Black Butte Mine Superfund Site
November 2013 2nd Storm Event Surface Water Sampling
Data Validation Report

Laboratory:	AmTest Laboratories
Matrix:	Surface Water

Sample Delivery Group (SDG) Numbers and Samples in SDGs:

SDG	Samples
13-A016513	13444201 13444205 13444207 13444209
13-A016626	13444213 13444215 13444217 13444219 13444221 13444223 13444227 13444229 13444231 13444233 13444235 13444239 13444245 13444247 13444251 13444253 13444255 13444259 13444261

Collection dates:	November 6, 7, and 8, 2013
Analysis/Methods:	DOC SW-846 415.3 UV_{254} SW-848 415.3 $SUVA_{254}$ SW-846 415.3

Validation to the Stage 4 (S4VM) level was performed in accordance with the methods and the Black Butte Mine Phase 1 Remedial Investigation - Surface Water Storm Sampling and Sediment Sampling QAPP,EPA National Functional Guidelines for Inorganic Superfrund Data Review(2010), and EPA Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use.

Dissolved Organic Carbon (DOC) SW-846 415.3

Precision:	**Yes No N/A**
Were the Field Duplicate relative percent differences (RPD) ≤ 50%?	**Yes**
Were the Matrix Spike Duplicate RPDs ≤ 20%?	**NA**

Comments: (note deviations): None

Accuracy:	**Yes No N/A**
Were the Matrix Spike criteria met? (frequency ≥ 5% and laboratory determined control limits)	**Yes**
Standard References Material criteria met?	**Yes**
Were the ICAL criteria met? Method requirement: $r^2 \geq 0.993$	**Yes**
Were the CCV criteria met? Method requirement: %D's for low-level, ± 50%; mid-level, ± 20%; high-level ± 15%?	**Yes**

Comments (note deviations): None

UV Absorption at 254 nanometers SW-846 415.3

Precision:	**Yes No N/A**
Were the Field Duplicate relative percent differences (RPD) ≤ 50%?	**No, see note**
Were the laboratory duplicate RPDs ≤ 20%	**Yes**

Comments: (note deviations): UV 254 was detected in the filter blank just above the reporting limit of 0.002 L/mg-M at 0.003 L/mg-M. UV 254 was detected in all of the samples , except two (113BBM-FC1-SW-000 and 1113BBM-FC1-SW-003) at levels greater than ten times the detection in the filter blank. The UV 254 results in samples 1113BBM-FC1-SW-000 and 1113BBM-FC1-SW-003 were qualified as undetected (U).

Accuracy:	**Yes No N/A**
Standard References Material criteria met?	**Yes**
Were the Laboratory Method Blank results all < CRQL?	**Yes**

Comments (note deviations): None

$SUVA_{254}$ SW 846-415.3

Note: The $SUVA_{254}$ value is determined by dividing the UV_{254} result by the DOC result with a conversion of centimeters to meters. The RPD for the calculated $SUVA_{254}$ result for 0214BBM-DC1-SW-002 and its filed

Comparability:	**Yes No N/A**
Were analytical procedures and methods followed as defined in the QAPP or field change documentation?	**Yes**

Comments (note deviations): None

Completeness (90%):	**Yes No N/A**
Are all data in this SDG usable?	**Yes**

Comments (note deviations): None

Sensitivity:	**Yes No N/A**
Do the reporting limits meet project requirements?	**Yes**
Are results within the linear range of the instrument?	**Yes**

Comments (note deviations): None

Data Validator: Mary Lou Fox Date: 7/10/2014

Data Reviewer: Kimberly Zilis Date: 8/5/2014