

Supplemental Site Inspection Report for the Big Wood River Mercury Investigation for the Minnie Moore Gulch and Broadford Slough

Blaine County



**State of Idaho
Department of Environmental Quality**

June 2015



Printed on recycled paper, DEQ June 2015, RM28,
CA 610. Costs associated with this publication are
available from the State of Idaho Department of
Environmental Quality in accordance with Section 60-
202, Idaho Code.



STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

1410 North Hilton • Boise, ID 83706 • (208) 373-0502

C. L. "Butch" Otter, Governor
Curt Fransen, Director

June 30, 2015

Mr. Ken Marcy
U.S. Environmental Protection Agency
Region 10
12928 SW 276th Street
Vashon, WA 98070

Subject: Supplemental Site Inspection Report for the Big Wood River, Mercury Investigation for the Minnie Moore Gulch and Broadford Slough, Blaine County, Idaho

Dear Mr. Marcy:

The Idaho Department of Environmental Quality (DEQ) completed the enclosed Supplemental Site Inspection (SI) for the Big Wood River under a cooperative agreement with Region 10 of the United States Environmental Protection Agency (EPA). Under this cooperative agreement, DEQ provides technical support for completion of preliminary assessments.

In 2008, Ecology and Environment, Inc. performed a SI on the Big Wood River under the EPA Region 10 Superfund Technical Assessment and Response Team program. Elevated metals were detected in sediment samples, including three mercury detections above the DEQ initial default target level. EPA requested that DEQ perform a reconnaissance site visit and supplemental sampling to further investigate these 2008 mercury detections. Sampling was conducted on September 18, 2014.

The 2014 results show detections of several metals in soil and sediment samples. Comparison of mercury detections between 2008 and 2014 show slightly lower concentrations in 2014 for co-located sites; however, the highest concentrations of mercury were detected in 2014 in upland soils and a downstream sediment sampling location. Detections of metals in the upland soil sample present possible concerns for soil exposures and air pathways. Although mercury is detected in sediment, mercury was not detected in the surface water samples.

In conjunction with this Supplemental SI, DEQ visited the Minnie Moore Mill Site which is the location of a 2005 EPA Removal Action. DEQ performed an inspection of the activity and use limitations set in the Environmental Covenant signed by DEQ and Minnie Moore Resources. At the time of this inspection, there was no evidence that waste material was moving into the river from the capped tailings pile.

This Supplemental SI report can also be found on DEQ's Preliminary Assessment web page: www.deq.idaho.gov/preliminary-assessments. If you have any questions, please feel free to give me a call at (208) 373-0296 or email dana.swift@deq.idaho.gov.

Sincerely,

A handwritten signature in blue ink that reads "Dana Swift".

Dana Swift
Mine Waste Project Coordinator

Attachments

**Supplemental Site Inspection Report
For the Big Wood River
Mercury Investigation for the Minnie Moore
Gulch and Broadford Slough**

Blaine County

June 2015



**Prepared by
Idaho Department of Environmental Quality
Mine Waste Program
1410 N. Hilton
Boise, Idaho 83706**

Table of Contents

List of Acronyms	v
1 Introduction.....	1
2 Site Description	2
2.1 Site Location and Ownership	2
2.2 General Geology	5
2.3 Climatology	7
2.4 Operational History of Past Mining Activities.....	7
2.5 Remedial Actions	9
2.6 Current and Potential Future Land Uses	10
3 Sample Collection and Analysis	10
3.1 Summary of 2008 Site Investigation Results	10
3.2 2014 Supplemental Site Investigation Results	10
3.3 2014 Minnie Moore Site Inspection.....	17
4 Migration/Exposure Pathways and Targets	19
4.1 Ground Water Pathways.....	19
4.2 Surface Water Pathways.....	23
4.3 Soil Exposures and Air Pathways	25
5 Summary and Conclusions	25
6 References.....	27
6.1 GIS Coverages.....	27
Appendix A. Field Checklists	29
Appendix B. Laboratory Sample Reports	37

List of Tables

Table 1. 2008 Site Investigation analytical detections in sediment above the instrument detection limit.....	11
Table 2. Tributaries and 2008 SI observations along the 2 mile stretch of concern.....	12
Table 3. Surface water analytical and field parameter results for Big Wood River samples collected on September 18, 2014.....	15
Table 4. Sediment and soil analytical results for the Big Wood River samples collected on September 18, 2014.....	16
Table 5. Comparison of 2008 and 2014 Site Investigation mercury detections in sediment and soil samples.	26

List of Figures

Figure 1. 2008 Site Investigation sampling locations (E&E 2010).	3
Figure 2. Topographic overview map of the sample locations.	4
Figure 3. Map of major lithology in the vicinity of the sample locations.	6
Figure 4. Location of 2005 EPA Removal Action.....	18
Figure 5. Domestic well and public water system locations.....	20
Figure 6. Source water delineation time of travel for Chestnut Well, City of Bellevue Public Water System.....	21
Figure 7. Source water delineation time of travel for Chantrelle Well, City of Bellevue Public Water System.....	22
Figure 8. Wetlands.....	24

List of Photos

Photo 1. Mammoth Gulch sample location.....	13
Photo 2. Mouth of Minnie Moore Gulch sample location.	13
Photo 3. Minnie Moore tailings cap.....	13
Photo 4. Close-up of Minnie Moore tailings cap.....	13
Photo 5. Broadford Slough sample location.	14
Photo 6. Close-up of Broadford Slough north of Heronwood Road culvert sample location.	14
Photo 7. Broadford Slough south side of Townsend Gulch Road sample location.....	14

List of Acronyms

CRQL	contract required quantitation limit
DEQ	Idaho Department of Environmental Quality
EC	environmental covenant
E&E	Ecology and Environment, Inc.
EPA	United States Environmental Protection Agency
GIS	geographic information system
HDPE	high-density polyethylene
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IDTL	initial default target level
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MS/MSD	matrix spike/matrix spike duplicate
NAIP	National Agriculture Imagery Program
ORP	oxidation reduction potential
PA	preliminary assessment
PPE	probable point of entry
ppm	parts per million
PQL	practical quantitation limit
PWS	public water system
QA/QC	quality assurance/quality control
RPD	relative percent difference
RSL	regional screening level
SI	site inspection
SQL	sample quantitation limit
START	Superfund Technical Assessment & Response Team
SVL	SVL Analytical, Inc.
SWA	source water assessment
TDL	target distance limit
TDS	total dissolved solids
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

This page intentionally left blank for correct double-sided printing.

1 Introduction

In 2008, Ecology and Environment, Inc. (E&E) performed a Site Inspection (SI) on the Big Wood River under the EPA Region 10 Superfund Technical Assessment and Response Team (START) program. The SI was designed to determine whether contamination from mining activities drained from tributaries to the Big Wood River. Specific mine sources were not investigated. Elevated metals were detected at seven out of 20 sediment sample locations, including three mercury detections above the Idaho Department of Environmental Quality (DEQ) initial default target level (IDTL) and one of those mercury detections above the Environmental Protection Agency (EPA) regional screening level (RSL; E&E 2010).

EPA requested that DEQ perform a reconnaissance site visit and sampling to further investigate the 2008 mercury detections. This report presents the *Supplemental SI for the Big Wood River, Mercury Investigation for the Minnie Moore Gulch and Broadford Slough* in Blaine County, Idaho which was conducted under a cooperative agreement with EPA Region 10. Under this cooperative agreement, DEQ provides technical support for performing the Preliminary Assessment (PA)/SI process at various mine and industrial sites located on private, state, or mixed ownership (public and private) lands. DEQ also completes assessments in response to complaints or information about sites possibly contaminated with hazardous waste. Additional information about DEQ's PA program can be found at: <http://www.deq.idaho.gov/preliminary-assessments>.

DEQ initiated the PA/SI program in February 2002 to prioritize and assess potentially contaminated sites. Due to accessibility and funding considerations, priority is given to sites where potential contamination poses the most substantial threat to human health or the environment. In recent years, this priority focuses DEQ's efforts in areas where residential and recreational developments are encroaching on historic mining districts. Priority is also given to mining districts where groups or clusters of sites can be cost-effectively assessed on a watershed basis.

The 2014 Supplemental SI is presented in the following sections:

- Section 2, **Site Description**, compiles desktop research information to present the location, ownership, general geology, and climatology for the site. Desktop research also includes compiling the operational history of past mining activities, past remedial actions related to the site, and current and potential future land uses.
- Section 3, **Sample Collection and Analysis**, describes the sampling locations and analytical results.
- Section 4, **Migration/Exposure Pathways and Targets**, presents observations and potential targets for the ground water pathway, surface water pathway, soil exposures and air pathway.
- Section 5, **Summary and Conclusions**, presents a summary of the SI results and recommendations based on the current conditions at the site.

2 Site Description

The site description for the 2014 Supplemental SI includes the following information: location and ownership (Section 2.1), general geology (Section 2.2), climatology (Section 2.3), operational history of past mining activities (Section 2.4), remedial actions related to the site (Section 2.5) and current and potential future land uses (Section 2.6). As part of the desktop research, DEQ uses references from historic reports which often have different spellings for claim names, town sites, and/or geographic features. DEQ retains the spelling and usage from the original source documents.

2.1 Site Location and Ownership

The stretch of the Big Wood River under investigation is located in the south central portion of the state, along Highway 75, and near Ketchum, Hailey and Bellevue, Idaho. The 2008 SI field sampling event included the portion of the river beginning at the confluence of Warm Springs Creek with the Big Wood River (northern boundary) and concluding at the confluence of Townsend Gulch with the Big Wood River (southern Boundary; Figure 1).

Based on the 2008 SI results and observations, the area of focus for this 2014 Supplemental SI is Minnie Moore Gulch and the surrounding two mile stretch along a side channel, Broadford Slough, between BR26 to BR20 (Figures 1 and 2; Township 2 North, Range 18 E, Sections 2, 26, 27, 35). All three 2008 SI mercury detections in sediment were associated with Minnie Moore Gulch: within gulch (NG01), approximately 25 feet downstream of gulch (BR23), and the next downstream sample location (BR21) which is upstream of the next tributary, Lee's Gulch.

All samples were collected on Idaho Department of Lands (IDL) property within the bed and banks of the river, slough, side channels or tributaries. DEQ does not warrant the location of property boundaries contained in this report.

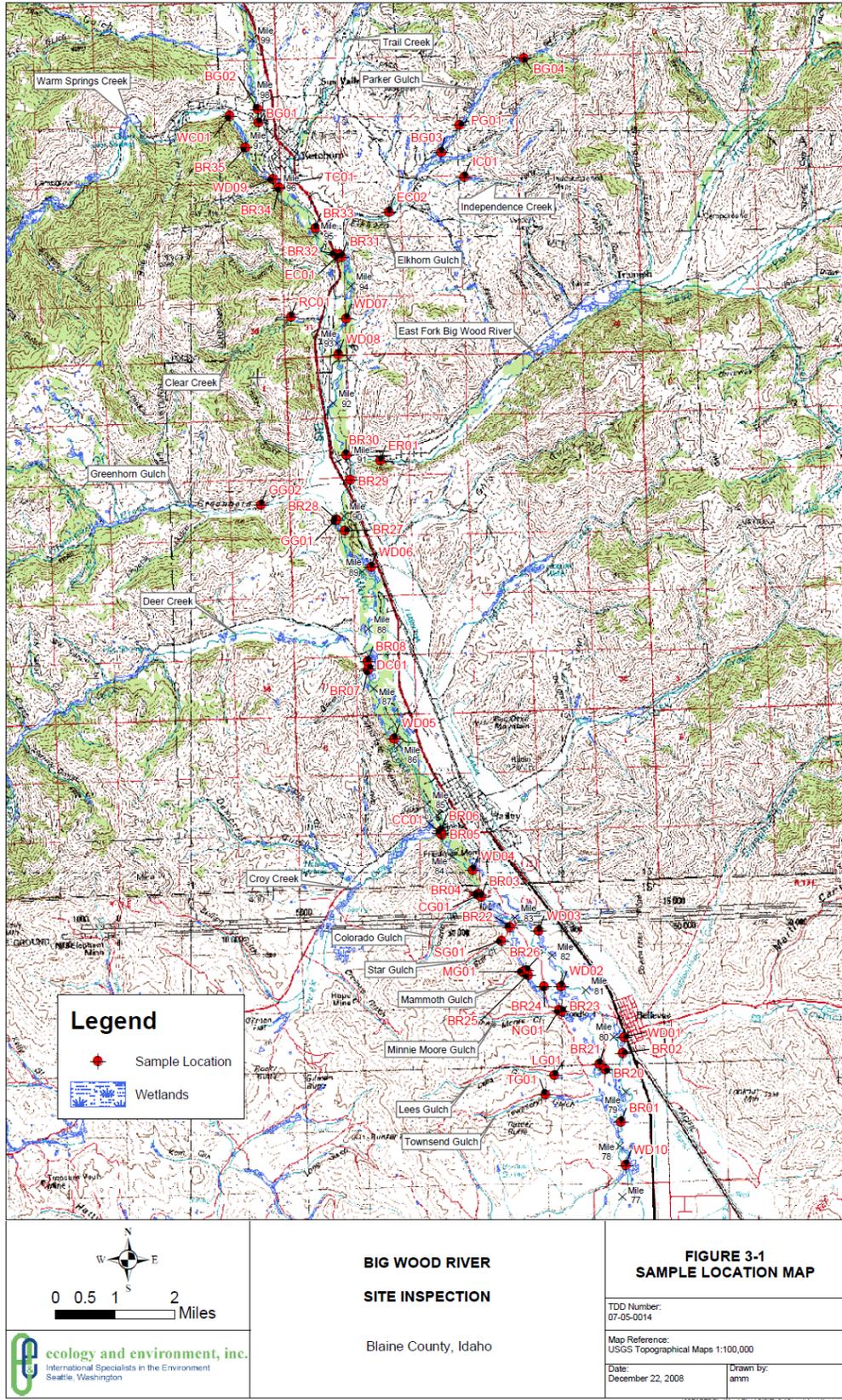


Figure 1. 2008 Site Investigation sampling locations (E&E 2010).

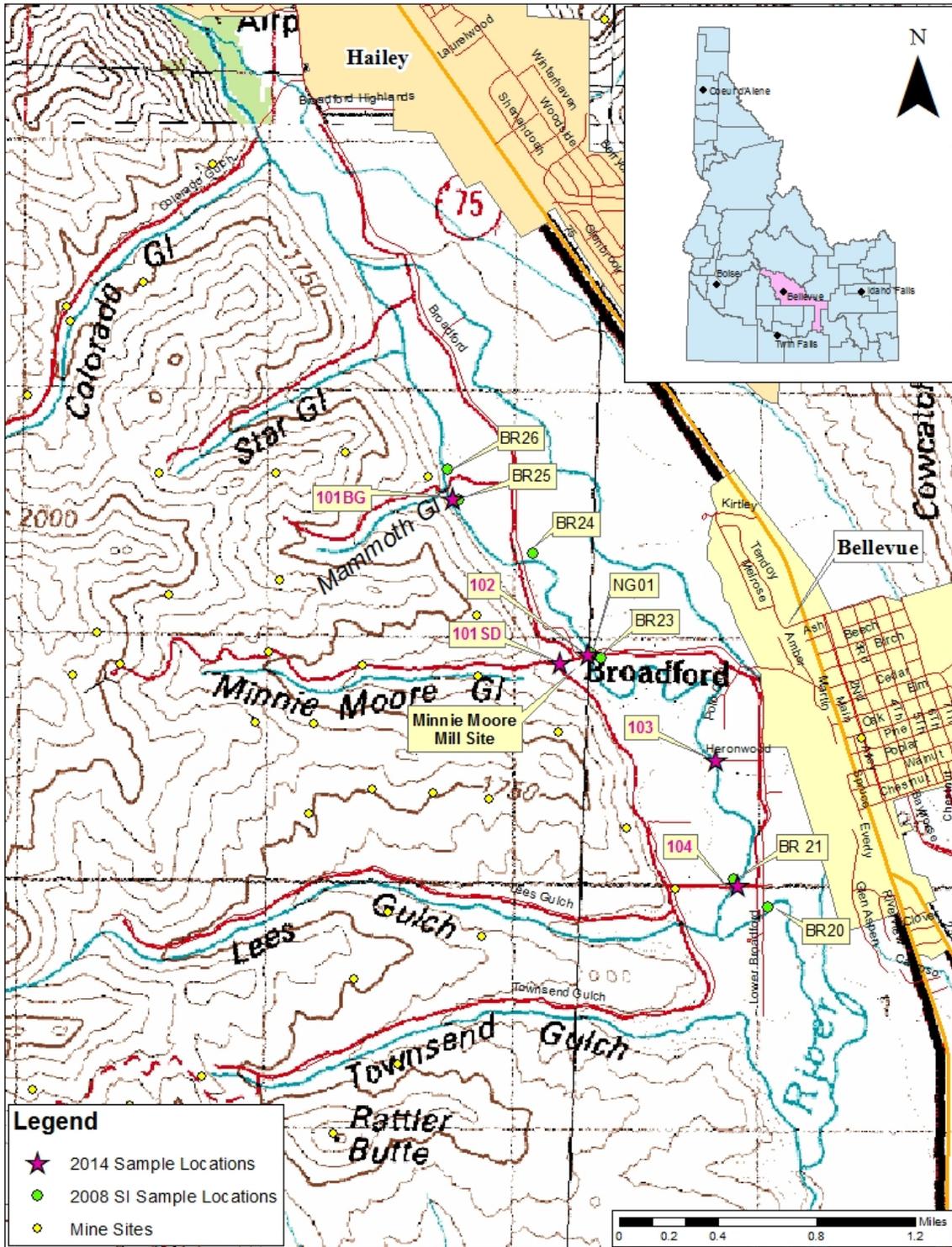


Figure 2. Topographic overview map of the sample locations.

2.2 General Geology

A map of the major lithology of this area is shown in Figure 3. The following information identifies the general geology and lithology as it relates to past mining activities; specifically the Minnie Moore Mine near the mouth of Minnie Moore Gulch, a tributary to the Big Wood River. Since DEQ cannot improve or expand upon information included in historic reports, this information is quoted directly from the Idaho Bureau of Mines and Geology *Detailed Geology of Certain Areas in the Mineral Hill and Warm Springs Mining Districts* (Anderson et al., 1950, p. 15). The figure referenced in the quote below has not been duplicated in this report.

The Minnie Moore vein is in argillitic rocks of the Milligen formation close to several limestone members a short distance under the sill-like body of diorite (Fig. 4). The Walkers¹ have divided the Milligen locally into the Michigan argillite (100 ± feet), the Penobscot formation (80 feet Upper Penobscot limestone; 40 feet Intermediate argillite; and 30 feet Lower Penobscot limestone); and the Defiance argillite (800 ± feet), listed from top to bottom.

These beds strike generally northwest and dip southwest at about 30°, with two notable exceptions. One of these is between the Minnie Moore and Relief shafts, where the strike locally changes to west-southwest for 200 to 300 feet and then resumes its northwest direction. This change produces a shallow synclition trough of southerly pitch which coincides with the middle of the Minnie Moore ore body. The other exception is near the 1,000-foot level of the Minnie Moore shaft. There the beds flatten and locally dip slightly to the northeast for some 200 to 300 feet before resuming their normal 30° southwest dip.

The diorite body conforms roughly to the northwesterly strike and southwesterly dip of the Milligen beds, although the contact is quite irregular. Both the diorite and sedimentary beds are cut by a few dikes and sills.

¹ R.T. Walker, geologist for United States Smelting, Refining & Mining Co., and W.J. Walker, whose geologic work on the Minnie Moore was presented in a private report to which Anderson had access.

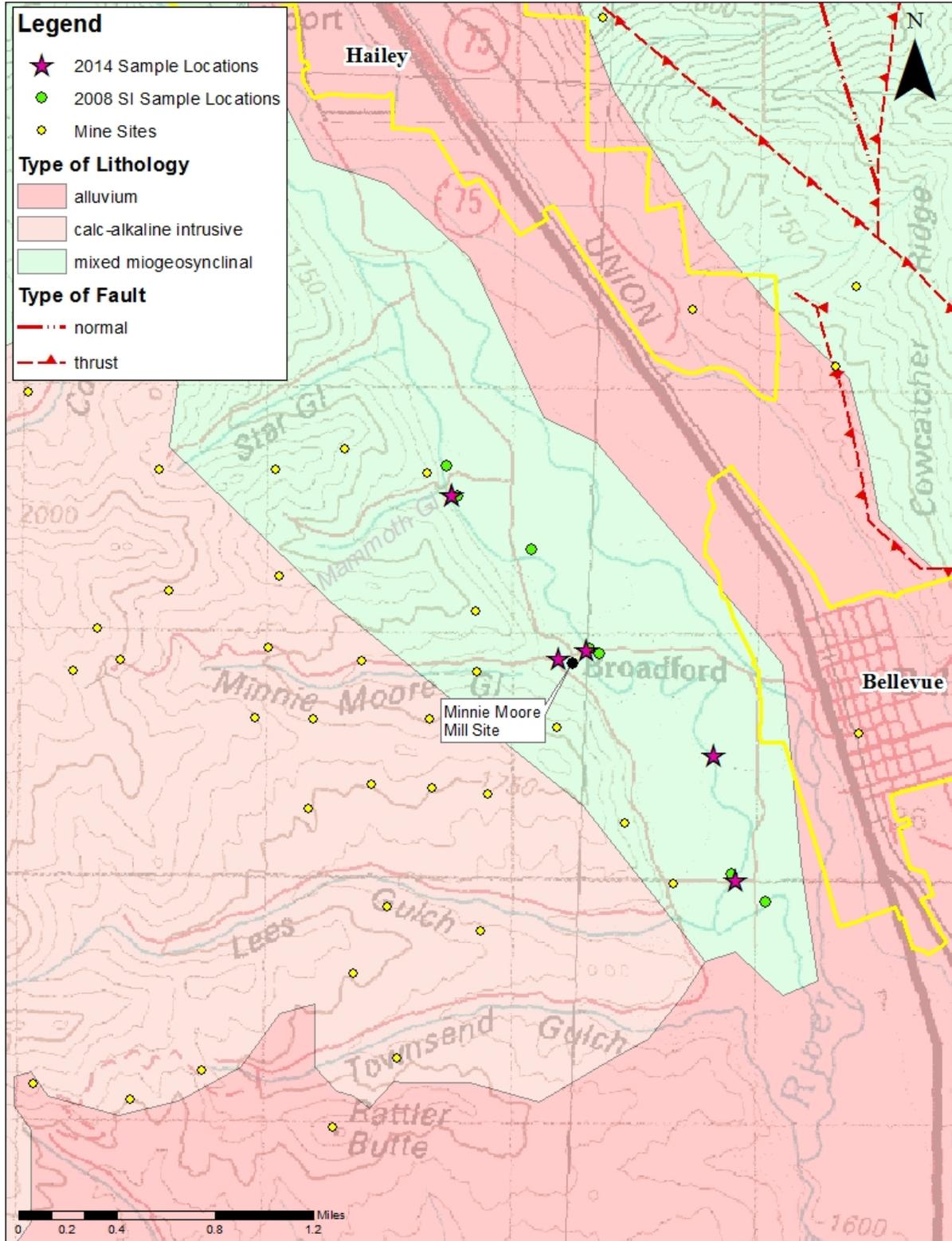


Figure 3. Map of major lithology in the vicinity of the sample locations.

2.3 Climatology

Climate information for this area is based on a summary for Hailey, Idaho obtained from the Western Regional Climate Center. The climatological data is collected at the Hailey 3 NNW Model Station (103942) (elevation 5,424 amsl) located approximately two miles from the sampling area.

This region is characterized by short, cool, dry summers and cold winters. Based on data collected from 1981 to 2010, total annual precipitation averages 13.43 inches. The driest months of the year are July, August, and September.

Based on records from 1981 to 2010, the average annual high temperature is 57.7°F and the average annual low temperature is 30.2°F. August is the hottest month with an average high temperature of 84.9°F. January is the coldest month with an average low temperature of 9.7°F.

2.4 Operational History of Past Mining Activities

Information about the operational history of past mining activities helps DEQ understand the levels of production, commodities, and potential waste types at the site. DEQ uses historical research for several purposes: identify the potential contaminants of concern, estimate the magnitude of waste at the site, and identify historical land uses that coincide with mining. This information is necessary to prepare for the SI field work.

DEQ acknowledges that many of the mine sites described in the historical documents are particularly important to both the federal government and State of Idaho. Historical information documents the relative importance of historic mining districts and workings as they are reevaluated from the perspective of economics, multiple land use, human health risks, and ecological risks.

Since DEQ cannot improve or expand upon information included in historic reports, this information is quoted directly from the following (tables and figures referenced in the quotes below have not been duplicated in this report):

Idaho Bureau of Mines and Geology *Detailed Geology of Certain Areas in the Mineral Hill and Warm Springs Mining Districts* (Anderson et al., 1950, p. 13-14).

Historical Sketch

Discovery of the Minnie Moore has been credited to a badger which brought fragments of galena ore to the surface and made it possible for John M. Moore to locate the otherwise concealed ore body. Within three years after discovery of the ore, which was made in 1880, the Minnie Moore shaft had been started and some high-grade ore developed. (For a detailed story of the history of the Minnie Moore mine up to the late twenties the reader is referred to U.S. Geol. Survey Bull. 814).

In 1884 the property was sold to Dent, Palmer, and Co., an English firm, for \$450,000, and the Minnie Moore shaft sunk to the 500-foot level, where a “pinch” in the ore body was interpreted to mean the bottom of the ore. By 1886 all the ore had been mined down to the “pinch” and operations were suspended. Later in the year the property was leased and work on the shaft resumed. This led to discovery of the downward extension of the ore body within 100 feet. The shaft was continued to the 900-foot level where the ore body ended against the Rockwell fault. Failing to find ore beyond the fault, and with all the ore mined above the fault, work came to an end (1889).

Ten years later the property was sold for \$30,000 to I. E. Rockwell and associates. After several years of exploratory work the continuation of the ore body beyond the Rockwell fault was found (9102), and the property again began shipping ore. In 1904, while still in production, the property was sold to Chas. M. Schwab for \$800,000. In the following year the ore body was found to terminate against the Minnie fault (between the 900 and 1100 levels). Search was carried out on the other side of the fault but continuation of the ore body was not found. After all the ore had been mined down to the fault the property was sold back to Rockwell and associates (1906). Some exploratory work continued until 1910 and resumed two or three years later, but after a year, work was again suspended, and the mine remained idle until 1923.

Beginning in 1923, five different operators made successive attempts to recover the ore shoot beyond the Minnie fault by exploring eastward on the 800, 900, 1,000-foot levels of the Allen shaft. The ore shoot was not found and in May, 1927, the mine was abandoned. However, two fault segments of the ore body were found, but according to R.T. Walker the operators were confused on finding four faults instead of one and failed to recognize the strike-slip movement on these faults. Hence, they had not realized that the ore body had been shifted east of the ground they had explored.

In 1932, the Federal Mining and Smelting Co. sank the Rockwell shaft near the mouth of Galena Gulch [Minnie Moore Gulch] to explore the extension of the Queen of the Hills vein on Minnie Moore ground. This work was later abandoned but three years later a crosscut was started by the Minnie Moore Mines Development Company on the 450 level of the Rockwell shaft to explore the area southeast of the old workings in the hope of finding the faulted extension of the Minnie Moore ore body. Before the area was reached, the crosscut (Hershey crosscut) was stopped and work diverted southeasterly toward an area in which the existence of a large ore body was claimed on geophysical evidence. The Bergman lateral failed to find the ore body but did expose the Bergman vein, a probable extension of the Minnie Moore, east of the part known to contain the ore shoot. As funds had been exhausted in the Bergman lateral, work on the Hershey crosscut could not be resumed and in 1941 the project was abandoned, and the workings allowed to fill with water.

In 1949 the Silver Star – Queens Mines Company began to rehabilitate the Rockwell shaft in order to gain entrance to the deeper levels of the Old Queen of the Hills mine. During the summer a new headframe was raised to replace the old one which had collapsed in the shaft and by the end of the year pumps were at work unwatering the shaft and the old workings of the Minnie Moore mine.

Property and Development

The property consists of 20 patented and 20 unpatented claims covering the lower part of Galena Gulch and the ridge between Galena Gulch and Lee Gulch, as shown in Figure 3. This map (Fig. 3) gives the location of the shafts and underground workings as well as the areal geology of the property and also the workings of the old Queen of the Hills mine. The underground workings and geology of the Minnie Moore, complete to 1941, are depicted on a larger scale in Figure 5.

The Minnie Moore has been developed by three inclined shafts, the Minnie Moore, Relief, and Allen; and by one vertical shaft, the Rockwell. The Minnie Moore shaft, the original working entry, has a slope length of 1,100 feet on a 30° angle. From it are 11 levels with an inclined winze, the 1012 winze, sunk from the 1,000-foot level. The Minnie shaft is caved and beyond repair. The Relief shaft, about 700 feet to the west of the Minnie Moore, is a single compartment shaft inclined at 20° with a length of about 800 feet. It has five levels and is still open. The Allen shaft, which is about 800 feet west of the Relief, has three compartments and is sunk to a depth of 850 feet at an angle of 35°. This shaft also has five levels and a two-compartment winze, (the Boeriche), which gives an additional depth of 325 feet. This shaft also is open. All three shafts closely parallel the Minnie Moore vein. The Rockwell shaft, about 1,700 feet east of the Minnie Moore, is a two-compartment shaft 500 feet deep with levels at 250 and 450 feet, workings on the 450 level, which include the Hershey crosscut and the Bergman lateral and drifts, and are by far the most extensive. These workings are connected with the 1,000-foot level of the Minnie Moore by a diamond drill hole which permits the old workings to be drained from the Rockwell shaft.

EPA Site Inspection Report (Herrera 2004, p. 7) *Minnie Moore Mine Site Blaine County, Idaho.*

The Minnie Moore Mine was the most famous of the Big Wood River silver mines, producing about \$7 million worth of ore between 1881 and 1887. According to a state historical marker, the Minnie Moore grossed \$8.4 million while active. Since the early 1900s, the site has had more than 15 owners.

Idaho Geological Survey (IGS) (Mitchell, p. 34-35) *History of the Minnie Moore Mine, Blaine County, Idaho.*

In 1978, Carl Johnston purchased the Minnie Moore for \$250,000. In 1980, a company based in Hailey reprocessed material from the dump.

High-grade silver ore was accidentally uncovered at the mine around the middle of 1983. A contractor who was breaking up rock for riprap to line river banks discovered the vein in holes being drilled for blasting. Soon after the discovery, Exxon Minerals obtained an interest in the property. In 1984, Exxon conducted a major land acquisition program in the Hailey area, reopened old mines to obtain geologic information, and did drilling and extensive surface exploration. The company continued its exploration program in 1985.

A year of low petroleum prices forced most of the oil companies in the U.S. to make drastic cuts in programs and staffing in 1986. Exxon was no exception, cutting capital expenditures by 25 percent and laying off over a quarter of its employees. The company apparently dropped its exploration work in the Hailey area at this time. Figure 15 shows the mine area and tailings pond as they appeared in the summer of 1994.

Total recorded production from the Minnie Moore between 1881 and 1947 was 96,197 tons of ore and 41,499 tons of reprocessed tailings. This material yielded 139 ounces of gold, 2,580,974 ounces of silver, 23,495 pounds of copper, 31,250,301 pounds of lead, and 640,419 pounds of zinc. These numbers must be considered a minimum. No accurate information is available prior to 1886, and it is highly unlikely that all production from leasing operations in the early days of the mine is included in the tabulated data. In addition, no production was recorded for the Minnie Moore during the period after 1950, when Silver Star-Queens Mines and Federal Resources were operating both the Minnie Moore and Queen of the Hills mines. Although undoubtedly small, any ore found while rehabilitating and exploring the Minnie Moore workings was not separated from the ore shipped from the Queen of the Hills mine. Finally, no information is available on the metals obtained from the tailings shipped from the property in 1980.

2.5 Remedial Actions

The Minnie Moore Mill Site identified on Figure 2 is the location of a 2005 EPA On-Scene Coordinator Removal Action (EPA 2006). Removal activities began on September 26, 2005 and included the excavation and on-site disposal of approximately 2,500 tons of lead-contaminated surface soils from the mill area, consolidation of excavated soil on the existing tailings pile, reconfiguration of the tailings pile to minimize erosion and infiltration, and construction of a permanent cover on the tailings pile including placement of clean soil and vegetation for stabilization. Removal action was completed in October 2005.

In 2013, an Environmental Covenant (EC) was signed by DEQ and Minnie Moore Resources (DEQ 2013). Under this EC, DEQ has right of access to the property for the purpose of ensuring compliance with the activity and use limitations, specifically maintenance of the soil and vegetative cover, fencing, and restrictions on excavation, digging and trenching activities. In conjunction with this sampling event, DEQ visited the site, observed the current state of the tailings pile, and determined if any erosion or other visible migration of contaminants to Broadford Slough is occurring.

2.6 Current and Potential Future Land Uses

The population of Bellevue/Broadford was 2,287 during the 2010 census; a population increase from 1,876 in 2000. Current land uses in the area include residential homes, farming, recreational activities such as fishing, picnicking, hiking, and tourism. These current uses are likely to continue into the future.

3 Sample Collection and Analysis

EPA requested that DEQ perform a reconnaissance site visit and sampling to further investigate the 2008 mercury detections. Based on the 2008 results and observations, the area of focus for this 2014 Supplemental SI is Minnie Moore Gulch and the surrounding two mile stretch along Broadford Slough.

3.1 Summary of 2008 Site Investigation Results

The 2008 results included elevated metal detections in seven out of 20 sediment sample locations (Tables 1 and 2). Six of the locations were consecutive from BR26 to BR20 (Figures 1 and 2) which cover a two mile stretch along a side channel of the Big Wood River, including Broadford Slough. The mercury detection in sediment from Minnie Moore Gulch was not considered elevated per the 2008 SI criteria; however all three mercury detections are above the Idaho DEQ IDTL of 0.00509 mg/kg in soil and the result from the Minnie Moore Gulch is above EPA RSL of 0.94 mg/kg in soil. The seventh sediment location with elevated metals concentrations (arsenic, cobalt, lead, and zinc) was BR31SD, collected downstream of Elkhorn Gulch and located north of this two mile stretch (Figure 1); however, mercury was not detected at this location.

Surface water samples only showed an elevated concentration of manganese at BR08 (25 feet upstream of Deer Creek). No elevated concentrations were detected within the two mile stretch of concern; however, surface water samples could not be collected from Star Gulch or Minnie Moore Gulch since no water was present at the time of the sampling event. A summary of observations for each tributary from the 2008 SI are stated in Table 2.

3.2 2014 Supplemental Site Investigation Results

On September 18, 2014, DEQ visited the site and collected soil, sediment, and surface water samples. Sampling was conducted in accordance with DEQ's Quality Assurance Project Plan for the Preliminary Assessment Program and the Field Sampling Plan for the Big Wood River Mercury Investigation (DEQ 2014a and 2014b). Modifications to the sampling plan were made in the field based on observed conditions and access to the planned sampling locations. All sampling was conducted on IDL property. DEQ did not purposely trespass on any private holdings.

Table 1. 2008 Site Investigation analytical detections in sediment above the instrument detection limit.

Station Location	Location Description	Media	Analyte	2008 Result (mg/kg)*
BR26	Big Wood River sample from side channel Upstream of Mammoth Gulch	Sediment	Cadmium	1.8 JL
			Zinc	205
BR25	Big Wood River sample from side channel Downstream of Mammoth Gulch	Sediment	Cadmium	4.7 JL
			Zinc	483
BR24	Big Wood River sample of Broadford Slough	Sediment	Cadmium	2.8 JL
			Lead	75.7
			Zinc	291
NG01	Minnie Moore Gulch	Sediment	Mercury	0.95**
BR23	Big Wood River sample of Broadford Slough Downstream of Minnie Moore Gulch	Sediment	Arsenic	58.7 JL
			Cadmium	4.5 JL
			Lead	735
			Mercury	0.22
			Silver	9.4
			Zinc	866
BR21	Big Wood River sample of Broadford Slough Upstream of Lee's Gulch	Sediment	Arsenic	84.4 JL
			Cadmium	3.4 JL
			Copper	38.3
			Lead	1440
			Manganese	1930
			Mercury	0.35
			Silver	16.9
			Zinc	1130
BR20	Big Wood River sample of Broadford Slough Downstream of Lee's Gulch	Sediment	Arsenic	40 JL
			Lead	438
			Zinc	333

*Only the values representing 'sample result is elevated' are shown, as defined as: 1) Equal to or greater than sample Contract Required Quantitation Limit (CRQL) or Sample Quantitation Limit (SQL) (non-contract laboratory program), 2) equal to or greater than sample background CRQL or SQL when background is below the detection limit or 3) 3x greater than background.

**Above detection limit but not elevated.

J = the associated value is an estimated quantity

L = low bias

Mercury detections are highlighted.

Table 2. Tributaries and 2008 SI observations along the 2 mile stretch of concern.

Tributary to the Big Wood River	2008 SI Observations
Star Gulch	Located approximately 0.6 mile upstream of 2 mile stretch. No water at time of 2008 SI sampling event. Sediment samples were not collected immediately downstream; hence the nearest downstream sediment sample to this gulch is upstream of Mammoth Gulch (BR26SD).
Mammoth Gulch	Cadmium and zinc elevated both upstream and downstream. No water at time of 2008 SI sampling event.
Minnie Moore Gulch	Higher metals concentrations in sediments relative to other tributaries. Similar concentrations 25 feet downstream (BR23SD) and next downstream sample (BR21SD). Mercury detected in gulch (NG01SD) and both locations downstream of gulch (BR23SD and BR21SD). No water at time of 2008 SI sampling event.
Lee’s Gulch	Not likely a source of contamination for mercury when comparing upstream BR21SD to downstream BR20SD results.

Six soil/sediment samples were collected and five grab surface water samples, including one field blank, were collected (Figure 2, Tables 3 and 4):

- **Background** (Photo 1)—sediment (BWBR101SDBG) and surface water (BWBR101SWBG); downstream of Mammoth Gulch, co-located with 2008 sample BR25.
- **Mouth of Minnie Moore Gulch** (Photos 2, 3, 4)—Soil (BWNG101SD), no surface water present. This upland soil sample was collected in a location where fine sediment accumulates and is available for windblown transport (near the electric pole shown in Photo 2). Most of the soil in this surrounding area is well compacted, especially along the road.
- **Downstream of Minnie Moore Gulch on Broadford Slough** (Photo 5)—sediment (BWBR102SD and BWBR102SDD duplicate) and surface water (BWBR102SW and BWBR103SW duplicate), co-located with 2008 sample BR23.
- **Broadford Slough North of Heronwood Road Culvert** (Photo 6)—sediment (BWBR103SD) and surface water (BWBR103SW).
- **Broadford Slough South Side of Townsend Gulch Road** (Photo 7)—sediment (BWBR104SD) and surface water (BWBR104SW), co-located with 2008 sample BR21.
- **Field Blank** (BWBR104B)—Quality Assurance/Quality Control (QA/QC) sample.



Photo 1. Mammoth Gulch sample location.



Photo 3. Minnie Moore tailings cap.



Photo 2. Mouth of Minnie Moore Gulch sample location.



Photo 4. Close-up of Minnie Moore tailings cap.



Photo 5. Broadford Slough sample location.

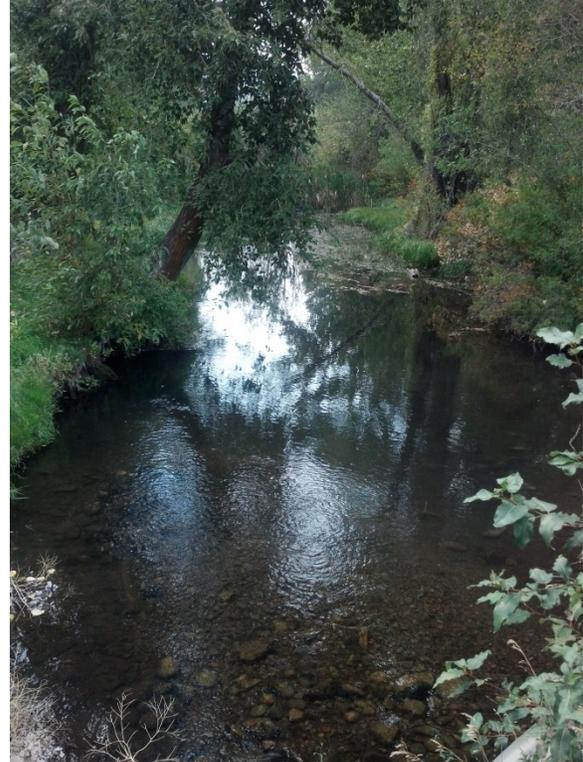


Photo 7. Broadford Slough south side of Townsend Gulch Road sample location.



Photo 6. Close-up of Broadford Slough north of Heronwood Road culvert sample location.

**Table 3. Surface water analytical and field parameter results for Big Wood River samples collected on September 18, 2014
(Concentrations expressed in milligrams per liter [mg/L] unless otherwise noted.)**

Analyte/Parameter	EPA Drinking Water Standard MCL	DEQ Cold Water Biota Standard Acute	DEQ Cold Water Biota Standard Chronic	Background Sample BWBR101SWBG	BWBR102SW	Duplicate Sample BWBR102SWD	BWBR103SW	BWBR104SW	Field Blank Sample BWBR104B
Antimony (Sb)	0.006	—	—	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Arsenic (As)	0.01	0.34	0.15	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Barium (Ba)	2	—	—	0.0414	0.0427	0.0419	0.0479	0.0442	<0.0020
Cadmium (Cd)	0.005	0.00056 to 0.0012 (H)	0.00031 to 0.00053 (H)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Chromium (Cr) (Total)	0.1	—	—	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Copper (Cu)	1.0 ^a	0.064 to 0.0153 (H)	0.0047 to 0.0103 (H)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Iron (Fe)	0.3 ^a	—	—	0.111	0.172	0.160	0.338	0.080	<0.060
Lead (Pb)	0.015 ^b	0.021 to 0.057 (H)	0.0008 to 0.0022 (H)	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300
Manganese (Mn)	0.05 ^a	—	—	0.0088	0.0209	0.0177	0.0299	0.0092	<0.0040
Mercury (Hg)	0.002	—	—	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Selenium (Se)	0.05	0.02 (T)	0.005 (T)	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300
Silver (Ag)	0.10 ^a	0.0006 to 0.0029 (H)	—	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc (Zn)	5 ^a	0.049 to 0.107 (H)	0.049 to 0.108 (H)	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
Temperature (°C)	—	—	Cold water aquatic life 22°C or less or a maximum daily average not >19°C ^c Salmonid spawning 13°C or less with a maximum daily average not >9°C	15.7	16.6	—	18.18	18.3	—
pH (su)	6.5 – 8.5 ^a	—	6.5 – 9.0	6.6	8.2	—	8.26	8.33	—
Hardness (as CaCO ₃)	—	—	—	—	—	—	—	—	—
Oxidation Reduction Potential (mV)	—	—	—	213	—	—	141	140	—
Conductivity (µs/cm)	—	—	—	0.287	0.28	—	0.279	0.273	—
Turbidity (NTU)	^b	Not >50 NTU instantaneous	Not >50 NTU instantaneous and no >25 NTU over a 10 day period	15.5	16	—	20.2	13.1	—
Dissolved Oxygen	—	—	>6 ppm	13.13	16.03	—	11.01	11.6	—
Total Dissolved Solids (g/L)	—	—	—	0.188	0.182	—	0.182	0.178	—

Concentrations expressed in milligrams per liter [mg/L] unless otherwise noted.

Shaded values indicate exceedances of water quality standards.

Bold/Large Font = three times background concentrations

Note: (T)—Standard in Total, (H)—Hardness dependent for Cd, Cu, Pb, Ni, Ag, Zn, range presented based on calculated values for all samples (excluding background)

^a Secondary Standard Maximum Contaminant Level (MCL) – non-enforceable guideline.

^b Action level regulated by treatment technique.

^c Only a snapshot temperature reading was collected. A daily temperature average was not collected.

mg/L=milligram per liter; MCL=maximum contaminant level; su=standard units; mV=millivolts; µs/cm=micro-Siemens per centimeter; NTU=nephelometric turbidity unit; g/L=gram per liter

Table 4. Sediment and soil analytical results for the Big Wood River samples collected on September 18, 2014.

Metals	IDTLs (mg/kg)	Background Sediment Sample BWBR101-SDBG (mg/kg)	Upland Soil Sample BWNG101SD (mg/kg)	Sediment Sample BWBR102SD (mg/kg)	Duplicate Sediment Sample BWBR102SDD (mg/kg)	Sediment Sample BWBR103SD (mg/kg)	Sediment Sample BWBR104SD (mg/kg)
Antimony (Sb)	4.77	<2.0	92.1	9.8	<2.0	<2.0	<2.0
Arsenic (As)	0.391	8.83	455	19.6	9.76	44.4	18.1
Barium (Ba)	896	264	225	243	341	183	317
Cadmium (Cd)	1.35	3.78	97.2	2.67	2.35	8.39	7.83
Chromium (Cr)	7.9 ^b	35.0	23.2	36.8	37.7	30.8	42.0
Copper (Cu)	921	26.9	252	27.8	27.4	66.7	54.2
Iron (Fe)	—	17,600	31,200	20,500	21,100	19,300	21,800
Lead (Pb)	49.6	49.0	9,350	215	86.9	957	496
Manganese (Mn)	223	711	2,720	879	1,100	1,260	994
Selenium ^a (Se)	2.03	2.74	4.22	0.879	0.868	2.35	2.30
Silver ^a (Ag)	0.189	<0.50	60.1	10.1	0.76	13.2	7.04
Zinc (Zn)	886	300	12,300	431	256	843	620
Mercury ^a (Hg)	0.00509	0.078	2.05	0.083	0.067	0.453	0.275

Shaded values exceed IDTL criteria.

IDTLs = Initial default target levels for soil; most conservative levels established by IDEQ, meeting these levels allows unrestricted (residential) use of the property.

Bold/Large Font = three times background concentrations.

a = The laboratory practical quantitation limit (PQL) is higher than the IDTL.

b = IDTL is based on Chromium (VI).

The field samples were collected, handled, and stored in accordance with the field sampling plan and submitted to SVL Analytical, Inc. (SVL) in Kellogg, Idaho for analysis. Unfiltered surface water samples were collected as grab samples, at a depth of ~1 to 2 feet below the river water level, in 500 mL high-density polyethylene (HDPE) containers and then preserved with nitric acid. Parameters measured in the field at each sampling location included temperature, pH, oxidation reduction potential (ORP), conductivity, turbidity, dissolved oxygen, and total dissolved solids (TDS). A copy of the field checklists is included as Appendix A and the laboratory report as Appendix B. A summary of the field parameters and laboratory results for surface water are summarized in Table 3 and for sediment and soil in Table 4. The results are discussed in the context of pathways and targets in Section 4.

Samples collected for evaluating QA/QC included one field blank and two duplicate surface water and sediment samples. The field blank was collected at the site using distilled water. None of the target analytes were detected in the field blank; all concentrations were below the laboratory practical quantitation limit (PQL). The analytical results of the duplicate surface water samples (BWBR102SW and BWBR102SWD) show that the RPD goal of 20 percent was met for all metals. The analytical results of the duplicate sediment samples (BWBR102SD and BWBR102SDD) show that the relative percent difference (RPD) goal of 20 percent was met for Cd, Cr, Cu, Fe, and Se; the maximum RPD allowed of 50 percent was met for Ba, Mn, and Hg; and the RPD goal was not met for Sb, As, Pb, Ag and Zn. The primary constituent of concern for this 2014 Supplemental SI is Hg in sediment, which had an RPD of 21 percent. The field duplicate samples were collected using the replicate method where samples were taken one immediately following the other; rather than being collected as split subsamples drawn from the same initial volume. For the sediment analyses, all laboratory QC samples for blanks were non-detect and matrix spike/matrix spike duplicate (MS/MSD) sample results fell within the acceptance limits for percent recovery and met the RPD goal of 20 percent. Therefore, the differences in the sediment duplicate samples are likely representative of variabilities in field conditions.

3.3 2014 Minnie Moore Site Inspection

The Minnie Moore Mill Site identified on Figure 2 is the location of a 2005 EPA On-Scene Coordinator Removal Action (EPA 2006). In conjunction with this SI, DEQ visited the mill site to inspect compliance with the activity and use limitations stated in the EC (DEQ 2013) which included observing the current state of the tailings pile to determine if any erosion or other visible migration of contaminants to Broadford Slough is occurring. The location of the tailings pile and 2014 sampling locations within this vicinity are shown in Figure 4.



Figure 4. Location of 2005 EPA Removal Action.

Based on this inspection, there was no evidence of excavation, digging or trenching on the waste pile and the vegetative cover was in place. However, the EC states that the cover will consist of grasses and forbs; therefore, some native shrubs will need to be removed before they grow too big (Photos 3 and 4). Only a few small areas (about six square inches) of physical disturbance to the cap were observed where the cap has been worn away by wildlife use on the east side. This is a trail where animals travel down to the Big Wood River. Overall, there was no evidence that waste material was moving into the river.

Follow-up items include repairing the fence which was damaged by a recent vehicle accident, removing shrubs over the next couple of years, and monitoring the wildlife trail and placing clean soil or large rocks as needed to control future damage to the cap (DEQ 2014c).

4 Migration/Exposure Pathways and Targets

The purpose of the 2014 Supplemental SI is to further investigate the mercury detections observed during the 2008 SI (E&E 2010) and determine potential source(s) of metals contamination into the Broadford Slough and Big Wood River. The following sections identify migration and exposure pathways for potential contaminant sources and releases with the associated human and ecological receptors.

4.1 Ground Water Pathways

In areas where historic mines are close to residential areas, contamination of drinking water systems may come from two types of mine sources (ore bodies and waste dumps). Potential drinking water systems within a 4-mile radius (Figure 5) currently includes six public water systems (PWS) and 624 domestic wells. No PWS or domestic wells were sampled as part of this SI.

Source water assessment (SWA) summary reports are available for the Chestnut Well (A0004264) and Chantrelle Well (A0018529) which are PWS for the City of Bellevue (PWS#ID5070004). The SWA contains information about the population served by each PWS and susceptibility rankings for potential contaminants. The rankings are high, moderate or low for inorganic, volatile organic, synthetic organic and microbial contaminants based on system construction, potential contaminant inventory/land use, and hydrologic sensitivity (i.e., likelihood that the water supply will become contaminated based on the hydrologic and geologic conditions surrounding the PWS).

The City of Bellevue PWS serves approximately 2,000 people. For both wells, a moderate ranking for hydrologic sensitivity and a final susceptibility ranking of moderate was assigned for all of the contaminant categories except microbial which received an auto high ranking. The auto high ranking is assigned if a contaminant is detected. No inorganic contaminants were detected. Maps showing the source water delineation time of travel for the two wells are shown as Figures 6 and 7 (DEQ 2015). Based on these maps, surface water is not included within the source water capture zone and the sampling area for this SI is outside the ground water capture area for a 10 year travel time.

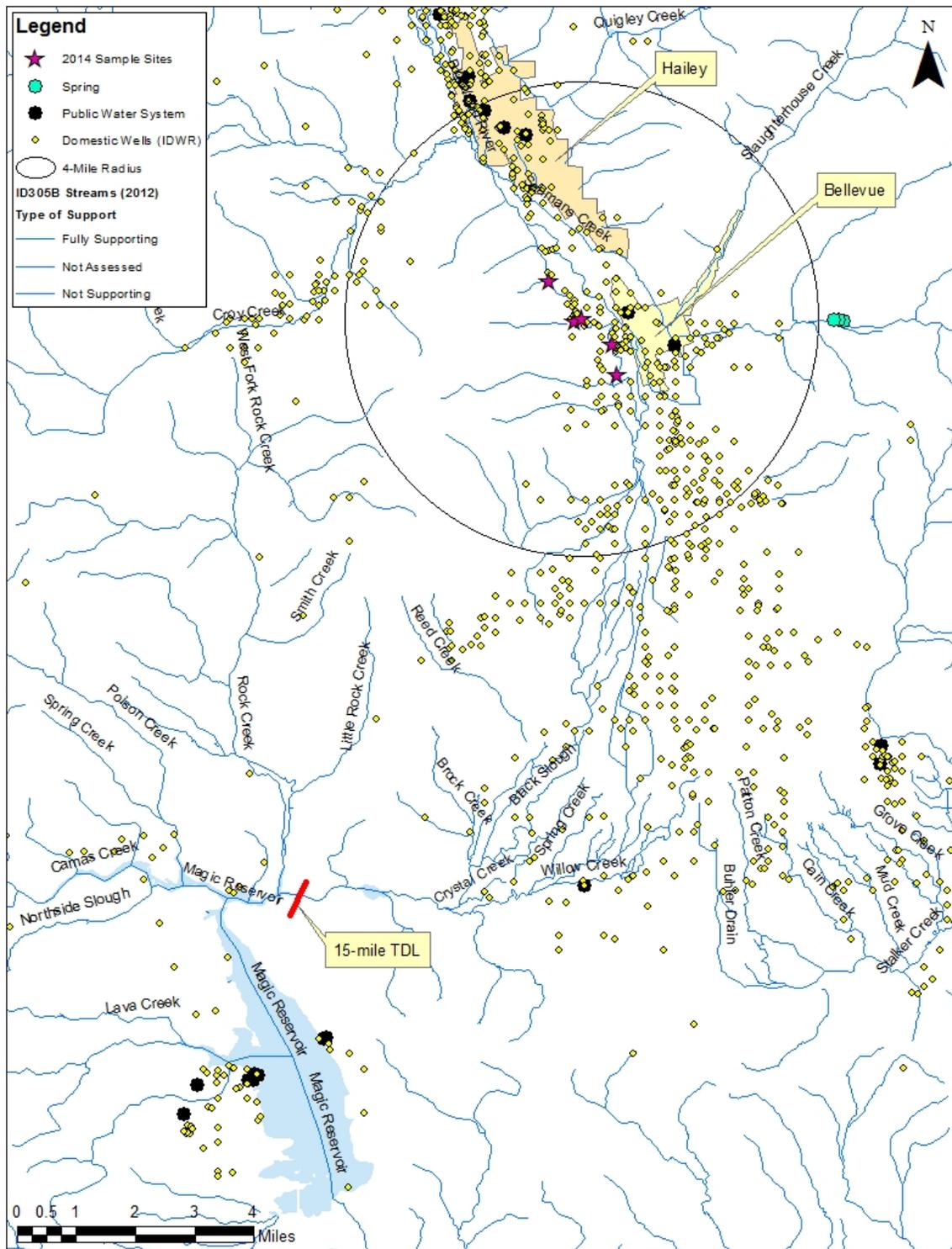
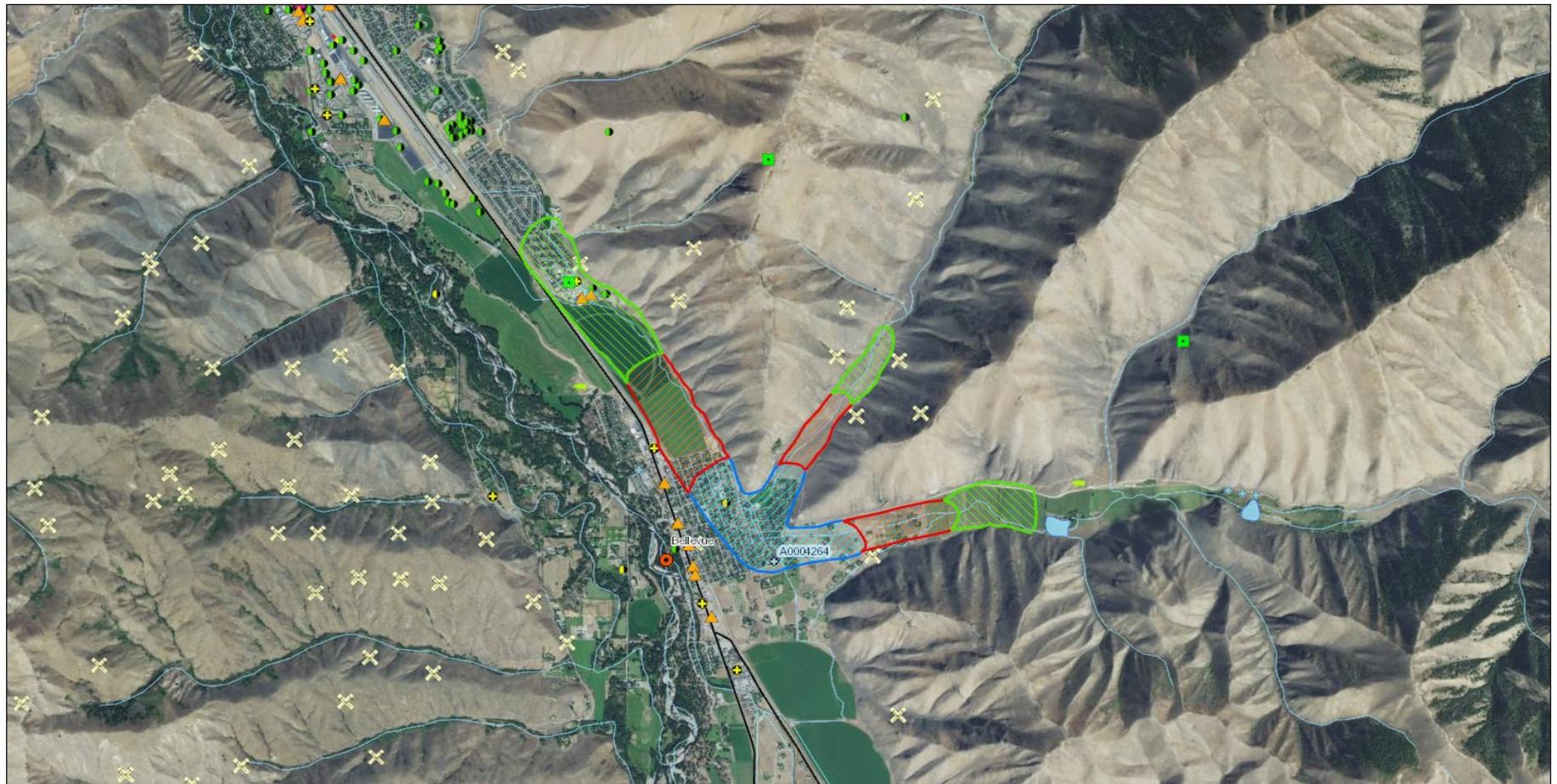


Figure 5. Domestic well and public water system locations.

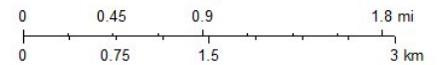
Chestnut Well PWS



June 23, 2015

- | | | | | |
|--|---|--|--|---|
| <ul style="list-style-type: none"> ● Source Location (s elected) Source Water Delineation (TOT) 3 Year TOT 6 Year TOT 10 Year TOT Surface Water ● Source Location (all) | <ul style="list-style-type: none"> Potential Contaminants Inventory Locations ● Brownfield Site ▲ CERCLA Site ● Toxics Release Inventory Site ■ General Waste Site ▲ UST/LUST Site ● Dairy ■ Feedlot | <ul style="list-style-type: none"> ● Deep Injection Well ● Shallow Injection Well ● NPDES Location ● RCRA Site ● Drain Location ● Road Salt Location ● Mine Site ● CAMEO Chemical Facility | <ul style="list-style-type: none"> ● Tunnels and Drains — Railroad Streets (100k) — Limited Access — Highway — Major Road — Other Road — Ramp | <ul style="list-style-type: none"> — 4WD — Trail ■ Lakes — Streams ■ Phosphate Mine ■ Water Reuse Area ■ Wastewater Lagoon ■ Landfill |
|--|---|--|--|---|

1:36,627

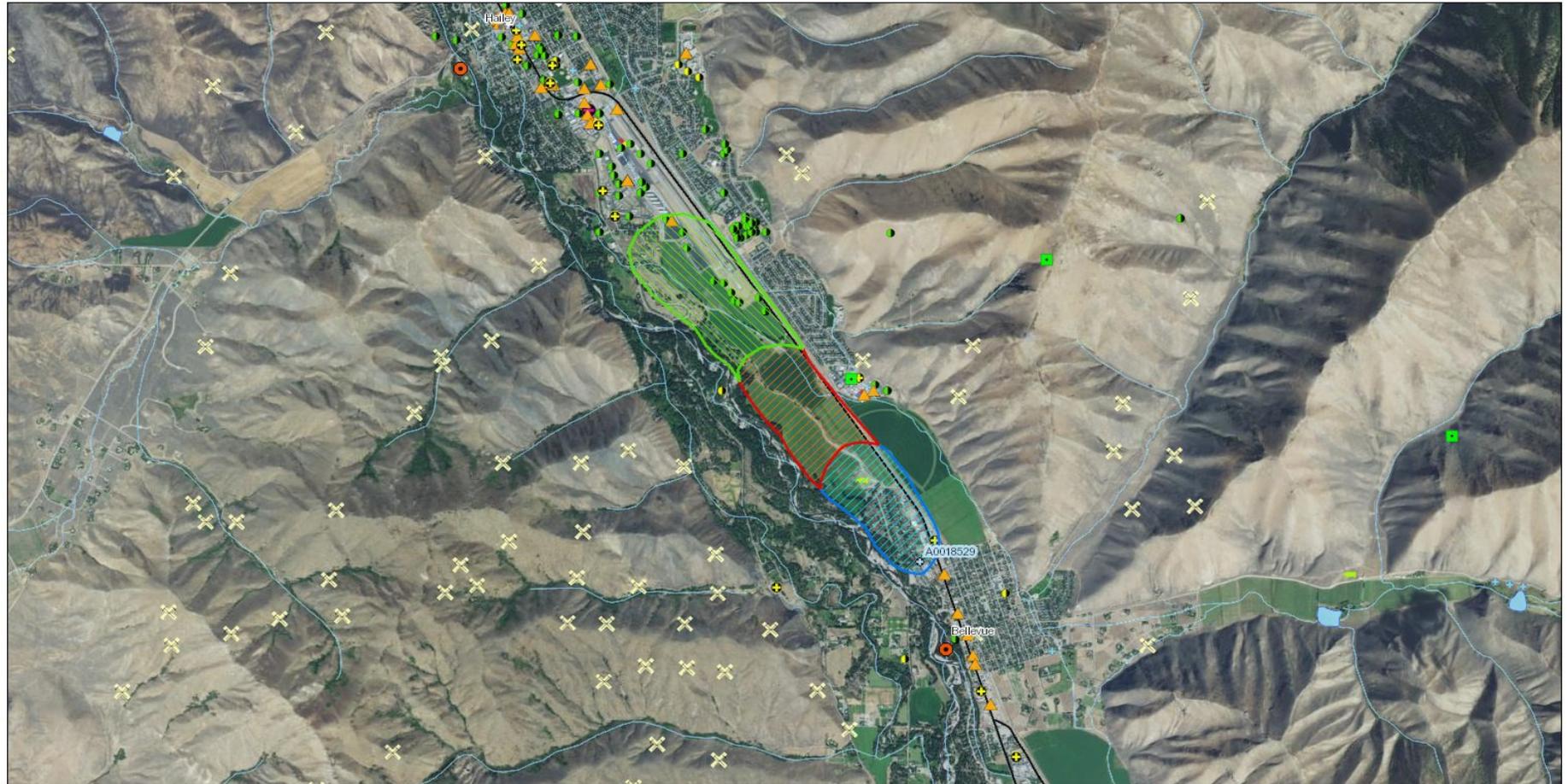


Idaho Department of Environmental Quality

Map Courtesy of IDEQ Source Water Assessment and Protection
Copyright ©2015 DEQ GIS

Figure 6. Source water delineation time of travel for Chestnut Well, City of Bellevue Public Water System.

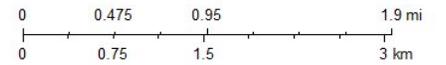
Chantrelle Well PWS



June 23, 2015



1:37,713



Idaho Department of Environmental Quality

Map Courtesy of IDEQ Source Water Assessment and Protection
Copyright ©2015 DEQ GIS

Figure 7. Source water delineation time of travel for Chantrelle Well, City of Bellevue Public Water System.

4.2 Surface Water Pathways

The surface water migration pathway target distance limit (TDL) begins at the probable point of entry (PPE) of surface water runoff from a site to a surface water body and extends downstream for 15 miles. Since mercury was detected above the IDTL for soil in sample BWNG101SD, the 15-mile starts at this sampling location and ends downstream in the Big Wood River before it empties into Magic Reservoir (Figure 5). Other surface water features within a 2-mile radius of the 2-mile stretch of sample sites include freshwater forested/shrub wetlands along the Broadford Slough and riverine wetlands along the banks of the Big Wood River (Figure 8). Analysis of the surface water pathways and targets for this SI include evaluation of analytical results (Section 4.2.1) and identification of sensitive, rare and threatened plant and animal species (Section 4.2.2).

4.2.1 Surface Water Analytical Results

Five surface water grab samples were collected with results presented in Section 3, Table 3. The purpose of sample collection includes:

- **Background** - Broadford Slough downgradient of Mammoth Gulch (sample BWBR101SWBG).
- **Downstream of Minnie Moore Gulch on Broadford Slough** - Evaluate past remedial actions near the Minnie Moore Mill site and to determine the presence of metals loading to Broadford Slough and the Big Wood River (sample BWBR102SW and BWBR102SWD duplicate).
- **Broadford Slough North of Heronwood Road Culvert** - Determine the presence of metals loading downstream to Broadford Slough and the Big Wood River (sample BWBR103SW).
- **Broadford Slough South Side of Townsend Gulch Road** - Determine the presence of metals loading downstream to Broadford Slough and the Big Wood River (sample BWBR104SW).

Evaluation of field parameters demonstrate that the water at the sampling sites downstream from the background location are slightly alkaline (pH = 8.2 to 8.33) and supportive of cold water aquatic life (temperature = 16.6 to 18.3). Low turbidity was observed on the Broadford Slough (13.1-20.2 NTU, below the DEQ instantaneous cold water biota standards) and dissolved oxygen measurements ranged from 11.01 to 16.03 parts per million (ppm). The low TDS values (0.178-0.188 g/L) support the decision to analyze surface water samples for total metals, instead of dissolved metals, for this sampling event.

Overall, metals concentrations from the four sampling locations along the Broadford Slough downstream of the Mammoth Gulch background sample location are similar. Non-detect results were observed for all metals except Ba, Fe, and Mn. These detections were compared against the EPA drinking water standard and the DEQ cold water biota acute and chronic standards. Only one detection is above a standard. At the Broadford Slough North of Heronwood Road Culvert sampling location, Fe detected at 0.338 mg/L is slightly above the EPA secondary MCL of 0.3 mg/L.

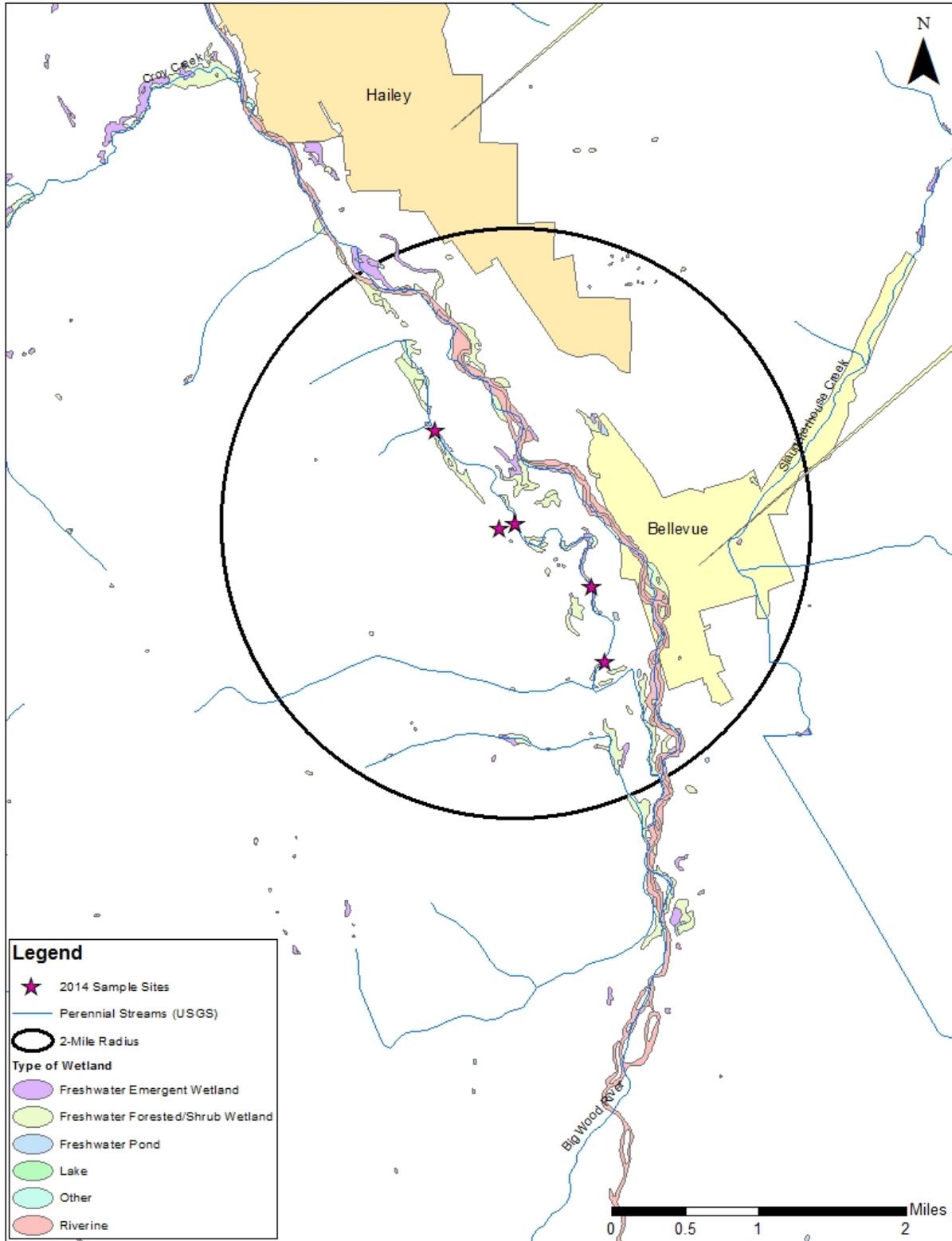


Figure 8. Wetlands.

4.2.2 Sensitive, Rare, and Threatened Plant and Animal Species

Sensitive species can have large habitat ranges that overlap the vicinity of this SI. Based on the resource list obtained during a search of the Information for Planning and Conservation system (USFWS 2015), the following species are identified for Blaine County:

- Birds: Greater Sage Grouse, *Centrocercus urophasianus*, candidate species and Yellow-Billed Cuckoo, *Coccyzus americanus*, threatened species.
- Mammals: Canada Lynx, *Lynx canadensis*, threatened species.
- Fish: Bull Trout, *Salvelinus confluentus*, threatened species.
- Plants: Whitebark Pine, *Pinus albicaulis*, candidate species.

4.3 Soil Exposures and Air Pathways

As stated in Section 3.3, the Minnie Moore Mill Site is the location of a 2005 EPA Removal Action (EPA 2006). In conjunction with this SI, DEQ visited the mill site to inspect compliance with the activity and use limitations stated in the EC (DEQ 2013). At the time of this inspection, there was no evidence that waste material was moving into the river from the capped tailings pile.

During this SI, an upland soil sample was collected near the mouth of Minnie Moore Gulch (BWNG101SD). At this location, several metals were detected above IDTLs, were higher than the sediment sample results, and were higher than three times background concentrations (Table 4). Detections include mercury at 2.05 mg/kg.

5 Summary and Conclusions

The purpose of this 2014 Supplemental SI is to assess the threat posed to human health and the environment through further investigation of Minnie Moore Gulch and the surrounding two-mile stretch of the Broadford Slough where mercury was detected during the 2008 SI (E&E 2010).

The following conclusions are based on the 2014 Supplemental SI observations and results:

- No concerns for the ground water pathway.
- Several metals were detected in soil and sediment samples. Comparison of mercury detections between 2008 and 2014 (Table 5) show slightly lower concentrations in 2014 for co-located sites; however, the highest concentrations of mercury were detected in 2014 in upland soils (2.05 mg/kg) and in sediment at the Broadford Slough north of Heronwood Road Culvert location (0.453 mg/kg).
- Although mercury is detected in sediment, mercury was not detected in surface water samples.

- The SWA reports show no concerns for the surface water pathways at this time since surface water is not included within the City of Bellevue PWS source water capture zones.
- Detections of metals in the upland soil sample present possible concerns for soil exposures and air pathways.
- In conjunction with this Supplemental SI, DEQ visited the Minnie Moore Mill Site which is the location of a 2005 EPA Removal Action. DEQ performed an inspection of the activity and use limitations set in the Environmental Covenant signed by DEQ and Minnie Moore Resources. At the time of this inspection, there was no evidence that waste material was moving into the river from the capped tailings pile.

Table 5. Comparison of 2008 and 2014 Site Investigation mercury detections in sediment and soil samples.

Station Location	BR25 (2008)	BWNG101SD (2014)	NG01 (2008)	BR23 (2008)	BWBR103SD (2014)	BR21 (2008)
	BWBR101SDBG (2014)			BWBR102SD (2014)		BWBR104SD (2014)
2008 Result (mg/kg)	0.16 U	No sample	0.95	0.22	No sample	0.35
2014 Result (mg/kg)	0.078	2.05	No sample	0.083/ 0.067	0.453	0.275

6 References

- Anderson, A.L., T.H. Kiilsgaard, and V.C. Fryklund, Jr. 1950. *Detailed Geology of Certain Areas in the Mineral Hill and Warm Springs Mining District, Blaine County, Idaho*. Idaho Bureau of Mines and Geology. Pamphlet No. 90.
- DEQ (Idaho Department of Environmental Quality). 2012. *Idaho's 2010 Integrated Report*. Boise, ID: DEQ. Available at: <http://www.deq.idaho.gov/water-quality/surface-water/monitoring-assessment/integrated-report.aspx>
- DEQ. 2013. *Environmental Covenant, Minnie Moore Resources, Inc.* Recorded for Title One Boise, Instrument #610331, Hailey, Blaine County, Idaho. TRIM record number 2014BEZ4.
- DEQ (Idaho Department of Environmental Quality). 2014a. *DEQ Statewide Generic Project Quality Assurance Project Plan (QAPP): Mine Sites Addressed under the Preliminary Assessment Program*. Boise, Idaho: DEQ. TRIM record number 2012BER8.
- DEQ. 2014b. *Field Sampling Plan for the Big Wood River Mercury Investigation Addressed under the Preliminary Assessment Program*. TRIM Record No. 2014BEQ248.
- DEQ. 2014c. Letter to Minnie Moore Resources, Inc. Subject: Environmental Covenant – Site Inspection. October 1, 2014. TRIM Record No. 2014BEZ87.
- DEQ. Source Water Assessments in Idaho. Accessed June 23, 2015. Available at: <http://www.deq.idaho.gov/water-quality/source-water/assessments.aspx>
- E&E (Ecology and Environment, Inc.). 2010. *Big Wood River Site Inspection, Blaine County, Idaho*. Technical Direction Document Number: 07-05-0014. Prepared for EPA, Seattle, Washington.
- EPA (U.S. Environmental Protection Agency). 2006. *Minnie Moore Mine, Bellevue, Idaho*. EPA Region X. Website accessed on July 31, 2014. http://www.epaosc.org/site/site_profile.aspx?site_id+1896
- Mitchell, Victoria E. 2000. History of the Minnie Moore Mine, Blaine County, Idaho. Idaho Geological Survey. Moscow, Idaho. Staff Report 00-12.
- USFWS (United States Fish and Wildlife Service). Information for Planning and Conservation (IPaC). Powered by the Environmental Conservation Online System (ECOS). Accessed June 23, 2015. <http://ecos.fws.gov/ipac/>
- Western Regional Climate Center. 2013. Available at: <http://www.wrcc.dri.edu/>

6.1 GIS Coverages

Animal Conservation Database. Using: ArcMap GIS. Version 10. Redlands, CA: Environmental Systems Research Institute, Inc., 1992–1999.

- IDFG (Idaho Department of Fish and Game). 2002. Fisheries information GIS layer.
- IDWR (Idaho Department of Water Resources). Domestic Wells (deqgis83.DBO.Domestic_Wells). Using: ArcMap GIS. Version 10. Redlands, CA: Environmental Systems Research Institute, Inc., 1992–1999.
- Major Lithology (deqgis83.DBO.Major_Lithology). Using: ArcMap GIS. Version 10. Redlands, CA: Environmental Systems Research Institute, Inc., 1992–1999.
- Microsoft Virtual Earth Aerial with Labels © 2009 Microsoft Corporation Using: ArcMap GIS. Version 10. Redlands, CA: Environmental Systems Research Institute, Inc., 1992–1999.
- NAIP (National Agricultural Imagery Program). 2011. Using: ArcMap GIS. Version 10. Redlands, CA: Environmental Systems Research Institute, Inc., 1992–1999.
- Public Water Systems (deqgis83.DBO.Public_Water_Systems). Using: ArcMap GIS. Version 10. Redlands, CA: Environmental Systems Research Institute, Inc., 1992–1999.
- Rare Plants, Endangered Species, Fish Presence (deqgis83.DBO.ESA_Fish_Wildlife). Using: ArcMap GIS. Version 10. Redlands, CA: Environmental Systems Research Institute, Inc., 1992–1999.
- Sensitive Streams (deqgis83.DBO.ID305B_2012). Using: ArcMap GIS. Version 10. Redlands, CA: Environmental Systems Research Institute, Inc., 1992–1999.
- USFWS (US Fish and Wildlife Service). 2012. National Wetlands Inventory. Available at: <http://www.fws.gov/wetlands/index.html>
- USGS (US Geological Survey). 24K Quad Map. Using: ArcMap GIS. Version 10. Redlands, CA: Environmental Systems Research Institute, Inc., 1992-1999.

Appendix A. Field Checklists

This page intentionally left blank for correct double-sided printing.

Big Wood River Field Checklist

Station Location: BW-BR-101-SD-BG Date/Time: 9-18-2014 12:02 PM

Location Description: Mammoth Gulch down gradient

Field Team: Don Carpenter, Rob Houser Weather: Partly cloudy T° in mid 60's

Latitude: 43.47785 Longitude: -114.2923

Sediment Sample Description

Sample ID: BW-BR-101-SD-BG

downgradient of Mammoth G/

Moisture: Wet Dry

Also took SW sample
BW-BR-101-SW-BG

Color: dark brown/black

Grain Size: < 2.0mm

Organic Content: None Slight Moderate Heavy

Odor? No Yes If yes, description _____

Other: _____

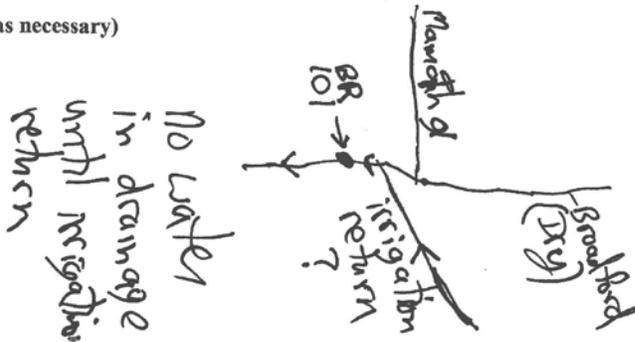
Water Quality Parameters

Parameter	Reading	Parameter	Reading
Temp (°C)	15.7	Turbidity (NTU)	15.5
pH	6.6	DO (mg/L)	13.13
ORP (mV)	213	TDS (g/L)	0.188
Cond (mS/cm)	0.287		

Photographs

Number	Time	Direction	Description
100 1	12:20	South	Sample location 122003_700

Site Sketch (use back of page as necessary)



Big Wood River Field Checklist

Station Location: Minnie Moore Gulch Date/Time: 9/18/14 2:01 PM
 Location Description: Mouth of Minnie Moore gulch
 Field Team: DRC RH Weather: part sun
 Latitude: 43.4682 Longitude: -114.28358

Sediment Sample Description

Sample ID: BW-NG-101-S0-BG - Sediment only
 Moisture: Wet X Dry - No water
 Color: Gray - incorrectly labeled as BG
 Grain Size: <2mm
 Organic Content: X None Slight Moderate Heavy
 Odor? X No Yes If yes, description
 Other:

Water Quality Parameters

Parameter	Reading	Parameter	Reading
Temp (°C)	NA	Turbidity (NTU)	
pH		DO (mg/L)	
ORP (mV)		TDS (g/L)	
Cond (mS/cm)			

Photographs

Number	Time	Direction	Description
2	1:15	West	Sed sample 130704-700
3	1:23	South	Tailings cap 132322-714
4	1:23	South	Tailings cap 132344-101

Site Sketch (use back of page as necessary)

Photo 3: Tailings cap
 Photo 4: Tailings cap

Big Wood River Field Checklist

Station Location: Monnie Moore Gulch Date/Time: 9/18/14 2:00 PM

Location Description: Downstream Monnie Moore Gulch on Bradford St

Field Team: Don C Bob H Weather: Part Sun

Latitude: 43.46888 Longitude: -114.28358

Sediment Sample Description SW 136

Sample ID: BW-BR-102-SW BW-BR-102-SW

Moisture: X Wet Dry BW-BR-102-SW-U

Color: Dark Brown/Black

Grain Size: < 2mm

Organic Content: None Slight X Moderate Heavy

Odor? X No Yes If yes, description

Other:

Water Quality Parameters

Parameter	Reading	Parameter	Reading
Temp (°C)	16.6	Turbidity (NTU)	16
pH	8.2	DO (mg/L)	16.03
ORP (mV)	NA	TDS (g/L)	0.182
Cond (mS/cm)	0.28		

Photographs

Number	Time	Direction	Description
5	2:25	South	Bradford St Sample site 142542646

Site Sketch (use back of page as necessary)

Big Wood River Field Checklist

Station Location: Heronwood Rd Date/Time: 2:45 PM
 Location Description: Slough ~~off~~ ^(N) next to road Calvert
 Field Team: DC, RH Weather: Part Sun
 Latitude: 43.462526 Longitude: -114.27099

Sediment Sample Description

Sample ID: BW-BR-103-SW + BW-BR-103-SW
 Moisture: 8 Wet _____ Dry _____
 Color: Dark Brown/Black
 Grain Size: < 2mm
 Organic Content: _____ None _____ Slight X Moderate _____ Heavy _____
 Odor? X No _____ Yes If yes, description _____
 Other: leaches observed in sample and on sampling device
- Used plastic scoop attached to pole for sample collection

Water Quality Parameters

Parameter	Reading	Parameter	Reading
Temp (°C)	18.18	Turbidity (NTU)	20.2
pH	8.26	DO (mg/L)	11.01
ORP (mV)	141	TDS (g/L)	0.192
Cond (mS/cm)	0.279		

Photographs

Number	Time	Direction	Description
6	2:46	North	Sample location 144617 544
7	2:46	North	Sample location 144631 025

Site Sketch (use back of page as necessary)

Big Wood River Field Checklist

Station Location: Townsend Gulch Rd Date/Time: 9/18/14 3:00 P
 Location Description: S. side of road & gough
 Field Team: DC, RW Weather: Part sun
 Latitude: 43.45515 Longitude: -114.26915

Sediment Sample Description

Sample ID: BW-BR-109-SW + BW-BR-109-SW
 Moisture: Wet Dry BW-BR-104-B
 Color: Dark Brown/Black
 Grain Size: < 2mm
 Organic Content: None Slight Moderate Heavy
 Odor? No Yes If yes, description _____
 Other: _____

Water Quality Parameters

Parameter	Reading	Parameter	Reading
Temp (°C)	18.3	Turbidity (NTU)	13.1
pH	8.33	DO (mg/L)	11.6
ORP (mV)	140	TDS (g/L)	0.178
Cond (mS/cm)	0.273		

Photographs

Number	Time	Direction	Description
8	3:10	SW	Sample site 151001.970

Site Sketch (use back of page as necessary)

This page intentionally left blank for correct double-sided printing.

Appendix B. Laboratory Sample Reports

This page intentionally left blank for correct double-sided printing.



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W4I0513**
Reported: 07-Oct-14 13:18

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Sampled By	Date Received	Notes
BWBR101SWBG	W4I0513-01	Surface Water	18-Sep-14 12:20	DC	23-Sep-2014	
BWBR102SW	W4I0513-02	Surface Water	18-Sep-14 14:04	DC	23-Sep-2014	
BWBR102SWD	W4I0513-03	Surface Water	18-Sep-14 14:03	DC	23-Sep-2014	
BWBR103SW	W4I0513-04	Surface Water	18-Sep-14 14:45	DC	23-Sep-2014	
BWBR104SW	W4I0513-05	Surface Water	18-Sep-14 15:02	DC	23-Sep-2014	
BWBR104B	W4I0513-06	Surface Water	18-Sep-14 15:10	RH	23-Sep-2014	
BWBR101-SDBG	W4I0513-07	Soil	18-Sep-14 12:20	RH	23-Sep-2014	
BWNG101SDBG	W4I0513-08	Soil	18-Sep-14 13:01	RH	23-Sep-2014	
BWBR102SD	W4I0513-09	Soil	18-Sep-14 14:00	RH	23-Sep-2014	
BWBR102SDD	W4I0513-10	Soil	18-Sep-14 14:01	RH	23-Sep-2014	
BWBR103SD	W4I0513-11	Soil	18-Sep-14 14:40	RH	23-Sep-2014	
BWBR104SD	W4I0513-12	Soil	18-Sep-14 15:00	RH	23-Sep-2014	

Solid samples are analyzed on an as-received, wet-weight basis, unless otherwise requested.

Sample preparation is defined by the client as per their Data Quality Objectives.

This report supercedes any previous reports for this Work Order. The complete report includes pages for each sample, a full QC report, and a notes section.

The results presented in this report relate only to the samples, and meet all requirements of the NELAC Standards unless otherwise noted.



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W410513**
Reported: 07-Oct-14 13:18

Client Sample ID: **BWBR101SWBG**

SVL Sample ID: **W410513-01 (Surface Water)**

Sample Report Page 1 of 1

Sampled: 18-Sep-14 12:20
Received: 23-Sep-14
Sampled By: DC

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total)										
EPA 245.1	Mercury	< 0.0020	mg/L	0.0020	0.000045		W440057	STA	10/01/14 13:06	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	Antimony	< 0.020	mg/L	0.020	0.004		W439092	MCE	09/30/14 15:58	
EPA 200.7	Barium	0.0414	mg/L	0.0020	0.0003		W439092	MCE	09/30/14 15:58	
EPA 200.7	Cadmium	< 0.0020	mg/L	0.0020	0.0003		W439092	MCE	09/30/14 15:58	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0009		W439092	MCE	09/30/14 15:58	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.001		W439092	MCE	09/30/14 15:58	
EPA 200.7	Iron	0.111	mg/L	0.060	0.012		W439092	MCE	09/30/14 15:58	
EPA 200.7	Manganese	0.0088	mg/L	0.0040	0.0006		W439092	MCE	09/30/14 15:58	
EPA 200.7	Silver	< 0.0050	mg/L	0.0050	0.0009		W439092	MCE	09/30/14 15:58	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0016		W439092	MCE	09/30/14 15:58	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0004	2.5	W439096	KWH	10/06/14 10:59	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000044	2.5	W439096	KWH	10/06/14 10:59	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00065	2.5	W439096	KWH	10/06/14 10:59	

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

John Kern
Laboratory Director



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W410513**
Reported: 07-Oct-14 13:18

Client Sample ID: **BWBR102SW**

SVL Sample ID: **W410513-02 (Surface Water)**

Sample Report Page 1 of 1

Sampled: 18-Sep-14 14:04
Received: 23-Sep-14
Sampled By: DC

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total)										
EPA 245.1	Mercury	< 0.0020	mg/L	0.0020	0.000045		W440057	STA	10/01/14 13:08	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	Antimony	< 0.020	mg/L	0.020	0.004		W439092	MCE	09/30/14 16:06	
EPA 200.7	Barium	0.0427	mg/L	0.0020	0.0003		W439092	MCE	09/30/14 16:06	
EPA 200.7	Cadmium	< 0.0020	mg/L	0.0020	0.0003		W439092	MCE	09/30/14 16:06	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0009		W439092	MCE	09/30/14 16:06	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.001		W439092	MCE	09/30/14 16:06	
EPA 200.7	Iron	0.172	mg/L	0.060	0.012		W439092	MCE	09/30/14 16:06	
EPA 200.7	Manganese	0.0209	mg/L	0.0040	0.0006		W439092	MCE	09/30/14 16:06	
EPA 200.7	Silver	< 0.0050	mg/L	0.0050	0.0009		W439092	MCE	09/30/14 16:06	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0016		W439092	MCE	09/30/14 16:06	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0004	2.5	W439096	KWH	10/06/14 11:04	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000044	2.5	W439096	KWH	10/06/14 11:04	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00065	2.5	W439096	KWH	10/06/14 11:04	

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

John Kern
Laboratory Director



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W410513**
Reported: 07-Oct-14 13:18

Client Sample ID: **BWBR102SWD**

SVL Sample ID: **W410513-03 (Surface Water)**

Sample Report Page 1 of 1

Sampled: 18-Sep-14 14:03
Received: 23-Sep-14
Sampled By: DC

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total)										
EPA 245.1	Mercury	< 0.0020	mg/L	0.0020	0.000045		W440057	STA	10/01/14 13:09	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	Antimony	< 0.020	mg/L	0.020	0.004		W439092	MCE	09/30/14 16:09	
EPA 200.7	Barium	0.0419	mg/L	0.0020	0.0003		W439092	MCE	09/30/14 16:09	
EPA 200.7	Cadmium	< 0.0020	mg/L	0.0020	0.0003		W439092	MCE	09/30/14 16:09	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0009		W439092	MCE	09/30/14 16:09	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.001		W439092	MCE	09/30/14 16:09	
EPA 200.7	Iron	0.160	mg/L	0.060	0.012		W439092	MCE	09/30/14 16:09	
EPA 200.7	Manganese	0.0177	mg/L	0.0040	0.0006		W439092	MCE	09/30/14 16:09	
EPA 200.7	Silver	< 0.0050	mg/L	0.0050	0.0009		W439092	MCE	09/30/14 16:09	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0016		W439092	MCE	09/30/14 16:09	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0004	2.5	W439096	KWH	10/06/14 11:06	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000044	2.5	W439096	KWH	10/06/14 11:06	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00065	2.5	W439096	KWH	10/06/14 11:06	

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

John Kern
Laboratory Director



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W410513**
Reported: 07-Oct-14 13:18

Client Sample ID: **BWBR103SW**

SVL Sample ID: **W410513-04 (Surface Water)**

Sample Report Page 1 of 1

Sampled: 18-Sep-14 14:45
Received: 23-Sep-14
Sampled By: DC

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total)										
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W440057	STA	10/01/14 13:11	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	Antimony	< 0.020	mg/L	0.020	0.004		W439092	MCE	09/30/14 16:11	
EPA 200.7	Barium	0.0479	mg/L	0.0020	0.0003		W439092	MCE	09/30/14 16:11	
EPA 200.7	Cadmium	< 0.0020	mg/L	0.0020	0.0003		W439092	MCE	09/30/14 16:11	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0009		W439092	MCE	09/30/14 16:11	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.001		W439092	MCE	09/30/14 16:11	
EPA 200.7	Iron	0.338	mg/L	0.060	0.012		W439092	MCE	09/30/14 16:11	
EPA 200.7	Manganese	0.0299	mg/L	0.0040	0.0006		W439092	MCE	09/30/14 16:11	
EPA 200.7	Silver	< 0.0050	mg/L	0.0050	0.0009		W439092	MCE	09/30/14 16:11	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0016		W439092	MCE	09/30/14 16:11	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0004	2.5	W439096	KWH	10/06/14 11:07	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000044	2.5	W439096	KWH	10/06/14 11:07	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00065	2.5	W439096	KWH	10/06/14 11:07	

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

John Kern
Laboratory Director



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W410513**
Reported: 07-Oct-14 13:18

Client Sample ID: **BWBR104SW**

SVL Sample ID: **W410513-05 (Surface Water)**

Sample Report Page 1 of 1

Sampled: 18-Sep-14 15:02
Received: 23-Sep-14
Sampled By: DC

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total)										
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W440057	STA	10/01/14 13:13	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	Antimony	< 0.020	mg/L	0.020	0.004		W439092	MCE	09/30/14 16:14	
EPA 200.7	Barium	0.0442	mg/L	0.0020	0.0003		W439092	MCE	09/30/14 16:14	
EPA 200.7	Cadmium	< 0.0020	mg/L	0.0020	0.0003		W439092	MCE	09/30/14 16:14	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0009		W439092	MCE	09/30/14 16:14	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.001		W439092	MCE	09/30/14 16:14	
EPA 200.7	Iron	0.080	mg/L	0.060	0.012		W439092	MCE	09/30/14 16:14	
EPA 200.7	Manganese	0.0092	mg/L	0.0040	0.0006		W439092	MCE	09/30/14 16:14	
EPA 200.7	Silver	< 0.0050	mg/L	0.0050	0.0009		W439092	MCE	09/30/14 16:14	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0016		W439092	MCE	09/30/14 16:14	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0004	2.5	W439096	KWH	10/06/14 11:09	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000044	2.5	W439096	KWH	10/06/14 11:09	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00065	2.5	W439096	KWH	10/06/14 11:09	

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

John Kern
Laboratory Director



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W410513**
Reported: 07-Oct-14 13:18

Client Sample ID: **BWBR104B**

SVL Sample ID: **W410513-06 (Surface Water)**

Sample Report Page 1 of 1

Sampled: 18-Sep-14 15:10
Received: 23-Sep-14
Sampled By: RH

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total)										
EPA 245.1	Mercury	< 0.0020	mg/L	0.0020	0.000045		W440057	STA	10/01/14 13:15	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	Antimony	< 0.020	mg/L	0.020	0.004		W439092	MCE	09/30/14 16:25	
EPA 200.7	Barium	< 0.0020	mg/L	0.0020	0.0003		W439092	MCE	09/30/14 16:25	
EPA 200.7	Cadmium	< 0.0020	mg/L	0.0020	0.0003		W439092	MCE	09/30/14 16:25	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0009		W439092	MCE	09/30/14 16:25	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.001		W439092	MCE	09/30/14 16:25	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.012		W439092	MCE	09/30/14 16:25	
EPA 200.7	Manganese	< 0.0040	mg/L	0.0040	0.0006		W439092	MCE	09/30/14 16:25	
EPA 200.7	Silver	< 0.0050	mg/L	0.0050	0.0009		W439092	MCE	09/30/14 16:25	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0016		W439092	MCE	09/30/14 16:25	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0004	2.5	W439096	KWH	10/06/14 11:11	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000044	2.5	W439096	KWH	10/06/14 11:11	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00065	2.5	W439096	KWH	10/06/14 11:11	

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

John Kern
Laboratory Director



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W410513**
Reported: 07-Oct-14 13:18

Client Sample ID: **BWBR101-SDBG**
SVL Sample ID: **W410513-07 (Soil)**

Sampled: 18-Sep-14 12:20
Received: 23-Sep-14
Sampled By: RH

Sample Report Page 1 of 1

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) (Sieved)										
EPA 6020A	Arsenic	8.83	mg/kg Dry	0.750	0.085	5	W439097	KWH	10/07/14 07:59	D8,M2
EPA 6020A	Lead	49.0	mg/kg Dry	0.100	0.0060	2	W439097	KWH	10/07/14 07:36	
EPA 6020A	Selenium	2.74	mg/kg Dry	0.500	0.150	5	W439097	KWH	10/07/14 07:59	D8
Metals (Total) by EPA 6000/7000 Methods (Sieved)										
EPA 6010C	Antimony	< 2.0	mg/kg Dry	2.0	0.8		W440028	MCE	10/03/14 13:09	M2
EPA 6010C	Barium	264	mg/kg Dry	0.200	0.081		W440028	MCE	10/03/14 13:09	
EPA 6010C	Cadmium	3.78	mg/kg Dry	0.20	0.05		W440028	MCE	10/03/14 13:09	
EPA 6010C	Chromium	35.0	mg/kg Dry	0.60	0.15		W440028	MCE	10/03/14 13:09	
EPA 6010C	Copper	26.9	mg/kg Dry	1.00	0.25		W440028	MCE	10/03/14 13:09	
EPA 6010C	Iron	17600	mg/kg Dry	6.0	2.7		W440028	MCE	10/03/14 13:09	M3
EPA 6010C	Manganese	711	mg/kg Dry	0.40	0.12		W440028	MCE	10/03/14 13:09	M3
EPA 6010C	Silver	< 0.50	mg/kg Dry	0.50	0.16		W440028	MCE	10/03/14 13:09	
EPA 6010C	Zinc	300	mg/kg Dry	1.00	0.34		W440028	MCE	10/03/14 13:09	
EPA 7471B	Mercury	0.078	mg/kg Dry	0.033	0.004		W439087	STA	09/26/14 14:45	

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

John Kern
Laboratory Director



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W410513**
Reported: 07-Oct-14 13:18

Client Sample ID: **BWNG101SDBG**
SVL Sample ID: **W410513-08 (Soil)**

Sampled: 18-Sep-14 13:01
Received: 23-Sep-14
Sampled By: RH

Sample Report Page 1 of 1

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) (Sieved)										
EPA 6020A	Arsenic	455	mg/kg Dry	0.300	0.034	2	W439097	KWH	10/07/14 07:42	
EPA 6020A	Lead	9350	mg/kg Dry	1.00	0.150	50	W439097	KWH	10/07/14 08:07	D2
EPA 6020A	Selenium	4.22	mg/kg Dry	0.300	0.060	2	W439097	KWH	10/07/14 07:42	
Metals (Total) by EPA 6000/7000 Methods (Sieved)										
EPA 6010C	Antimony	92.1	mg/kg Dry	2.0	0.8		W440028	MCE	10/03/14 13:20	
EPA 6010C	Barium	225	mg/kg Dry	0.200	0.081		W440028	MCE	10/03/14 13:20	
EPA 6010C	Cadmium	97.2	mg/kg Dry	0.20	0.05		W440028	MCE	10/03/14 13:20	
EPA 6010C	Chromium	23.2	mg/kg Dry	0.60	0.15		W440028	MCE	10/03/14 13:20	
EPA 6010C	Copper	252	mg/kg Dry	1.00	0.25		W440028	MCE	10/03/14 13:20	
EPA 6010C	Iron	31200	mg/kg Dry	6.0	2.7		W440028	MCE	10/03/14 13:20	
EPA 6010C	Manganese	2720	mg/kg Dry	0.40	0.12		W440028	MCE	10/03/14 13:20	
EPA 6010C	Silver	60.1	mg/kg Dry	0.50	0.16		W440028	MCE	10/03/14 13:20	
EPA 6010C	Zinc	12300	mg/kg Dry	10.0	3.40	10	W440028	MCE	10/03/14 14:02	D2
EPA 7471B	Mercury	2.05	mg/kg Dry	0.066	0.008	2	W439087	STA	09/26/14 14:59	D2

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

John Kern
Laboratory Director



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W410513**
Reported: 07-Oct-14 13:18

Client Sample ID: **BWBR102SD**
SVL Sample ID: **W410513-09 (Soil)**

Sampled: 18-Sep-14 14:00
Received: 23-Sep-14
Sampled By: RH

Sample Report Page 1 of 1

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) (Sieved)										
EPA 6020A	Arsenic	19.6	mg/kg Dry	0.300	0.034	2	W439097	KWH	10/07/14 07:44	
EPA 6020A	Lead	215	mg/kg Dry	0.100	0.0060	2	W439097	KWH	10/07/14 07:44	
EPA 6020A	Selenium	0.879	mg/kg Dry	0.300	0.060	2	W439097	KWH	10/07/14 07:44	
Metals (Total) by EPA 6000/7000 Methods (Sieved)										
EPA 6010C	Antimony	9.8	mg/kg Dry	2.0	0.8		W440028	MCE	10/03/14 13:23	
EPA 6010C	Barium	243	mg/kg Dry	0.200	0.081		W440028	MCE	10/03/14 13:23	
EPA 6010C	Cadmium	2.67	mg/kg Dry	0.20	0.05		W440028	MCE	10/03/14 13:23	
EPA 6010C	Chromium	36.8	mg/kg Dry	0.60	0.15		W440028	MCE	10/03/14 13:23	
EPA 6010C	Copper	27.8	mg/kg Dry	1.00	0.25		W440028	MCE	10/03/14 13:23	
EPA 6010C	Iron	20500	mg/kg Dry	6.0	2.7		W440028	MCE	10/03/14 13:23	
EPA 6010C	Manganese	879	mg/kg Dry	0.40	0.12		W440028	MCE	10/03/14 13:23	
EPA 6010C	Silver	10.1	mg/kg Dry	0.50	0.16		W440028	MCE	10/03/14 13:23	
EPA 6010C	Zinc	431	mg/kg Dry	1.00	0.34		W440028	MCE	10/03/14 13:23	
EPA 7471B	Mercury	0.083	mg/kg Dry	0.033	0.004		W439087	STA	09/26/14 14:48	

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

John Kern
Laboratory Director



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W410513**
Reported: 07-Oct-14 13:18

Client Sample ID: **BWBR102SDD**
SVL Sample ID: **W410513-10 (Soil)**

Sampled: 18-Sep-14 14:01
Received: 23-Sep-14
Sampled By: RH

Sample Report Page 1 of 1

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) (Sieved)										
EPA 6020A	Arsenic	9.76	mg/kg Dry	0.300	0.034	2	W439097	KWH	10/07/14 07:47	
EPA 6020A	Lead	86.9	mg/kg Dry	0.100	0.0060	2	W439097	KWH	10/07/14 07:47	
EPA 6020A	Selenium	0.868	mg/kg Dry	0.300	0.060	2	W439097	KWH	10/07/14 07:47	
Metals (Total) by EPA 6000/7000 Methods (Sieved)										
EPA 6010C	Antimony	< 2.0	mg/kg Dry	2.0	0.8		W440028	MCE	10/03/14 13:26	
EPA 6010C	Barium	341	mg/kg Dry	0.200	0.081		W440028	MCE	10/03/14 13:26	
EPA 6010C	Cadmium	2.35	mg/kg Dry	0.20	0.05		W440028	MCE	10/03/14 13:26	
EPA 6010C	Chromium	37.7	mg/kg Dry	0.60	0.15		W440028	MCE	10/03/14 13:26	
EPA 6010C	Copper	27.4	mg/kg Dry	1.00	0.25		W440028	MCE	10/03/14 13:26	
EPA 6010C	Iron	21100	mg/kg Dry	6.0	2.7		W440028	MCE	10/03/14 13:26	
EPA 6010C	Manganese	1100	mg/kg Dry	0.40	0.12		W440028	MCE	10/03/14 13:26	
EPA 6010C	Silver	0.76	mg/kg Dry	0.50	0.16		W440028	MCE	10/03/14 13:26	
EPA 6010C	Zinc	256	mg/kg Dry	1.00	0.34		W440028	MCE	10/03/14 13:26	
EPA 7471B	Mercury	0.067	mg/kg Dry	0.033	0.004		W439087	STA	09/26/14 14:54	

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

John Kern
Laboratory Director



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W410513**
Reported: 07-Oct-14 13:18

Client Sample ID: **BWBR103SD**
SVL Sample ID: **W410513-11 (Soil)**

Sampled: 18-Sep-14 14:40
Received: 23-Sep-14
Sampled By: RH

Sample Report Page 1 of 1

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) (Sieved)										
EPA 6020A	Arsenic	44.4	mg/kg Dry	0.300	0.034	2	W439097	KWH	10/07/14 07:48	
EPA 6020A	Lead	957	mg/kg Dry	0.100	0.0150	5	W439097	KWH	10/07/14 08:08	D2
EPA 6020A	Selenium	2.35	mg/kg Dry	0.300	0.060	2	W439097	KWH	10/07/14 07:48	
Metals (Total) by EPA 6000/7000 Methods (Sieved)										
EPA 6010C	Antimony	< 2.0	mg/kg Dry	2.0	0.8		W440028	MCE	10/03/14 13:30	
EPA 6010C	Barium	183	mg/kg Dry	0.200	0.081		W440028	MCE	10/03/14 13:30	
EPA 6010C	Cadmium	8.39	mg/kg Dry	0.20	0.05		W440028	MCE	10/03/14 13:30	
EPA 6010C	Chromium	30.8	mg/kg Dry	0.60	0.15		W440028	MCE	10/03/14 13:30	
EPA 6010C	Copper	66.7	mg/kg Dry	1.00	0.25		W440028	MCE	10/03/14 13:30	
EPA 6010C	Iron	19300	mg/kg Dry	6.0	2.7		W440028	MCE	10/03/14 13:30	
EPA 6010C	Manganese	1260	mg/kg Dry	0.40	0.12		W440028	MCE	10/03/14 13:30	
EPA 6010C	Silver	13.2	mg/kg Dry	0.50	0.16		W440028	MCE	10/03/14 13:30	
EPA 6010C	Zinc	843	mg/kg Dry	1.00	0.34		W440028	MCE	10/03/14 13:30	
EPA 7471B	Mercury	0.453	mg/kg Dry	0.033	0.004		W439087	STA	09/26/14 14:56	

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

John Kern
Laboratory Director



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W410513**
Reported: 07-Oct-14 13:18

Client Sample ID: **BWBR104SD**

SVL Sample ID: **W410513-12 (Soil)**

Sample Report Page 1 of 1

Sampled: 18-Sep-14 15:00
Received: 23-Sep-14
Sampled By: RH

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total) (Sieved)										
EPA 6020A	Arsenic	18.1	mg/kg Dry	0.300	0.034	2	W439097	KWH	10/07/14 07:54	
EPA 6020A	Lead	496	mg/kg Dry	0.100	0.0060	2	W439097	KWH	10/07/14 07:54	
EPA 6020A	Selenium	2.30	mg/kg Dry	0.300	0.060	2	W439097	KWH	10/07/14 07:54	
Metals (Total) by EPA 6000/7000 Methods (Sieved)										
EPA 6010C	Antimony	< 2.0	mg/kg Dry	2.0	0.8		W440028	MCE	10/03/14 13:33	
EPA 6010C	Barium	317	mg/kg Dry	0.200	0.081		W440028	MCE	10/03/14 13:33	
EPA 6010C	Cadmium	7.83	mg/kg Dry	0.20	0.05		W440028	MCE	10/03/14 13:33	
EPA 6010C	Chromium	42.0	mg/kg Dry	0.60	0.15		W440028	MCE	10/03/14 13:33	
EPA 6010C	Copper	54.2	mg/kg Dry	1.00	0.25		W440028	MCE	10/03/14 13:33	
EPA 6010C	Iron	21800	mg/kg Dry	6.0	2.7		W440028	MCE	10/03/14 13:33	
EPA 6010C	Manganese	994	mg/kg Dry	0.40	0.12		W440028	MCE	10/03/14 13:33	
EPA 6010C	Silver	7.04	mg/kg Dry	0.50	0.16		W440028	MCE	10/03/14 13:33	
EPA 6010C	Zinc	620	mg/kg Dry	1.00	0.34		W440028	MCE	10/03/14 13:33	
EPA 7471B	Mercury	0.275	mg/kg Dry	0.033	0.004		W439088	STA	09/26/14 14:07	

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

John Kern
Laboratory Director



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W410513**
Reported: 07-Oct-14 13:18

Quality Control - BLANK Data

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
--------	---------	-------	--------	-----	-----	----------	----------	-------

Metals (Total)

EPA 245.1	Mercury	mg/L	<0.00020	0.000045	0.00020	W440057	01-Oct-14	
EPA 6020A	Arsenic	mg/kg	<0.300	0.034	0.300	W439097	07-Oct-14	
EPA 6020A	Lead	mg/kg	<0.100	0.0060	0.100	W439097	07-Oct-14	
EPA 6020A	Selenium	mg/kg	<0.300	0.060	0.300	W439097	07-Oct-14	

Metals (Total) by EPA 6000/7000 Methods

EPA 6010C	Antimony	mg/kg	<2.0	0.8	2.0	W440028	03-Oct-14	
EPA 6010C	Barium	mg/kg	<0.200	0.081	0.200	W440028	03-Oct-14	
EPA 6010C	Cadmium	mg/kg	<0.20	0.05	0.20	W440028	03-Oct-14	
EPA 6010C	Chromium	mg/kg	<0.60	0.15	0.60	W440028	03-Oct-14	
EPA 6010C	Copper	mg/kg	<1.00	0.25	1.00	W440028	03-Oct-14	
EPA 6010C	Iron	mg/kg	<6.0	2.7	6.0	W440028	03-Oct-14	
EPA 6010C	Manganese	mg/kg	<0.40	0.12	0.40	W440028	03-Oct-14	
EPA 6010C	Silver	mg/kg	<0.50	0.16	0.50	W440028	03-Oct-14	
EPA 6010C	Zinc	mg/kg	<1.00	0.34	1.00	W440028	03-Oct-14	
EPA 7471B	Mercury	mg/kg	<0.033	0.004	0.033	W439087	26-Sep-14	
EPA 7471B	Mercury	mg/kg	<0.033	0.004	0.033	W439088	26-Sep-14	

Metals (Total Recoverable--reportable as Total per 40 CFR 136)

EPA 200.7	Antimony	mg/L	<0.020	0.004	0.020	W439092	30-Sep-14	
EPA 200.7	Barium	mg/L	<0.0020	0.0003	0.0020	W439092	30-Sep-14	
EPA 200.7	Cadmium	mg/L	<0.0020	0.0003	0.0020	W439092	30-Sep-14	
EPA 200.7	Chromium	mg/L	<0.0060	0.0009	0.0060	W439092	30-Sep-14	
EPA 200.7	Copper	mg/L	<0.010	0.001	0.010	W439092	30-Sep-14	
EPA 200.7	Iron	mg/L	<0.060	0.012	0.060	W439092	30-Sep-14	
EPA 200.7	Manganese	mg/L	<0.0040	0.0006	0.0040	W439092	30-Sep-14	
EPA 200.7	Silver	mg/L	<0.0050	0.0009	0.0050	W439092	30-Sep-14	
EPA 200.7	Zinc	mg/L	<0.0100	0.0016	0.0100	W439092	30-Sep-14	
EPA 200.8	Arsenic	mg/L	<0.0030	0.0004	0.0030	W439096	06-Oct-14	
EPA 200.8	Lead	mg/L	<0.00300	0.000044	0.00300	W439096	06-Oct-14	
EPA 200.8	Selenium	mg/L	<0.00300	0.00065	0.00300	W439096	06-Oct-14	

Quality Control - LABORATORY CONTROL SAMPLE Data

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
--------	---------	-------	------------	----------	--------	-------------------	----------	----------	-------

Metals (Total)

EPA 245.1	Mercury	mg/L	0.00503	0.00500	101	85 - 115	W440057	01-Oct-14	
EPA 6020A	Arsenic	mg/kg	2.29	2.50	91.4	80 - 120	W439097	07-Oct-14	
EPA 6020A	Lead	mg/kg	2.46	2.50	98.4	80 - 120	W439097	07-Oct-14	
EPA 6020A	Selenium	mg/kg	2.27	2.50	90.8	80 - 120	W439097	07-Oct-14	

Metals (Total) by EPA 6000/7000 Methods

EPA 6010C	Antimony	mg/kg	95.2	100	95.2	80 - 120	W440028	03-Oct-14	
EPA 6010C	Barium	mg/kg	95.3	100	95.3	80 - 120	W440028	03-Oct-14	
EPA 6010C	Cadmium	mg/kg	94.8	100	94.8	80 - 120	W440028	03-Oct-14	
EPA 6010C	Chromium	mg/kg	99.4	100	99.4	80 - 120	W440028	03-Oct-14	
EPA 6010C	Copper	mg/kg	98.0	100	98.0	80 - 120	W440028	03-Oct-14	
EPA 6010C	Iron	mg/kg	95.5	1000	95.5	80 - 120	W440028	03-Oct-14	
EPA 6010C	Manganese	mg/kg	96.5	100	96.5	80 - 120	W440028	03-Oct-14	
EPA 6010C	Silver	mg/kg	4.58	5.00	91.5	80 - 120	W440028	03-Oct-14	
EPA 6010C	Zinc	mg/kg	91.1	100	91.1	80 - 120	W440028	03-Oct-14	
EPA 7471B	Mercury	mg/kg	0.862	0.833	103	80 - 120	W439088	26-Sep-14	
EPA 7471B	Mercury	mg/kg	0.838	0.833	101	80 - 120	W439087	26-Sep-14	



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W410513**
Reported: 07-Oct-14 13:18

Quality Control - LABORATORY CONTROL SAMPLE Data (Continued)

Metals (Total Recoverable--reportable as Total per 40 CFR 136)

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
EPA 200.7	Antimony	mg/L	1.01	1.00	101	85 - 115	W439092	30-Sep-14	
EPA 200.7	Barium	mg/L	1.01	1.00	101	85 - 115	W439092	30-Sep-14	
EPA 200.7	Cadmium	mg/L	0.982	1.00	98.2	85 - 115	W439092	30-Sep-14	
EPA 200.7	Chromium	mg/L	0.993	1.00	99.3	85 - 115	W439092	30-Sep-14	
EPA 200.7	Copper	mg/L	1.01	1.00	101	85 - 115	W439092	30-Sep-14	
EPA 200.7	Iron	mg/L	10.4	10.0	104	85 - 115	W439092	30-Sep-14	
EPA 200.7	Manganese	mg/L	0.984	1.00	98.4	85 - 115	W439092	30-Sep-14	
EPA 200.7	Silver	mg/L	0.0514	0.0500	103	85 - 115	W439092	30-Sep-14	
EPA 200.7	Zinc	mg/L	0.968	1.00	96.8	85 - 115	W439092	30-Sep-14	
EPA 200.8	Arsenic	mg/L	0.0249	0.0250	99.5	85 - 115	W439096	06-Oct-14	
EPA 200.8	Lead	mg/L	0.0247	0.0250	98.6	85 - 115	W439096	06-Oct-14	
EPA 200.8	Selenium	mg/L	0.0247	0.0250	98.9	85 - 115	W439096	06-Oct-14	

Quality Control - MATRIX SPIKE Data

Metals (Total)

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
EPA 245.1	Mercury	mg/L	0.00099	<0.00020	0.00100	99.0	70 - 130	W440057	01-Oct-14	
EPA 245.1	Mercury	mg/L	0.00099	<0.00020	0.00100	99.0	70 - 130	W440057	01-Oct-14	
EPA 6020A	Arsenic	mg/kg	10.6	8.83	2.50	69.4	75 - 125	W439097	07-Oct-14	D8,M2
EPA 6020A	Lead	mg/kg	51.7	49.0	2.50	110	75 - 125	W439097	07-Oct-14	
EPA 6020A	Selenium	mg/kg	4.84	2.74	2.50	83.8	75 - 125	W439097	07-Oct-14	D8

Metals (Total) by EPA 6000/7000 Methods

EPA 6010C	Antimony	mg/kg	30.7	<2.0	100	30.7	75 - 125	W440028	03-Oct-14	M2
EPA 6010C	Barium	mg/kg	384	264	100	121	75 - 125	W440028	03-Oct-14	
EPA 6010C	Cadmium	mg/kg	103	3.78	100	99.2	75 - 125	W440028	03-Oct-14	
EPA 6010C	Chromium	mg/kg	140	35.0	100	105	75 - 125	W440028	03-Oct-14	
EPA 6010C	Copper	mg/kg	133	26.9	100	106	75 - 125	W440028	03-Oct-14	
EPA 6010C	Iron	mg/kg	19400	17600	1000	R > 4S	75 - 125	W440028	03-Oct-14	M3
EPA 6010C	Manganese	mg/kg	817	711	100	105	75 - 125	W440028	03-Oct-14	M3
EPA 6010C	Silver	mg/kg	4.90	<0.50	5.00	98.1	75 - 125	W440028	03-Oct-14	
EPA 6010C	Zinc	mg/kg	381	300	100	81.9	75 - 125	W440028	03-Oct-14	
EPA 7471B	Mercury	mg/kg	0.617	0.275	0.333	102	75 - 125	W439088	26-Sep-14	
EPA 7471B	Mercury	mg/kg	0.432	0.083	0.333	104	75 - 125	W439087	26-Sep-14	

Metals (Total Recoverable--reportable as Total per 40 CFR 136)

EPA 200.7	Antimony	mg/L	1.00	<0.020	1.00	100	70 - 130	W439092	30-Sep-14	
EPA 200.7	Barium	mg/L	1.04	0.0414	1.00	100	70 - 130	W439092	30-Sep-14	
EPA 200.7	Cadmium	mg/L	0.978	<0.0020	1.00	97.8	70 - 130	W439092	30-Sep-14	
EPA 200.7	Chromium	mg/L	0.991	<0.0060	1.00	99.1	70 - 130	W439092	30-Sep-14	
EPA 200.7	Copper	mg/L	1.00	<0.010	1.00	100	70 - 130	W439092	30-Sep-14	
EPA 200.7	Iron	mg/L	10.4	0.111	10.0	103	70 - 130	W439092	30-Sep-14	
EPA 200.7	Manganese	mg/L	0.990	0.0088	1.00	98.2	70 - 130	W439092	30-Sep-14	
EPA 200.7	Silver	mg/L	0.0514	<0.0050	0.0500	103	70 - 130	W439092	30-Sep-14	
EPA 200.7	Zinc	mg/L	0.963	<0.0100	1.00	96.0	70 - 130	W439092	30-Sep-14	
EPA 200.8	Arsenic	mg/L	0.0254	<0.0030	0.0250	98.1	70 - 130	W439096	06-Oct-14	
EPA 200.8	Lead	mg/L	0.0237	<0.00300	0.0250	93.5	70 - 130	W439096	06-Oct-14	
EPA 200.8	Selenium	mg/L	0.0242	<0.00300	0.0250	96.9	70 - 130	W439096	06-Oct-14	



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W410513**
Reported: 07-Oct-14 13:18

Quality Control - MATRIX SPIKE DUPLICATE Data

Method	Analyte	Units	MSD Result	Spike Result	Spike Level	%R	RPD	RPD Limit	Batch ID	Analyzed	Notes
--------	---------	-------	------------	--------------	-------------	----	-----	-----------	----------	----------	-------

Metals (Total)

EPA 245.1	Mercury	mg/L	0.00098	0.00099	0.00100	98.0	1.0	20	W440057	01-Oct-14	
EPA 6020A	Arsenic	mg/kg	11.0	10.6	2.50	84.9	3.6	20	W439097	07-Oct-14	D8
EPA 6020A	Lead	mg/kg	51.6	51.7	2.50	105	0.2	20	W439097	07-Oct-14	
EPA 6020A	Selenium	mg/kg	5.11	4.84	2.50	94.8	5.6	20	W439097	07-Oct-14	D8

Metals (Total) by EPA 6000/7000 Methods

EPA 6010C	Antimony	mg/kg	29.1	30.7	100	29.1	5.4	20	W440028	03-Oct-14	M2
EPA 6010C	Barium	mg/kg	387	384	100	124	0.7	20	W440028	03-Oct-14	
EPA 6010C	Cadmium	mg/kg	102	103	100	98.5	0.7	20	W440028	03-Oct-14	
EPA 6010C	Chromium	mg/kg	141	140	100	106	1.0	20	W440028	03-Oct-14	
EPA 6010C	Copper	mg/kg	133	133	100	106	0.4	20	W440028	03-Oct-14	
EPA 6010C	Iron	mg/kg	19500	19400	1000	R > 4S	0.3	20	W440028	03-Oct-14	M3
EPA 6010C	Manganese	mg/kg	804	817	100	92.5	1.6	20	W440028	03-Oct-14	M3
EPA 6010C	Silver	mg/kg	4.95	4.90	5.00	99.0	0.9	20	W440028	03-Oct-14	
EPA 6010C	Zinc	mg/kg	385	381	100	85.8	1.0	20	W440028	03-Oct-14	
EPA 7471B	Mercury	mg/kg	0.440	0.432	0.333	107	1.9	20	W439087	26-Sep-14	
EPA 7471B	Mercury	mg/kg	0.627	0.617	0.333	106	1.6	20	W439088	26-Sep-14	

Metals (Total Recoverable--reportable as Total per 40 CFR 136)

EPA 200.7	Antimony	mg/L	1.01	1.00	1.00	101	0.2	20	W439092	30-Sep-14	
EPA 200.7	Barium	mg/L	1.03	1.04	1.00	98.5	1.6	20	W439092	30-Sep-14	
EPA 200.7	Cadmium	mg/L	0.987	0.978	1.00	98.7	0.9	20	W439092	30-Sep-14	
EPA 200.7	Chromium	mg/L	0.990	0.991	1.00	99.0	0.0	20	W439092	30-Sep-14	
EPA 200.7	Copper	mg/L	1.01	1.00	1.00	101	0.8	20	W439092	30-Sep-14	
EPA 200.7	Iron	mg/L	10.5	10.4	10.0	103	0.4	20	W439092	30-Sep-14	
EPA 200.7	Manganese	mg/L	0.979	0.990	1.00	97.0	1.2	20	W439092	30-Sep-14	
EPA 200.7	Silver	mg/L	0.0507	0.0514	0.0500	101	1.4	20	W439092	30-Sep-14	
EPA 200.7	Zinc	mg/L	0.975	0.963	1.00	97.2	1.2	20	W439092	30-Sep-14	
EPA 200.8	Arsenic	mg/L	0.0253	0.0254	0.0250	98.0	0.1	20	W439096	06-Oct-14	
EPA 200.8	Lead	mg/L	0.0237	0.0237	0.0250	93.8	0.3	20	W439096	06-Oct-14	
EPA 200.8	Selenium	mg/L	0.0245	0.0242	0.0250	97.8	0.9	20	W439096	06-Oct-14	

Quality Control - POST DIGESTION SPIKE Data

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
--------	---------	-------	--------------	-------------------	-----------------	--------	-------------------	----------	----------	-------

Metals (Total)

EPA 6020A	Arsenic	mg/kg	28.2	8.83	20.0	97.1	75 - 125	W439097	07-Oct-14	D8
EPA 6020A	Lead	mg/kg	66.8	49.0	20.0	89.4	75 - 125	W439097	07-Oct-14	
EPA 6020A	Selenium	mg/kg	23.2	2.74	20.0	103	75 - 125	W439097	07-Oct-14	D8

Metals (Total) by EPA 6000/7000 Methods

EPA 6010C	Antimony	mg/kg	15.4	<2.0	20.0	77.1	75 - 125	W440028	03-Oct-14	
-----------	----------	-------	------	------	------	------	----------	---------	-----------	--



IDEQ (Boise)
1410 N. Hilton
Boise, ID 83706

Project Name: Big Wood River Hg INV - 2014
Work Order: **W410513**
Reported: 07-Oct-14 13:18

Notes and Definitions

D2	Sample required dilution due to high concentration of target analyte.
D8	Sample required dilution to meet internal standard recovery limits.
M2	Matrix spike recovery was low, but the LCS recovery was acceptable.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to spike level. The LCS was acceptable.
LCS	Laboratory Control Sample (Blank Spike)
RPD	Relative Percent Difference
UDL	A result is less than the detection limit
R > 4S	% recovery not applicable, sample concentration more than four times greater than spike level
<RL	A result is less than the reporting limit
MRL	Method Reporting Limit
MDL	Method Detection Limit
N/A	Not Applicable
