

# **Preliminary Assessment and Site Inspection Report for Livingston and Little Livingston Mine Sites (aka Livingstone, Little Livingston Lake Mine)**

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Custer County



**State of Idaho  
Department of Environmental Quality**

**February 2014**



STATE OF IDAHO  
DEPARTMENT OF  
ENVIRONMENTAL QUALITY

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February 26, 2014

Mr. Ken Marcy  
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Subject: Preliminary Assessment and Site Inspection Report for the Livingston and  
Little Livingston Mine Sites, Custer County, Idaho

Dear Mr. Marcy:

The Idaho Department of Environmental Quality (DEQ) completed the enclosed Preliminary Assessment and Site Inspection (PA/SI) for the Livingston and Little Livingston Mine sites 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.

DEQ inspected these sites in August and September 2013. This PA/SI was performed as a partnership between DEQ and the United States Forest Service (USFS). During the 2013 field season, surface water and sediment sampling was conducted on USFS property to assess possible contamination originating from the mine sites. USFS is currently working on an agreement with the private landowner; therefore, soil sampling on the patented lands will be planned for a future field season.

Based on existing conditions and uses, historic information, data observations made during the site visit, potential pathways of contaminants to receptors, and potential exposures to ecological and human receptors, DEQ recommends **Further Site Inspections** to make a final determination for Livingston and Little Livingston Mines.

Recommendations for further site inspections include soil sampling of the waste dumps, roads and recreational use areas to determine if any sources of metals remain at the sites that: 1) could be an exposure pathway to recreational users, wildlife or livestock or 2) could be an ongoing contributing source to Jim Creek and the watershed surrounding Livingston Mine or the tributaries to Livingston Creek and the watershed surrounding Little Livingston Mine. If exposure pathways or ongoing sources are identified, recommendations for risk management efforts and/or remedial actions to reduce or eliminate risk should be identified.

This PA/SI report can also be found on DEQ's preliminary assessment web page:

<http://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](mailto:dana.swift@deq.idaho.gov).

Sincerely,

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

Dana Swift  
Mine Waste Project Coordinator

Attachments:

cc: Dean Morgan, USFS, Salmon-Challis National Forest  
Kathy Zamba, USFS, Intermountain Region



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February 2014



**Prepared by  
Idaho Department of Environmental Quality  
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## **Acknowledgments**

DEQ would like to thank United States Forest Service for being a partner on this preliminary assessment and site inspection of the Livingston and Little Livingston Mine sites.

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## List of Acronyms

amsl	above mean sea level
ATV	all-terrain vehicle
BLM	United States Bureau of Land Management
CWA	Clean Water Act
DEQ	Idaho Department of Environmental Quality
EPA	United States Environmental Protection Agency
g/L	gram per liter
GIS	geographic information system
HDPE	high-density polyethylene
IDFG	Idaho Department of Fish and Game
IDTLs	initial default target levels
MCL	maximum contaminant level
m/L	milliliter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mV	millivolts
NAIP	National Agriculture Imagery Program
NTU	nephelometric turbidity unit
ORP	oxidation reduction potential
PA	preliminary assessment
PPE	probable point of entry
PQL	practical quantitation limit
PWS	public water system
QA/QC	quality assurance/quality control
RPD	relative percent difference
SI	site inspection
su	standard units
SVL	Silver Valley Laboratories, Inc.
TDL	target distance limit
TDS	total dissolved solids
TMDL	total maximum daily load
USFS	United States Forest Service
USGS	United States Geological Survey

# 1 Introduction

This report presents the preliminary assessment and site inspection (PA/SI) results for the Livingston and Little Livingston Mine sites in Custer County, Idaho. Under a cooperative agreement with the United States Environmental Protection Agency (EPA) Region 10, the Idaho Department of Environmental Quality (DEQ) provides technical support for performing the 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 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 purpose of this PA/SI is to assess the threat posed to human health and the environment and determine the need for additional investigation or remediation at the Livingston and Little Livingston Mine sites. This PA/SI was performed as a partnership between DEQ and the United States Forest Service (USFS). Of the total acres to be assessed, about half is privately owned and the other half is owned by the USFS. During the 2013 field season, surface water and sediment samples for the mine sites were evaluated. USFS is currently working on an agreement with the private landowner; therefore, soil sampling of waste dumps, roads and recreational use areas on private lands will be planned for a future field season.

The PA/SI process 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 and current and potential future land uses.
- Section 3, **Sample Collection and Analysis**, describes the sampling locations and presents the 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 PA/SI conclusions and recommendations based on the current conditions at the site.

## 2 Site Description

The site description for the Livingston and Little Livingston Mine sites 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), and current and potential future land uses (Section 2.5). 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 Location and Ownership

The Livingston and Little Livingston Mine sites are located in the Boulder Creek Mining District within the Sawtooth National Forest in Custer County Idaho (Figure 1). The Livingston Mine is located at 9,300 feet above mean sea level (amsl) at the head of Jim Creek on the south side of Railroad Ridge. The Little Livingston Mine is located on the north side of Railroad Ridge (Mitchell, 1997). Livingston Mine is located in Section 4, Township 09 North, Range 16 East (latitude 44.13519°N and longitude -114.58543°W). Little Livingston Mine is located in Section 32, Township 10 North, Range 16 East (latitude 44.14844°N and longitude -114.59606°W). The Livingston Mine patented lands MS 912 and MS 914 comprise approximately 81.9 acres (Figure 2). The Little Livingston Mine patented lands MS 913 comprise approximately 59.7 acres (Figure 3).

The mine sites are located approximately 14 miles southwest of Clayton, Idaho. To access the sites, take Highway 75 from Stanley or Challis to the East Fork of the Salmon River. Turn right on the East Fork Road and follow the road until the pavement ends. Turn right on Forest Service Road No. 667 which follows Big Boulder Creek. Livingston Mill is at the end of this USFS road. Access to the mines from this point is by all-terrain vehicle (ATV) or foot.

This assessment was conducted to assess the impacts of mining on mixed ownership (public and private) lands. The Livingston and Little Livingston Mine patented lands are owned by Western States Land (parcel number RP9910N16E3218). All adjacent land is owned by the USFS. Sampling for this assessment was conducted on USFS property. DEQ does not warrant the ownership research or location of property boundaries contained in this report. The information regarding ownership and property boundaries was provided by the USFS and obtained from the Custer County Assessor's webpage (<http://www.greenwoodmap.com/custer/>).



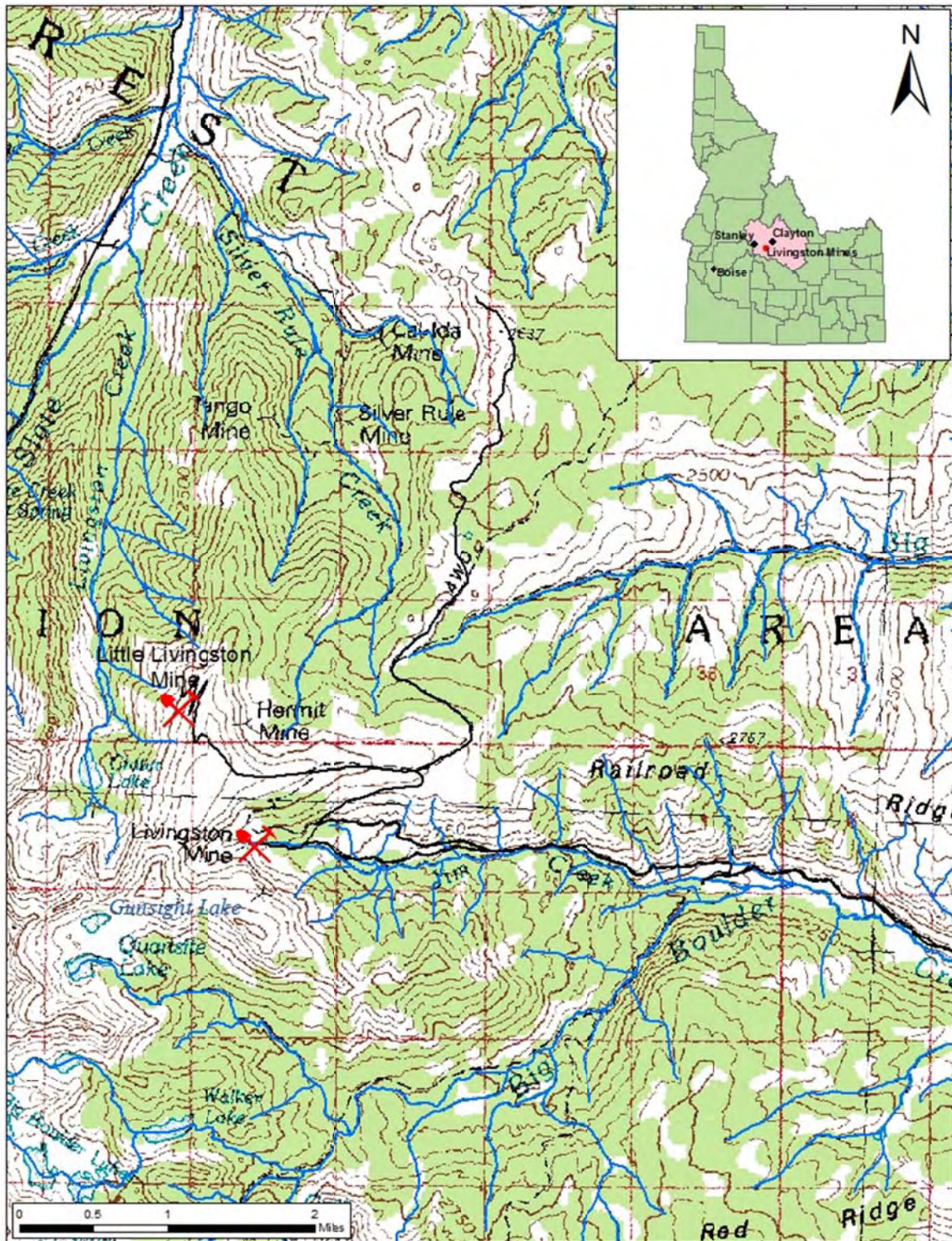
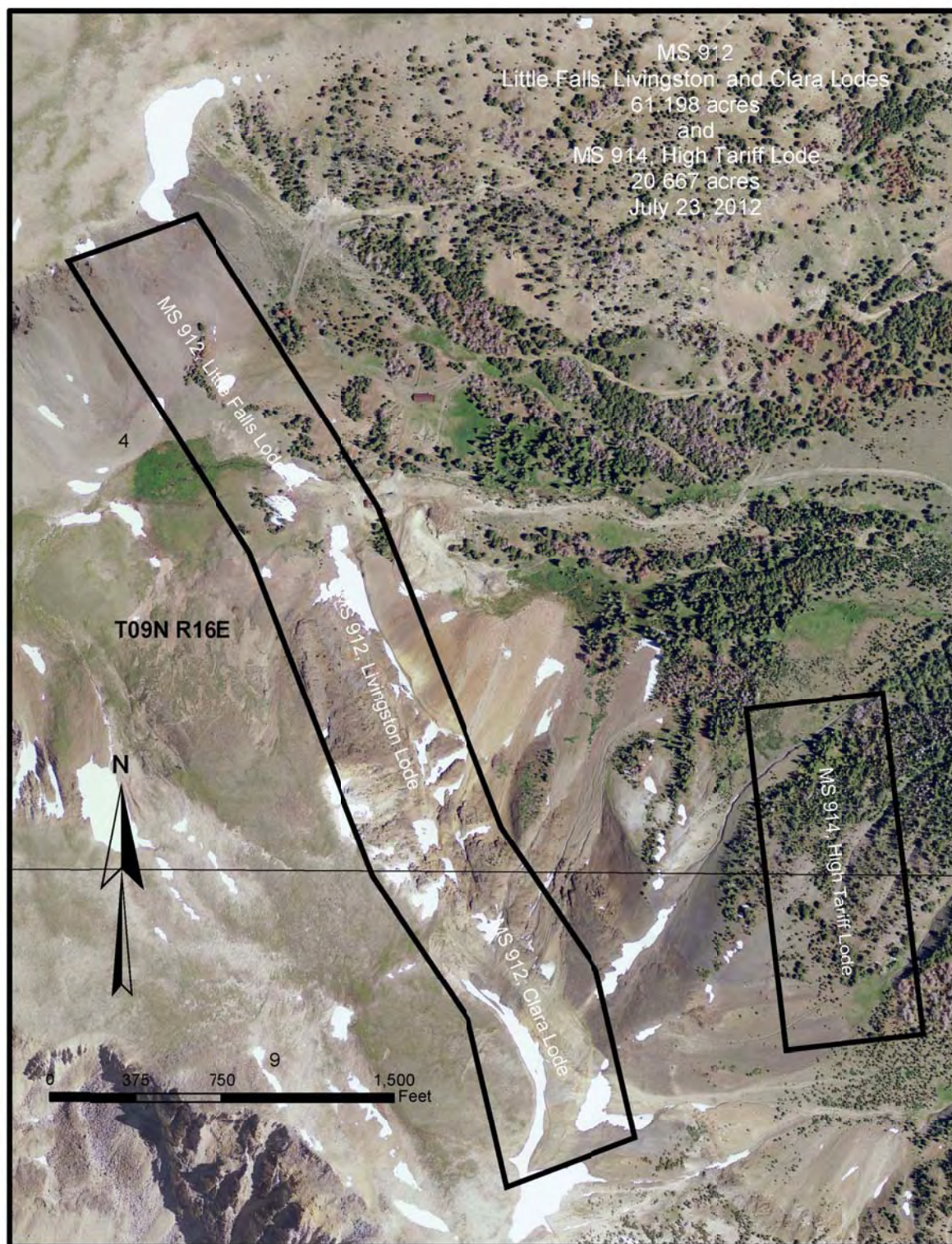


Figure 1. Topographic overview map of the Livingston and Little Livingston Mine sites.

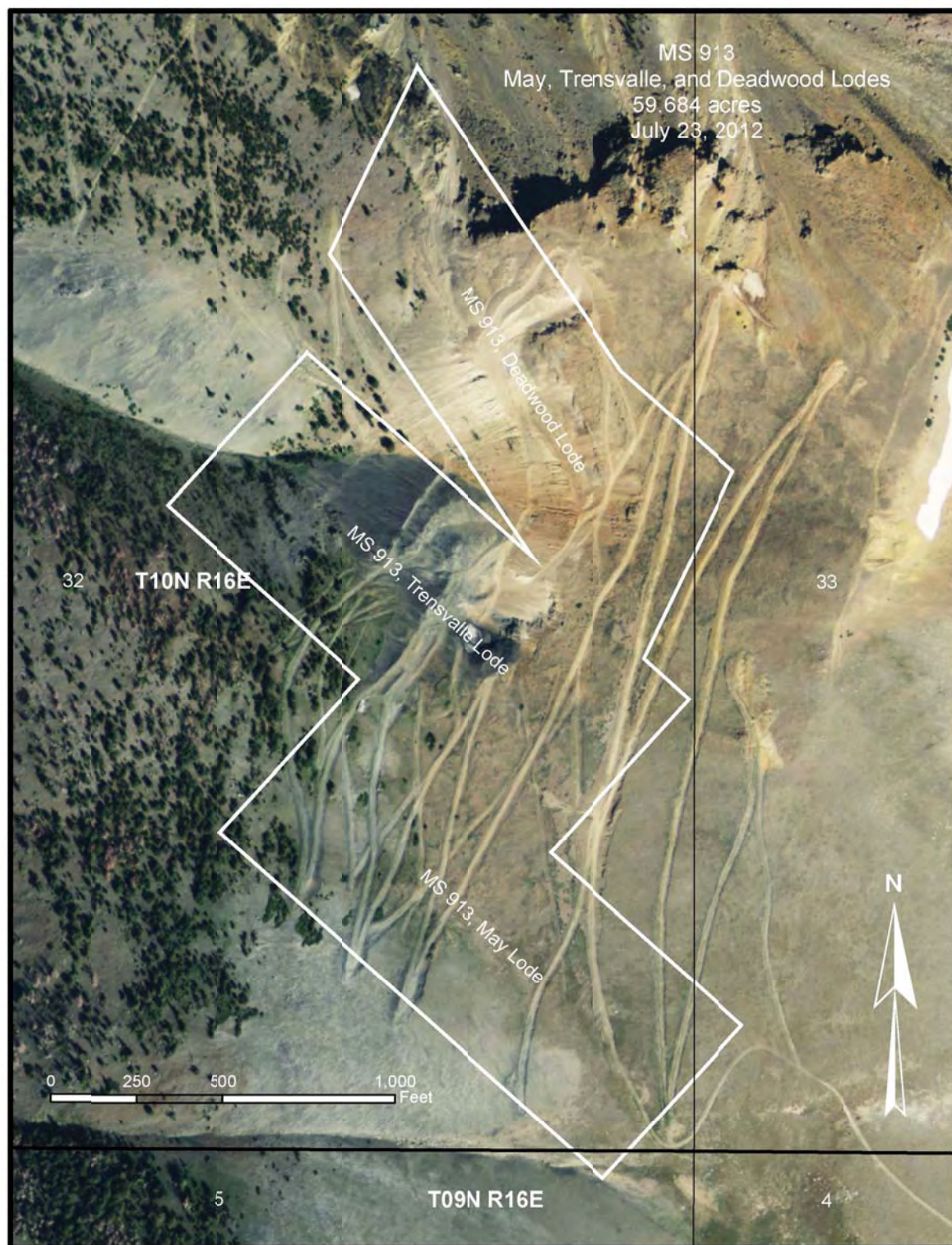




**Figure 2. Livingston Mine patented lands.**

(Source: Courtesy of USFS)





**Figure 3. Little Livingston Mine patented lands.**

(Source: Courtesy of USFS)

## 2.2 General Geology

A map of the major lithology for the Livingston and Little Livingston Mine sites is shown in Figure 4. The following information from *The Geology and Ore Deposits of the Boulder Creek Mining District, Custer County, Idaho* (Kiilsgaard 1949) was used to identify the composition of geology and lithology for the area. Since DEQ cannot improve or expand upon information included in historic reports, this information is quoted directly. The tables and figures referenced in this quote have not been duplicated in this report.

To unravel the many geologic problems, and to describe in detail, the lithology, stratigraphy, and structural features of the entire Boulder Creek district, would require time and efforts beyond the scope of this report. For this reason the following discussion is limited to those areas, and to those geologic features, which bear directly upon the problems of mineralization.

A hurried reconnaissance of the district reveals that the southwestern part is underlain by granitic rocks, a portion of the Idaho batholith; the central part by folded, northwest-trending Paleozoic sediments of which the Milligen formation is the chief component; and the northern and eastern parts by extrusive volcanic rocks, members of the Challis volcanics.

### SEDIMENTARY ROCKS

#### Milligen Formation

**Distribution:** The Milligen formation is well exposed near the Livingston mine. There it outcrops boldly as escarpments and precipitous slopes. Locally, the beds are contorted and have divergent strikes and dips; but in general the formation trends northwest and beds dip steeply northeast. At the Livingston mine and the Milligen outcrops as a broad belt, over a mile in width; however, when traced northwest to the upper limits of Slate and Livingston Creeks, the width increases to several miles. South of the mine, the trend of the belt is almost due north, the width decreases and the formation is restricted to the eastern face of the high ridge leading from the mine toward Boulder Creek.

**Character:** Most of the Milligen formation is a black, carbonaceous argillite containing some intercalated limestone and quartzite. Where exposed near the Hermit and Livingston mines, the argillite is black, dense, and thinly bedded. The dark coloration is caused by carbonaceous material that undoubtedly originated as organic matter deposited with the muds and silts which originally made up the formation. In thin section, the carbonaceous material appears as thin wisps and wavy streaks, which gives the rock its laminated appearance. The lamination as well as the bedding are highly contorted, indicating that the formation has been subjected to vigorous deformation.

At the head of the cirque immediately west of the Livingston mine buildings, alternating beds of light and dark quartzite, from 6 inches to 2 feet thick are prominently displayed. The coloration in the darker quartzitic beds reflects the presence of carbonaceous material. However, some of the dark beds are intercalated argillites. The quartzitic rocks are fine-grained, almost flint-like in appearance. Some of the beds are quite shaly and locally, where in contact with granitic rocks, have been strongly affected by contact metamorphism. Where also calcareous, these shaly quartzites have been metamorphosed to aggregates of such minerals as diopside, tremolite, and anorthophyllite. These minerals give the rock a light, somewhat mottled appearance, and the rock thus affected may easily be mistaken for a fine-grained igneous rock. Some excellent exposures of the rock occur in the west 2263 drift and in the cliff face adjacent to the Livingston mine portals.

A thick lense of impure limestone underlies the Livingston mine buildings. This lense may be traced to the northwest and southeast, thinning in both directions. The limestone is blue-black, fine-grained, and thinly bedded. It commonly weathers to a blue-gray, and in some places to a rusty brown.



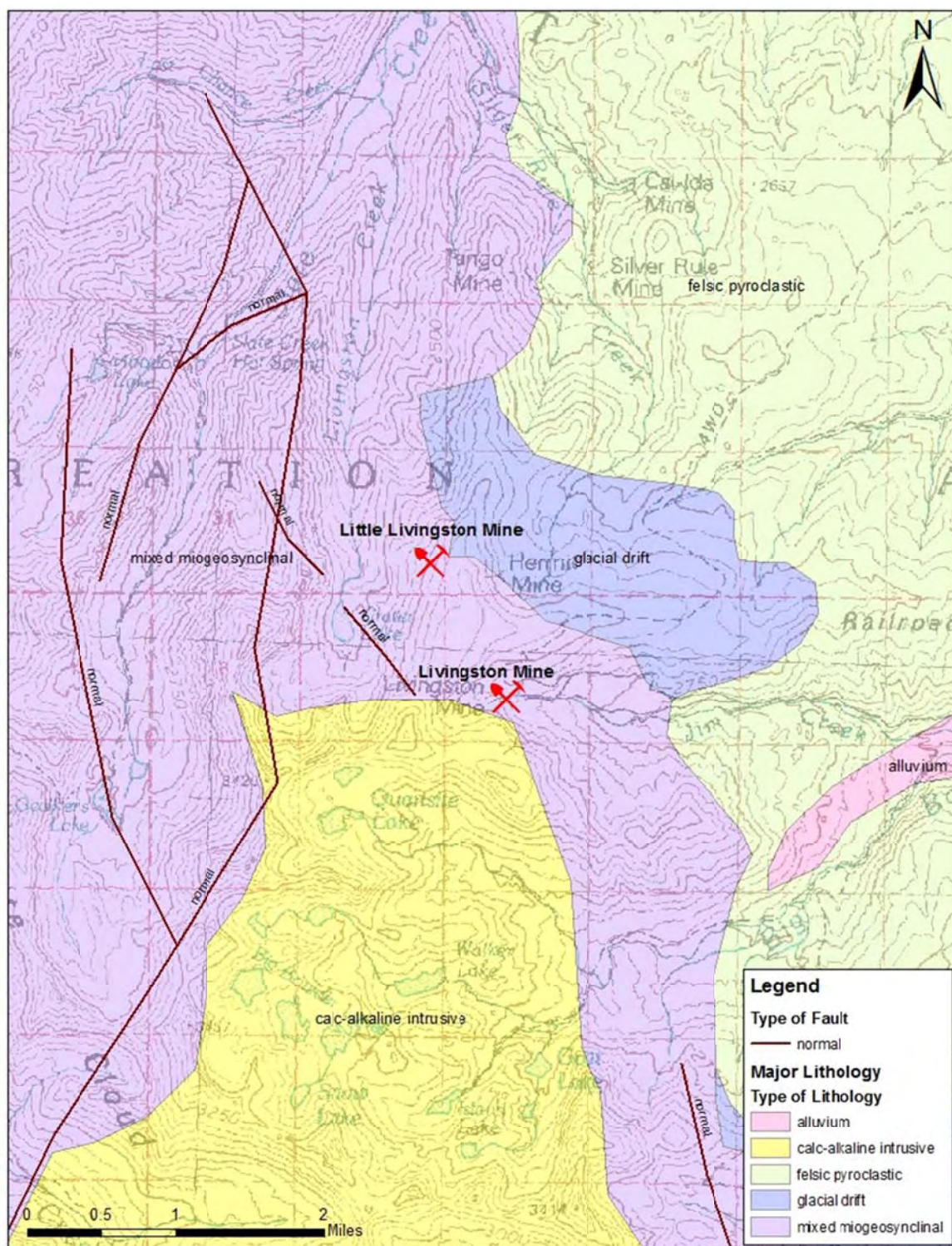


Figure 4. Map of major lithology in the vicinity of the Livingston and Little Livingston Mines.

Age: Ross,<sup>1/</sup> who has studied the Milligen formation in the Boulder Creek area, regards its age as Mississippian. This age assignment is based on fossil evidence plus stratigraphic correlation with similar rocks of that age. The Milligen is similar lithologically to the younger overlying Wood River formation, <sup>2,</sup> <sup>3/</sup> but the two are separated by a basal conglomerate. As the conglomerate does not appear in the Boulder Creek district, the rock is regarded as Milligen.

## IGNEOUS ROCKS

### Quartz Monzonite

Distribution and correlation: Granitic rock of general quartz monzonite composition is widespread in the western and southwestern parts of the Boulder Creek district, underlying much of the Boulder Creek basin and extending well up, and in places, beyond the summits of the surrounding mountains. Good exposures occur on the mountain top immediately west of the Livingston mine. This rock is regarded as an outlying part of the Idaho batholith; the main body of which lies a few miles to the west.

Character: Although there are some compositional variations, the prevailing rock type is quartz monzonite. It is medium grained, light gray, and has a granitoid texture. The rock is composed of dull white feldspars (orthoclase and oligoclase), quartz, and biotite. Accessory minerals include apatite, sphene, muscovite, and magnetite. Some of the rock in places contains phenocrysts of flesh colored orthoclase measuring up to one centimeter in length.

Age: The quartz monzonite intrudes the Milligen formation (shown in excellent exposures on the mountain top west of the Livingston mine) and is overlain by the Challis volcanics (Oligocene?) to the southeast. The rock therefore was emplaced after Mississippian time and before Oligocene time. As it appears to form a part of the Idaho batholith, it was probably intruded in late Jurassic or Cretaceous time as fixed by others, <sup>4,5/</sup> who have studied the age of the batholith.

### Dikes

Porphyritic dikes are plentiful in the granitic rock of the Boulder Creek basin, less so in the adjacent Paleozoic rocks. These dikes are composed chiefly of rhyolite porphyry.

One of the rhyolite porphyry dikes (the Scotch dike) is particularly important because of its influence on the location of ore at the Livingston mine. This dike has been cut by the Livingston fault with displacements as much as 160 feet, less so in places because of strike and dip variations. (Fig. 4, Section B-B'). The displaced segment is prominently displayed in the cliff face near the mine portals where it is from 20 to 40 feet thick. It may be traced southwest beyond the ridge crest and northwest to the basin of a small cirque where it is concealed beneath moronic debris. (Fig. 2).

Exposures of rhyolite porphyry are numerous in the western extensions of the Livingston mine. Some of these exposures may be mapped as dikes, but in places the rock is so sheared and contorted that projections can not be made from one mine-level to another.

The dike-rock has been variously described in times past. Former miners called it "turkey-egg granite"; other writers, <sup>1, 6, 7/</sup> have referred to it as aplite, alaskite, quartz porphyry, and quartzite. It is hereby proposed that the dike be termed rhyolite porphyry, because this classification is the only one which accurately satisfies its petrographic and compositional characteristics.

The hand specimen shows a dark aphanitic groundmass in which are plainly discernible dark phenocrysts ranging from 1 to 2 millimeters in diameter. The phenocrysts are chiefly quartz; however, some are orthoclase. They are the most prominent features in the dike rock, and in some underground working places they provide the only means by which the rock may be distinguished from fine-grained quartzite. At the outcrop the rock weathers to a whitish color, but may be streaked and mottled pinkish-red, because of oxidation of contained sulphides.

All exposures of the rhyolite porphyry are petrographically similar, except where in contact with the Livingston vein; there, the rock is highly silicified. In thin section, the groundmass of the rock is seen to be composed of sugary-textured quartz, orthoclase, albite, and sericite. The dike segment on the hanging wall side of the Livingston vein commonly displays a multitude of tiny lens—like slips that are filled with optically oriented sericite. The orientation has resulted from the intense stresses that acted upon the dike during fault movement. Ore minerals occur throughout all segments of the dike, both as fissure fillings and as replacements. The ore minerals are commonly displayed in joint planes and in fracture openings at the outcrop.

No definite age is assigned the dikes because of insufficient collaborative evidence. That they are younger than the quartz monzonite is proven by the manner in which they cut that body. Ross, 1/, places the dikes as end members of the magmatic activity which emplaced the batholith. On the other hand Anderson, 10/, in studying similar dikes in adjacent areas, holds that such intrusions are the results of a later magmatic cycle of Tertiary age. As evidence, he points to the chilling at relatively shallow depths. Thus the quartz monzonite must have been thoroughly chilled and deeply eroded before dike invasion.

### Extrusive Rocks

#### Challis Volcanics

The eastern, or foothill parts, of the district are covered by a thick series of interbedded andesites, latities, basalts, and tuffs. These volcanic extrusives have been mapped by Ross, 1/, but since they do not contain ore deposits locally, they were not studied in detail.

Ross, 1/, who has pioneered the study of this formation, has given their age as Oligocene(?).

#### ALLUVIUM

### Glacial Deposits

Glacial deposits are well exposed on the small bench south of the Livingston mine near the Del Yante property. They also occur in the cirque immediately behind and in the area surrounding the Livingston mine buildings. The most prominent deposits form capping on Railroad Ridge. Other extensive deposits overlie the Challis volcanics on the ridge south of Jim Creek.

These deposits are composed of poorly sorted alluvium ranging from coarse sands to boulders 15 feet in diameter. Most of the material has been derived from the granitic areas lying to the west.

The glacial deposits are the products of alpine glaciation which was widespread in the central Idaho region during Pleistocene time.

#### STRUCTURE

The contortion of the Milligen formation indicates that structural deformation in this area has been intense. This deformation is strikingly evident in the eastern canyon wall near the headwaters of Livingston Creek. Here, the denuded and precipitous wall presents a perfect cross section of an asymmetrical syncline. A fault of large but unknown magnitude cuts the northern limb of the syncline, which together with its accompanying dragfolds, may be viewed from several miles distant.

Although most of the deformation is older than the quartz monzonite, no attempt is made to assign either an age or a cause for this deformation. Such postulations would require collaborative evidence beyond the scope of this report. Criteria concerning the general age of the deformation are present along the granitic contact on the mountain top west of the Livingston mine. In this area a large block of argillite, striking NW and dipping steeply to the NE is enclosed by quartz monzonite. The larger, parent body of argillite located nearby has the same strike and dip as the enclosed block. This indicates that the argillite was folded before encroachment by the granitic magma.

Some structural disturbances have occurred since the granitic intrusion. A good example is the Livingston fault which displaces not only the older argillite, but also the younger dikes.

### ORE DEPOSITS

The ore deposits in the district occur along shear zones, partly as fillings of open fissures and partly as replacements of the host rock. These shear zones are made up of enumerable small, closely spaced slips (shears) that represent discontinuous movement for a period of time. The hanging wall of some of the pillars in the Christmas stope on the Livingston vein reveals this character admirably. Here, thin-banded laminated zones of sheared argillite, some as much as 3 feet thick, attest to the repeated movement to which these rocks have been subjected.

An important, if not the most important aspect of the shearing has been the compatibility of the rocks that were subjected to shearing stress. Some rocks, such as the pliant argillites, have been deformed by flowage, and locally by shearing, whereas the more competent rocks, i.e., the dikes and some quartzites have readily failed by fracturing. Thus, fracture openings in the competent rocks have provided the main avenues of approach for the mineralizing solutions. In places these solutions diffused into and replaced the bordering, unfractured host rocks, forming ore deposits. Here and there the solutions were able to permeate along the shear planes in the argillite, producing a banded or book-like structure in which thin layers and small masses of ore are separated by bands and irregular layers of argillite. This structure is the product of progressive shearing in which each separate shear plane has formed a receptacle for mineral deposition. It was apparently easier for the recurrent shearing to form a new opening than to reopen an old one that had been healed with ore.

The ore bodies are not continuous but are confined to shoots of definite rake. These shoots may be separated by barren ground or ground so little mineralized as to be scarcely distinguishable from the country rock. The ore shoots are structurally controlled and where the control is such as to inhibit mineral deposition, ore was not formed.

The ores were deposited under mesothermal or moderately deep-seated conditions and should continue to depths not yet reached by mining.

The age at which ore deposition occurred is undetermined. In as much as the ores replace the rhyolite porphyry dike-rock, they are obviously younger. If the dikes were emplaced in early Tertiary times, as implied by Anderson, 1910, then it is probably that the ore was deposited during the early Tertiary epoch of mineralization that was so prevalent throughout the west.

## **2.3 Climatology**

Climate information is based on a summary for Stanley, Idaho obtained from the Western Regional Climate Center (<http://www.wrcc.dri.edu/climatedata/climsum/>). The climatological data is collected at the Stanley Model Station (108676) (elevation 6,260 amsl) which is approximately 19 air miles from the Livingston and Little Livingston Mine sites.

The region is characterized by short, cool, dry summers and cold winters. Based on data collected from 1916 to 2013, total annual precipitation averages 13.6 inches. The majority of precipitation occurs as snow in December and January with a total annual snowfall average of 74.8 inches. The driest months of the year are July, August, and September.

The average annual high temperature is 52°F and the average annual low temperature is 18°F. July is the hottest month with an average temperature of 79°F. January is the coldest month with an average temperature of -0.9°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, locate potentially dangerous physical hazards such as open adits and shafts, 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.

Numerous sources were used during desktop research prior to visiting the site and often the historical records do not distinguish between the Livingston and Little Livingston Mines. Since DEQ cannot improve or expand upon information included in historic reports, this information is quoted directly from the Idaho Geological Survey (IGS) report by Victoria E. Mitchell (1997) *History of the Livingston Mine, Custer County, Idaho*. The tables and figures referenced in this quote have not been duplicated in this report.

The Livingston Mine is located at an altitude of 9,300 feet at the head of Jim Creek on the south side of Railroad Ridge in the Boulder Creek mining district in Custer County (Figures 1 and 2). The mill is located at the confluence of Jim Creek and Big Boulder Creek, about 2,000 feet lower and 4 miles to the east of the mine (Figure 3). The original claims were staked by A.S. and W.S. Livingston on July 28, 1882. (Table 1 shows individuals and companies operating at the mine.) Early production records have been lost, but rich lead-silver ore found on the outcrop was shipped by mule to the Clayton smelter soon after the mine's discovery. At various times, ore was shipped to smelters as far away as Denver, Colorado (Kiilsgaard, 1949).

For most of its history, the Little Livingstone Mine, on the north side of Railroad Ridge, was under the same ownership as the Livingston, and records do not always distinguish between the two properties. Ross (1937) believed that a large percentage of the work and ore shipments credited to the Livingston in the early records may have come from the Little Livingston. In the Livingston mine proper, most of the ore came from one large shoot, known as the Christmas stope, that extended 210 feet along strike, was up to 30 feet thick, and was mined for more than 400 feet downward (Van Noy and others, 1986).

In 1922, Livingston Mines Corporation acquired the mine. The company began work late in the year. The extensive development and construction campaign included rehabilitating the mine and building a 10-mile road to connect the mine with the highway on the East Fork of the Salmon River. Much of the road work required heavy construction.

During 1923, the company continued to work on the road, which cost \$50,000. Installation also began on a 3-mile Leschen aerial tramway (\$45,000), a 380-horsepower hydroelectric power plant (\$35,000), and a concentrator (\$50,000). The mine had six tunnels, with a total length of about 1,650 feet. Several lots of lead ore rich in silver were produced during the year.

The mine and mill operated continuously throughout 1926, and a large quantity of crude ore and concentrates was shipped to Salt Lake City, Utah. The company did more than 3,000 feet of improvements. (Table 5 shows the development work done during 1926.) Total development on the property was 7,751 feet, including 120 feet of shafts, 973 feet of raises, and 6,658 feet of tunnels, crosscuts, and drifts. A third compressor (a 12-inch by 16-inch Ingersol-Rand) was added to the mine and haulage was done with a Mancha storage battery locomotive, also new in 1926. The mine had an Anaconda air hoist for use in the



raises. During the year, a supplementary 250-horsepower vertical Diesel engine was added to the power plant, the mill and tramway were extensively modified, and considerable work was done to improve the road. New equipment added to the mill included five Wilfley tables and three Cornish-type rolls; a “table and flotation annex” was added to the mill buildings. In addition, two new bunkhouses, two shops, and six additional residences were constructed.

In 1927, Livingston Mines Corporation had the largest payroll of any mine in southern Idaho. The mine produced continuously all year long. (Table 6 shows the development work done during 1927.) In addition, the company redesigned and rebuilt its mill and performed a large amount of development work.

Reflecting progress in extractive metallurgy, the mine became a zinc producer in 1928.

The Livingston was worked continuously during 1929. The company greatly increased shipments of lead concentrates but made no lead-zinc middlings. Outside of the Coeur d’Alene region, the company ranked first in lead and second in silver production in the state. The mill treated 25,577 tons of lead ore and shipped about 4,300 tons of silver-lead concentrates. No effort was made to save separate zinc concentrates or middlings. The mine had 19,715 feet of drifts and tunnels and 3,823 feet of raises. Development for the year included 2,000 feet of crosscuts and drifts and a large amount of stoping.

During 1929, the company conducted active mining and milling operations only during January. In that time, the company treated 1,326 tons of lead ore in the mill and shipped 289 tons of concentrates to Midvale, Utah, for smelting. Development continued for the following five months, totalling 1,150 feet. The mine closed on July 19, 1930, and the company went into receivership on December 24.

The property remained idle and in receivership throughout 1931 and 1932. The 1933 IMIR mentions that the property had been sold, but the following year’s report again states that the company was in receivership. Correspondence in the Mine Inspector’s records indicates that the mine was sold to Lewis Twynman of Miami, Florida, at a receiver’s sale in the summer of 1934. Twynman operated the mine with a crew of five or six men during the summer of 1935, but the mine was inactive in 1936 and 1937.

During 1947, the mine was operated most of the year. The company shipped 1,295 tons of ore to a custom flotation mill at Midvale, Utah. The ore yielded 14 ounces of gold, 8,712 ounces of silver, 2,640 pounds of copper, 314,550 pounds of lead, and 174,608 pounds of zinc.

During late 1947 and early 1948, the company extended the winze another 60 feet and did “considerable” stoping. According to the company’s report to the Mine Inspector, 43 carloads of crude ore (2,495 tons) were shipped directly to the smelter, for which the net smelter returns were \$39,326. In contrast, the USBM credited the mine with shipping 2,172 tons of ore to reduction plants in Utah. The ore contained 29 ounces of gold, 13,949 ounces of silver, 4,400 pounds of copper, 404,837 pounds of lead, and 264,751 pounds of zinc. The company added a Gardner Denver 210-cubic-foot compressor (with engine) to the mine and, toward the end of the year, purchased a 100-ton flotation mill.

The mine operated throughout 1949, shipping 1,027 tons of ore to reduction plants in Utah. The ore yielded 15 ounces of gold, 6,632 ounces of silver, 2,244 pounds of copper, 186,684 pounds of lead, and 195,666 pounds of zinc.

The company operated the mine for three months during 1950. During that time, 50 tons of ore was shipped to Montana and Utah smelters. The ore contained 1 ounce of gold, 1,158 ounces of silver, 19,600 pounds of lead, and 4,400 pounds of zinc. According to the company’s report, lessees shipped 354.8945 tons of crude ore, with net smelter returns of \$3,028.06. The mine was inactive for the next year.

In 1951, Livingston Mines, Inc., sold all its assets and liabilities to Idaho Custer Mines Co., of Wallace, Idaho. Idaho Custer began milling the zinc-lead tailings from the tailings pond in September. A total of 598 tons of lead concentrates and 586 tons of zinc concentrates was produced. This was the entire output of the district for the year.

Idaho Custer continued to process zinc-lead tailings through October 1952. The company started to rehabilitate the mine in April, but ceased operations in September. The company planned to extend development of the property with a Defense Minerals Exploration Administration (DMEA) loan.

The mine was inactive in 1953, but a DMEA contract was awarded on July 28, 1953, for \$97,737. Government participation in the project was 50 percent. The contract was active until September 1958 and was amended twice.

Idaho Custer began exploration work on the mine in late 1953, using funds from the DMEA loan. However, heavy snow halted operations. The company resumed exploration work in 1954 and also produced a small amount of lead-zinc concentrate. During the latter part of the year, a block-leasing system was started in the upper levels of the mine. In 1955, the total amount of Idaho Custer's award was reduced to \$95,500. The mine was operated under a block leasing system during the year.

In May 1956, Idaho Custer Mines, Inc., sold all its assets and liabilities to Idaho Custer Silver-Lead Mines, Inc., in exchange for 4,252,960 shares of Idaho Custer Silver-Lead Mines stock. The new company entered into an agreement with Hecla Mining Co. in April 1957 for Hecla to carry out the exploration work on the mine under the DMEA contract. The work started in June, and Hecla had the option to participate on a profit-sharing basis after the initial exploration program had been completed. The DMEA contract was amended to show Hecla's participation and the amount of the loan was changed to \$91,790 on March 25, 1957. The exploration program ended in September 1958. Van Noy and others (1986) indicate that mineralization was discovered in three of the DMEA drill holes, but that it was thought to be from small, widely separated ore pods. In September 1958, Hecla terminated the agreement with Idaho Custer.

The mine, mill, and camp were sold to Elmer H. Swanson, of Seattle, Washington, in January 1960. The next mention of the property is in the 1971 IMIR, which listed the mine as active. The 1972 IMIR also showed the Livingston as active, although Swanson apparently had no men working on the property. In 1992, the Idaho Geological Survey reported some activity at the Livingston.

When the USBM visited the property in 1971 or 1972 (Figures 23 and 24; Table 9), the mine was flooded below the 2400 level. Many of the workings and portals along fault zones were caved. However, hundreds of feet of workings, including the large Christmas stope, were open and had a minimum of support (Van Noy and others, 1986).

Ross (1937) stated that several hundred feet of tunnels had been driven on the Little Livingston property, but that most of them were caved. Two tunnels were reopened in the 1920s and were visited by one of Ross's assistants. Only a 550-foot adit well below the ore zone was open in the early 1970s. Extensive bulldozing had removed virtually all traces of the old workings (Figure 25 and Table 10; Van Noy and others, 1986).

Total recorded production for the Livingston Mine (which includes ore removed from the Little Livingston) from before 1900 to 1975 was 86,702 tons of ore. In addition, 60,000 tons of tailings were reprocessed. This material yielded 613 ounces of gold, 543,959 ounces of silver, 47,898 pounds of copper, 17,295,085 pounds of lead, and 4,143,004 pounds of zinc. Production does not accurately reflect the ore grade, because material containing predominately sphalerite was often bypassed, dumped in open stopes, or used for backfill (Van Noy and others, 1986). In addition, no antimony was produced, although jamesonite was the dominant ore mineral.

The Livingston vein still contains an estimated 50,000 tons of ore with an average grade of 0.005 ounces of gold and 4 ounces of silver per ton, 0.02 percent copper, 4 percent lead, and 5 percent zinc. Additional ore is present in small stringers (Van Noy and others, 1986).

Additional historic information from the Geological Survey Bulletin 1545-E by Ronald M. Van Noy et. al. (1986) regarding the Livingston and Little Livingston Mines is quoted below. The tables and figures have not been duplicated from Van Noy's report.

**Livingston Mine.** The Livingston mine is at an altitude of 9,300 ft (2,835 m) in a cirque at the head of Jim Creek (pl. 3, 90; fig. 73). The Livingston mill is at the confluence of Jim Creek and Big Boulder Creek about 2,000 ft (610 m) lower and 4 mi (6.4 km) west by road from the mine (fig. 74).

The claims covering the mine were located by A. S. and W. S. Livingston on July 28, 1882. Some rich lead-silver ore was reportedly shipped by pack train. In 1922, a road was constructed to the mine and a 200-ton/day mill, a 3-mi (4.8-km) aerial tram, and a hydroelectric plant were installed; by 1923, the property was in production. Production was fairly continuous until 1930 (table 18). From 1930 to the present time, the mine has changed ownership several times. Mining and milling equipment was removed, reinstalled, and some of it removed again. In 1951 and 1952, 60,000 tons (54,000 t) of mill tails were rerun. During the period from July 1953 to September 1958, the mine was explored under a DMEA contract.

The mine is owned by Elmer Swanson of Clayton, Idaho. The property includes 4 patented mining claims, and about 77 unpatented mining claims extending to the Little Livingston mine. A patent application is pending on the millsites.

A total of more than 3 mi (4.8 km) of underground workings has been driven on the nine main levels (fig. 75). The mine is flooded to the 2400 level. Above this level, the ground stands exceptionally well. Some portals and many underground workings along fault zones are caved, but hundreds of feet of workings stand open with a minimum of ground support, including the large Christmas stope.

The country rock is black carbonaceous argillite, with some interbedded limestone and quartzite (figs. 73, 76). A west-trending fault that dips 33° N. is exposed both in the mine workings and on the ridge south of the mine, where it is traceable northwestward down the cirque face to glacial debris on the valley floor. This structure, called the Livingston fault or vein, apparently was the main channel for ore-forming solutions that deposited sulfide minerals in fractures along and near the fault and formed replacement bodies in the wall rock. The Livingston fault is a reverse fault with a right-lateral component of movement; it is terminated on the west and east by north-trending, west-dipping, pre-mineral bounding faults. The known strike length between the near-vertical West and East bounding faults (fig. 76) ranges from 250 to 600 ft (76 to 180 m). The fault has been explored for 2,700 ft (823 m) downdip, a vertical distance of 1,400 ft (427 m) (figs. 74, 77).

The principal ore minerals are jamesonite, galena, sphalerite, and tetrahedrite. Jamesonite, the dominant ore mineral, occurs throughout the mine from the highest outcrops to the lowest working without any noticeable change in character (Kiilsgaard, 1949, p. 18). Galena is particularly abundant on and above the 1400 level. Sphalerite is more abundant from the 1800 level to the lower mine levels.

The major ore shoots in the Livingston vein do not follow the dip of the fault but rake 26° NW. Major replacement ore shoots occur along the contact of the vein and a steeply southwesterly dipping rhyolite porphyry dike (Scotch dike) that cuts the fault zone. Most production came from a continuous ore shoot along the intersection of the vein and the dike. This ore shoot extended as far as 210 ft (64 m) along the strike, was as much as 30 ft (9 m) thick, and was mined for more than 400 ft (120 m) downward. This mined-out area is known as the Christmas stope. The average material produced from the mine, according to production records, contained about 0.005 oz gold per ton (0.17 g/t), 4.1 oz silver per ton (141 g/t), 6.7 percent lead, 3.0 percent zinc, and 0.02 percent copper. The grade of the ore is not correctly reflected by production records because material containing predominantly sphalerite often was bypassed, dumped in open stopes, or used for backfill. Furthermore, although jamesonite contains 80 percent as much antimony as lead, no antimony production is recorded (table 18).

Other veins in the mine include the Little Falls, Blumenthal, and small offshoots; these veins are extensively described by Kiilsgaard (1949, p. 16-18). The Little Falls vein is exposed west of the mine buildings and in the 2200 and 2400 levels. The thickness is less than 2 ft (0.6 m). Lead ore with a high silver content was reportedly mined from small stopes along the vein (Kiilsgaard, 1949), but samples R-19 and R-20 (fig. 73) from the surface exposures contained only 0.5 and 0.6 oz silver per ton (17 and 21 g/t), respectively. The Blumenthal vein is a mineralized porphyry dike exposed in the 2402 cross cut. Judging from hand specimens, the value is very low (Kiilsgaard, 1949, p. 17). The small size, discontinuous nature, and low grade of the small off-shoot veins, which occur at various distances from the Livingston vein,

discouraged exploration. A relatively large, barren quartz vein (sample R-116, fig. 73) crops out 2,000 ft (610 m) east from the south end of the Livingston vein. The vein is 10 ft (3 m) thick and is exposed for about 300 ft (90 m) in a trench.

In 1953, a project to explore the possible downward (northern) extension of the mineralized zone was conducted under a DMEA contract. The work completed includes a 250-ft (76-m) extension of the vertical two-compartment winze, a 245-ft (75-m)-long crosscut on the 2750 level, and 20 diamond drill holes aggregating 2,863 ft (873 m) (fig. 78). Lead and zinc minerals were encountered in two holes and one other hole showed abundant mineralized material, but the mineralized showings are thought to be small, widely separated pods because core from nearby holes was barren.

The extended winze did not intersect the Livingston fault, which indicates that the fault may have steepened. The six drill holes from a crosscut on the 2750 level (fig. 78) encountered a large amount of water, which may indicate proximity of the Livingston fault or a subsidiary structure; but ore minerals or favorable indications for the occurrence of an ore body were almost completely lacking (DMEA unpub. data, 1959).

Diamond drilling on the 2,400-ft level (figs. 77, 78, site No. 1) consisted of four down holes that totaled 881 ft (269 m) in length. The only significant mineralization encountered was in the vertical hole, where an 8-ft (2.4-m) zone of low-grade mineralization containing jamesonite, sphalerite, and pyrrhotite was encountered between 135 and 143 ft (41 and 43 m) below the collar (DMEA report). The zone was not sampled by the U.S. Bureau of Mines during this study.

Eight holes aggregating 1,294 ft (394 m) were drilled on the 2500 level. Only two widely separated and diverging holes penetrated noteworthy mineralized material. A drill hole from site No. 2 encountered sphalerite at a depth of 110 to 120 ft (34 to 37 m). The 10-ft (3-m) interval averaged 0.9 oz silver per ton (30.9 g/t), 9.1 percent zinc, and no lead. A drill hole from site No. 3 intersected a mineralized zone of sphalerite and jamesonite from 50.0 to 60.0 ft (15 to 18 m) below the collar that averaged 4.6 oz silver per ton (158 g/t), 4.4 percent lead, 7.5 percent zinc, and 1 percent antimony. Selected specimens split from the remaining drill core indicated that as much as 0.189 percent cadmium and 0.24 percent copper occur in the mineralized material.

Seven samples were taken from outcrops, 21 from underground working (2200 level and above), 11 from drillcores, 9 from tailings ponds near the mill, and 2 from a stockpile near the mill. Values ranged to 0.08 oz gold per ton (2.74 g/t), 48.5 oz silver per ton (1,663 g/t), 0.24 percent copper, 48 percent lead, 52 percent zinc, 0.189 percent cadmium, 2.6 percent antimony, and 1.74 percent arsenic. Sample averages by location are listed in table 19. They coincide favorably with previously published data.

High-grade ore containing as much as 48 oz of silver per ton (1,645 g/t) was left in place because some material had to be handled as much as five times between the 1200 level and the portal on the 2200 level. The section of the Livingston fault from the 1200 level to the surface, a projected distance of 650 ft (198 m), has not been explored. The remaining quantity of mineralized material within the known extent of the Livingston vein is estimated to be about 50,000 tons (45,000 t), containing 0.005 oz gold per ton (0.17 g/t), 4 oz silver per ton (137 g/t), 4 percent lead, 5 percent zinc, and 0.02 percent copper. Additional material is present in narrow stringers.

**Little Livingston Mine.** The Little Livingston mine (pl. 3, 88) is covered by three patented mining claims, located August 6, 1884, and patented February 3, 1894. The surrounding ground is covered by unpatented mining claims.

Production records do not differentiate between the Livingston and the Little Livingston mines. Part of the early ore shipments credited to the Livingston (table 18) probably came from the Little Livingston mine (Ross, 1937, p. 152).

Adits several hundred feet in total length had been driven by 1928 (Ross, 1937, p. 152), but a 550-ft (167-m) adit in barren argillite was the only one accessible in 1972. This adit is far below the argillite-quartzite

contact reportedly associated with ore (Ross, 1937, p. 152). Extensive bulldozing has virtually obliterated all the other old workings (fig. 79).

Country rocks in the mine area are carbonaceous and calcareous argillite and argillaceous limestone overlain by the Hailey conglomerate and quartzite. The argillite bed generally strike N. 45°-50° W. and dip 20°–30° N. According to Ross (1937, p. 152), a mineralized fault zone that strikes N. 25°–30° W. and dips 45° S. was exposed in the mine. Reportedly, the rock between the faults was broken and subsequently silicified; pockets of ore were irregularly distributed in the breccia.

Small irregularly distributed pods of quartz and limonite-stained brecciated zones occur near the contact of the argillite and quartzite on the surface. They probably are in the same zone that contained ore underground. The pods are generally less than 2 ft (0.6 m) thick and less than 10 ft (3 m) long. The limonite-stained zones are less than 4 ft (1.2 m) thick. A selected sample (R-11) from one zone contained 13.7 oz silver per ton (470 g/t) and 19.4 percent lead. Other samples from the quartz pods or limonite-stained zones generally contained less than 3 oz silver per ton (103 g/t) and less than 1 percent lead.

## **2.5 Current and Potential Future Land Uses**

There are no permanent residents at the Livingston and Little Livingston Mine sites. However, near the Livingston Mill site, about 2,000 feet lower and approximately four miles to the east of the Livingston Mine, there is one permanent resident and the Big Boulder Creek trailhead. This trailhead is a popular seasonal recreation area with hikers camping near the trailhead.

Public access to the mine sites is unrestricted. Current land uses include recreational activities such as hiking, backpacking, camping, hunting, horseback riding, biking, and ATV touring. Evidence of cattle grazing was observed at the Livingston Mine at the time of the site visit. These current uses are likely to continue into the future.

## **3 Sample Collection and Analysis**

During the 2013 field season, sediment and surface water samples were collected to evaluate the Livingston and Little Livingston Mine sites. Photographs, sample collection information, field parameters, and analytical results are presented for Livingston Mine (Section 3.1) and Little Livingston Mine (Section 3.2).

Sampling was conducted in accordance with DEQ's Quality Assurance Project Plan for the Preliminary Assessment Program and the Field Sampling Plan for Livingston Mine and Little Livingston Mine (DEQ 2012 and 2013). The field crew did not purposely or knowingly trespass on any private holdings during field work. All 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.

Sediment samples were collected in Ziploc bags and placed in cloth bags for protection. The sediment samples were dried and sieved at the laboratory for analysis using EPA method 200.7. Surface water samples were field filtered using a tower and 0.45  $\mu$ m filter, transferred to 500 mL high-density polyethylene (HDPE) containers and preserved with nitric acid. At the laboratory, surface water samples were analyzed using EPA method 200.7 for all analytes except As, Cd, Pb, Se, and Sb which were analyzed by EPA method 200.8 and Hg was analyzed by EPA 245.1. Parameters measured in the field at each sampling location include temperature, pH, oxidation reduction potential (ORP), conductivity, turbidity, dissolved oxygen, and total dissolved solids (TDS).

A copy of the laboratory report is included as Appendix A and a summary of the field parameters and laboratory results are included in the following subsections. Results are discussed in the context of pathways and targets in Section 4.

### 3.1 Livingston Mine

DEQ and USFS visited the Livingston Mine on August 7, 2013 (Photo 1). DEQ collected samples on August 7 and 8, 2013. The weather was approximately 70°F, sunny, and clear.



**Photo 1. Overview of Livingston Mine vicinity.**

Eight sediment samples and nine surface water samples were collected by DEQ on August 7, 2013 in the immediate vicinity of Livingston Mine (Figure 5). A summary of the laboratory results and field parameters are presented in Tables 1 and 2.

- *Background* (Photos 2 and 3): sediment (LV-BG-SD1) and surface water (LV-BG-SW1). The background samples were collected to the east and upgradient of the Livingston Mine. Evidence of cattle grazing was observed in this area.
- *Main haulage drift portal* (Photo 4): sediment (LV-MHDW-SD2 and LV-MHDW-SD3 duplicate) and surface water (LV-MHDW-SW2 and LV-MHDW-SW3 duplicate).
- *Jim Creek #1 below the main haulage drift portal* (Photo 5): sediment (LV-MHCA-SD4) and surface water (LV-MHCA-SW4). Sample location was downgradient of a collapsed adit. The adit opening was approximately 2 feet wide by approximately 1 foot high.
- *Collapsed adit with vegetation overgrowth* (Photo 6): surface water (LV-CAD-SW5). This adit was completely overgrown with vegetation and an opening was not present.
- *Newly collapsed adit* (Photo 7): sediment (LV-AD-SD5) and surface water (LV-AD-SW6). USFS observed that this adit recently collapsed within the last year and the track coming out of the adit is still present.
- *Waste rock dump seepage* (Photos 8 and 9): sediment (LV-SEEP-SD6) and surface water (LV-SEEP-SW7). Samples collected from an unnamed tributary to Jim Creek located downgradient of the waste rock dump and talus slope with a mine opening. Evidence of cattle grazing was observed in this area.
- *Jim Creek #2 upstream of culvert and confluence with unnamed tributary* (Photo 10): sediment (LV-JC-SD7) and surface water (LV-JC-SW8). Samples were collected upstream of the culvert and the unnamed tributary confluence with Jim Creek.
- *Jim Creek #3 downstream of culvert and confluence with unnamed tributary* (Photo 11): sediment (LV-JC-SD8) and surface water (LV-JC-SW9). Samples were collected downstream of the culvert and the unnamed tributary confluence with Jim Creek.



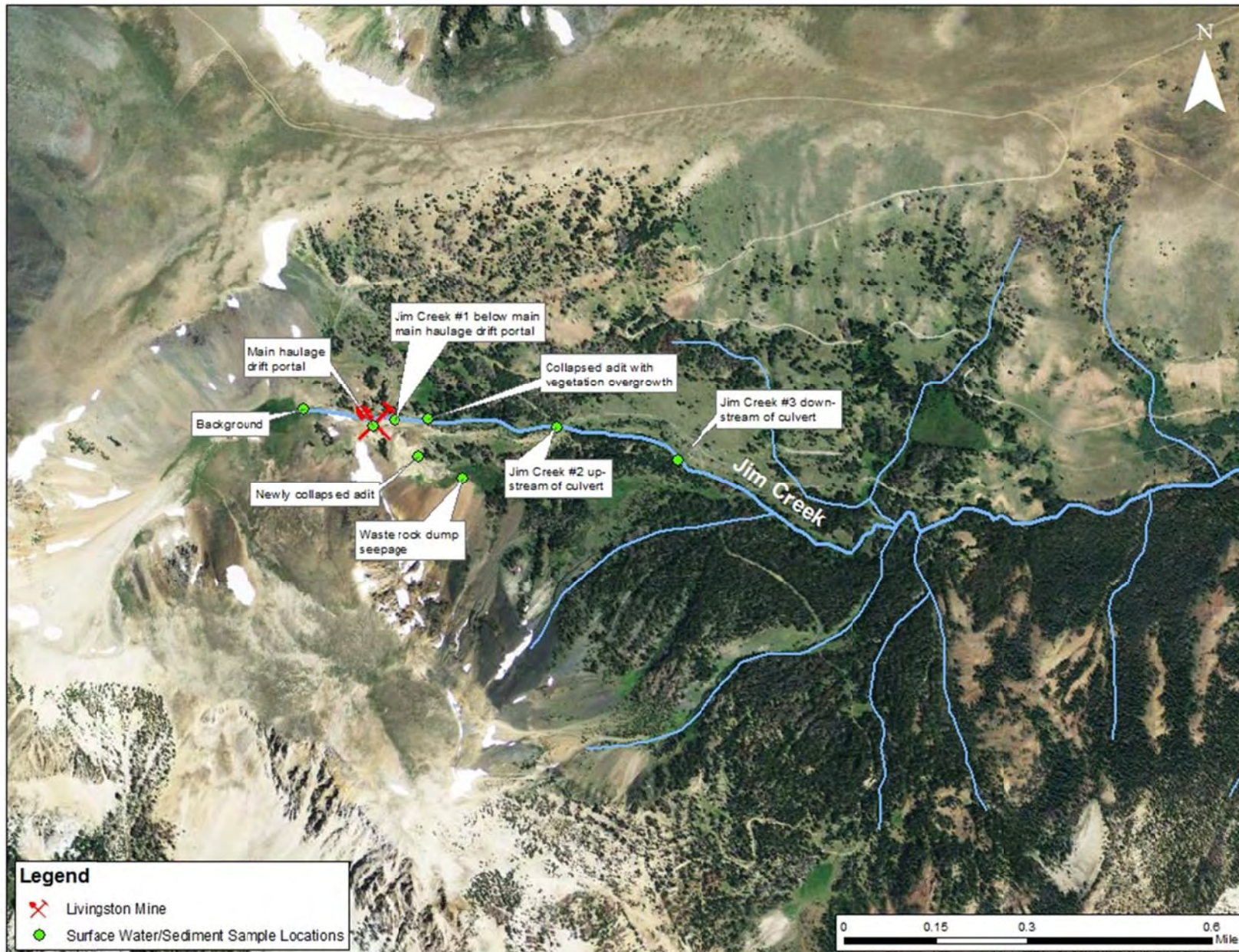


Figure 5. Sample locations and features of the Livingston Mine site.



**Table 1. Sediment analytical results for Livingston Mine samples collected on August 7, 2013.**

Metals	IDTLs (mg/kg)	Human BLM Risk Criteria Camper (mg/kg)	Eco BLM Risk Criteria Median (mg/kg)	Main Haulage LV-MHDW-SD2 (mg/kg)	Main Haulage Duplicate LV-MHDW-SD3 (mg/kg)	Jim Creek #1 LV-MHCA-SD4 (mg/kg)	Newly Collapsed Adit LV-AD-SD5 (mg/kg)	Waste Dump Seep LV-SEEP-SD6 (mg/kg)	Jim Creek #2 LV-JC-SD7 (mg/kg)	Jim Creek #3 LV-JC-SD8 (mg/kg)	Background LV-BG-SD1 (mg/kg)
Antimony (Sb)	4.77	62	—	<b>7.6</b>	<b>7.5</b>	<b>6.6</b>	2.7	3.5	<b>7.5</b>	4.8	<2.0
Arsenic (As)	0.391	46	275	<b>68.2</b>	<b>66</b>	<b>64.4</b>	15.7	20.7	<b>39.4</b>	<b>35.1</b>	11.4
Barium (Ba)	896	—	—	39.7	38	37.7	28.5	26	50.5	34.1	36.4
Cadmium (Cd)	1.35	155	3	<b>31.1</b>	<b>32.7</b>	<b>22</b>	<b>6.41</b>	<b>12.6</b>	<b>11.9</b>	<b>17.9</b>	0.44
Chromium (Cr)	7.9 <sup>b</sup>	—	—	20.9	21.3	17.5	10.4	11.8	21	17.8	9.31
Copper (Cu)	921	5,745	136	<b>116</b>	<b>109</b>	<b>57.3</b>	<b>25.2</b>	<b>23.4</b>	<b>31</b>	<b>35.5</b>	6.41
Iron (Fe)	—	—	—	22,000	21,100	17,100	12,900	12,600	15,100	14,400	9,040
Lead (Pb)	49.6	1,000	125	<b>712</b>	<b>723</b>	<b>499</b>	<b>89.3</b>	<b>114</b>	<b>252</b>	<b>289</b>	5.74
Manganese (Mn)	223	21,679	—	<b>708</b>	<b>624</b>	<b>454</b>	170	275	<b>305</b>	<b>349</b>	92.4
Nickel (Ni)	59.1	3,094	—	<b>66.8</b>	<b>61.5</b>	<b>49.3</b>	<b>30</b>	<b>34.2</b>	<b>40.3</b>	<b>40.3</b>	9.85
Selenium <sup>a</sup> (Se)	2.03	774	—	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Silver <sup>a</sup> (Ag)	0.189	774	—	<b>1.97</b>	<b>2.08</b>	1.32	<0.50	0.87	<b>2.24</b>	1.24	<0.50
Zinc (Zn)	886	46,455	307	<b>4,920</b>	<b>4,850</b>	<b>3,010</b>	<b>813</b>	<b>1,940</b>	<b>1,620</b>	<b>2,200</b>	61.4
Mercury <sup>a</sup> (Hg)	0.00509	46	8	0.053	0.065	0.07	<0.033	<0.033	<0.033	<0.033	<0.033

Shaded values exceed criteria.

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

BLM Risk Criteria = Human criteria based on sediment exposure to campers; ecological criteria based on median soil exposure value for all wildlife and livestock (BLM, 2004)

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)

**Table 2. Surface water analytical and field parameter results for Livingston Mine samples collected on August 7, 2013 (in mg/L).**

Analyte/Parameter	EPA	DEQ	DEQ					Newly	Waste Dump			
	Drinking Water Standard MCL	Cold Water Biota Standard Acute	Cold Water Biota Standard Chronic	Main Haulage LV-MHDW-SW2	Main Haulage Duplicate LV-MHDW-SW3	Jim Ck #1 LV-MHCA-SW4	Collapsed Adit LV-CAD-SW5	Collapsed Adit LV-AD-SW6	Seep LV-SEEP-SW7	Jim Ck #2 LV-JC-SW8	Jim Ck #3 LV-JC-SW9	Background LV-BG-SW1
Antimony (Sb)	0.006	—	—	0.00518	0.00506	<0.00300	<0.00300	<b>0.00994</b>	0.00694	0.00362	0.00486	<0.00300
Arsenic (As)	0.01	0.34	0.15	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.006
Barium (Ba)	2	—	—	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.002	0.0032	0.0049	<0.0020
Cadmium (Cd)	0.005	0.00067 to 0.00200 (H)	0.00035 to 0.00075 (H)	<b>0.0425</b>	<b>0.0417</b>	<b>0.011</b>	0.00033	<b>0.0119</b>	<b>0.0258</b>	<b>0.00383</b>	<b>0.0115</b>	<0.00020
Chromium (Cr) (Total)	0.1	—	—	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Copper (Cu)	1.0 <sup>a</sup>	0.0079 to 0.0267 (H)	0.0056 to 0.0171 (H)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Iron (Fe)	0.3 <sup>a</sup>	—	—	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060
Lead (Pb)	0.015 <sup>b</sup>	0.026 to 0.108 (H)	0.0010 to 0.0042 (H)	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300
Manganese (Mn)	0.05 <sup>a</sup>	—	—	<b>0.0746</b>	<b>0.0667</b>	<b>0.0164</b>	<0.0040	<b>0.0335</b>	<b>0.0178</b>	<0.0040	<0.0040	<0.0040
Mercury (Hg)	0.002	—	—	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Nickel (Ni)	—	0.234 to 0.701 (H)	0.026 to 0.078 (H)	<b>0.033<sup>c</sup></b>	<b>0.033<sup>c</sup></b>	<0.010	<0.010	0.015	0.016	<0.010	<0.010	<0.010
Selenium (Se)	0.05	0.02 (T)	0.005 (T)	0.0076	0.00733	0.00347	<0.00300	<0.00445	0.00551	<0.00300	0.00367	<0.00300
Silver (Ag)	0.10 <sup>a</sup>	0.0008 to 0.0078 (H)	—	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Zinc (Zn)	5 <sup>a</sup>	0.058 to 0.175 (H)	0.059 to 0.177 (H)	<b>4.3</b>	<b>4.28</b>	<b>1.04</b>	0.01	<b>1.92</b>	<b>2.07</b>	<b>0.281</b>	<b>0.672</b>	<0.0100
Temperature (°C)	—	—	Cold water aquatic life 22°C or less or a maximum daily average not >19°C <sup>d</sup> Salmonid spawning 13°C or less with a maximum daily average not >9°C	3.62	—	13.74	8.15	4.31	10.25	13.00	12.98	7.86
pH (su)	6.5 – 8.5 <sup>a</sup>	—	6.5 – 9.0	6.58	—	7.06	6.86	6.68	7.42	7.57	7.5	6.76
Hardness (as CaCO <sub>3</sub> )	—	—	—	140	141	68.7	44	161	136	58.1	89.6	39.8
Oxidation Reduction Potential (mV)	—	—	—	199	—	228	252	246	205	225	241	258
Conductivity (µs/cm)	—	—	—	0.298	—	0.154	0.090	0.047	0.331	0.125	0.199	0.087
Turbidity (NTU)	b	Not >50 NTU instantaneous	Not >50 NTU instantaneous and no >25 NTU over a 10 day period	20.5	—	4.5	2.3	0	2.2	5.5	2.3	0.6
Dissolved Oxygen	—	—	>6 ppm	11.51	—	9.34	10.86	10.77	10.52	9.72	9.16	9.85
Total Dissolved Solids (g/L)	—	—	—	0.194	—	0.100	0.058	0.226	0.25	0.081	0.129	0.57

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)

<sup>a</sup> Secondary Standard Maximum Contaminant Level (MCL) – non-enforceable guideline.<sup>b</sup> Action level regulated by treatment technique.<sup>c</sup> Results are below hardness specific standards for these locations, even though the results falls within the standard ranges presented.<sup>d</sup> 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



**Photo 2. Livingston Mine background sample location.**



**Photo 3. Livingston Mine background sample location.**





**Photo 4. Main haulage drift portal.**



**Photo 5. Jim Creek #1 below the main haulage drift portal.**





**Photo 6. Collapsed adit with vegetation overgrowth.**



**Photo 7. Newly collapsed adit.**





**Photo 8. Waste rock dump.**



**Photo 9. Waste rock dump seepage sampling location along an unnamed tributary to Jim Creek.**





**Photo 10. Jim Creek #2 upstream of culvert and the confluence with unnamed tributary.**



**Photo 11. Jim Creek #3 downstream of the culvert and the confluence with unnamed tributary.**

Structures remaining at the Livingston Mine include a building next to the main haulage drift portal and an old tower for the tramway to Livingston Mill (Photo 12).



**Photo 12. Old tower for tramway to Livingston Mill.**

Four sediment samples, four surface water samples and one field blank were collected by DEQ on August 8, 2013 near the confluence of Jim Creek and Big Boulder Creek (Figure 6). A summary of the laboratory results and field parameters are presented in Tables 3 and 4.

- *Jim Creek #4 upstream of the confluence with Big Boulder Creek* (Photo 13): sediment (LV-JC3-SD9 and LV-JC3-SD10 duplicate) and surface water (LV-JC3-SW10 and LV-JC3-SW11 duplicate). The quality assurance/quality control (QA/QC) field blank was also collected at this location using distilled water and the same filtering method as the surface water samples (LV-FB-SW12).
- *Big Boulder Creek #1 upstream of the confluence with Jim Creek* (Photo 14): sediment (LV-BCA-SD12) and surface water (LV-BCA-SW14).
- *Big Boulder Creek #2 downstream of the confluence with Jim Creek* (Photo 15): sediment (LV-BCB-SD11) and surface water (LV-BCB-SW13).



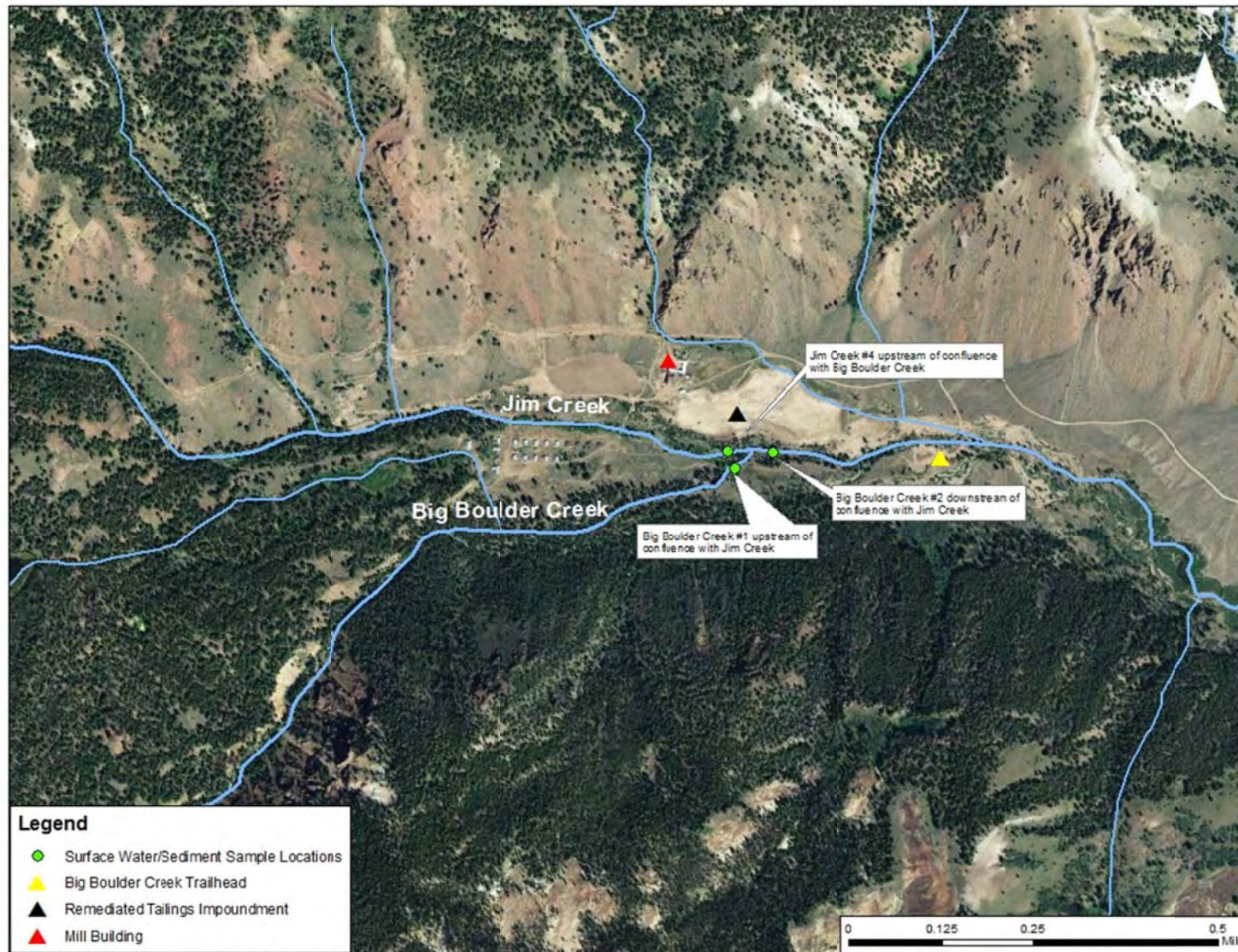


Figure 6. Sample locations and features near the confluence of Jim Creek and Big Boulder Creek.

**Table 3. Sediment analytical results for Livingston Mine samples collected on August 8, 2013.**

Metals	IDTLs (mg/kg)	Human BLM Risk Criteria Camper (mg/kg)	Eco BLM Risk Criteria Median (mg/kg)	Jim Creek #4 LV-JC3-SD9 (mg/kg)	Jim Creek #4 Duplicate LV-JC3-SD10 (mg/kg)	Big Boulder Creek #1 LV-BCA-SD12 (mg/kg)	Big Boulder Creek #2 LV-BCB-SD11 (mg/kg)	Background LV-BG-SD1 (mg/kg)
Antimony (Sb)	4.77	62	—	4.1	4.1	<2.0	2.9	<2.0
Arsenic (As)	0.391	46	275	33.2	<b>34.7</b>	9	21.5	11.4
Barium (Ba)	896	—	—	<b>341</b>	<b>302</b>	<b>216</b>	<b>329</b>	36.4
Cadmium (Cd)	1.35	155	3	<b>21.3</b>	<b>21.3</b>	<0.20	<b>8.42</b>	0.44
Chromium (Cr)	7.9 <sup>b</sup>	—	—	<b>45.4</b>	<b>44.3</b>	<b>29</b>	<b>33.6</b>	9.31
Copper (Cu)	921	5,745	136	<b>45.1</b>	<b>44</b>	<b>21.4</b>	<b>30.5</b>	6.41
Iron (Fe)	—	—	—	24,600	23,100	20,100	22,700	9,040
Lead (Pb)	49.6	1,000	125	<b>337</b>	<b>401</b>	11	<b>173</b>	5.74
Manganese (Mn)	223	21,679	—	<b>442</b>	<b>396</b>	<b>356</b>	<b>624</b>	92.4
Nickel (Ni)	59.1	3,094	—	<b>67</b>	<b>64.5</b>	<b>37.4</b>	<b>49</b>	9.85
Selenium <sup>a</sup> (Se)	2.03	774	—	<4.0	<4.0	<4.0	<4.0	<4.0
Silver <sup>a</sup> (Ag)	0.189	774	—	<b>1.61</b>	<b>1.59</b>	<0.50	1.06	<0.50
Zinc (Zn)	886	46,455	307	<b>1,720</b>	<b>1,760</b>	92.6	<b>827</b>	61.4
Mercury <sup>a</sup> (Hg)	0.00509	46	8	0.07	0.078	0.043	0.033	<0.033

Shaded values exceed criteria.

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

BLM Risk Criteria = Human criteria based on sediment exposure to campers; ecological criteria based on median soil exposure value for all wildlife and livestock (BLM, 2004)

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)

**Table 4. Surface water analytical and field parameter results for Livingston Mine samples collected on August 8, 2013 (in mg/L).**

Analyte/Parameter	EPA Drinking Water Standard MCL	DEQ Cold Water Biota Standard Acute	DEQ Cold Water Biota Standard Chronic	Jim Creek #4 LV-JC3-SW10	Jim Creek #4 Duplicate LV-JC3-SW11	Big Boulder Creek #1 LV-BCA-SW14	Big Boulder Creek #2 LV-BCB-SW13	Background LV-BG-SW1	Field Blank LV-FB-SW12
Antimony (Sb)	0.006	—	—	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300
Arsenic (As)	0.01	0.34	0.15	<0.0030	<0.0030	<0.0030	<0.0030	0.006	<0.0030
Barium (Ba)	2	—	—	0.0044	0.0043	<0.0020	0.0022	<0.0020	<0.00020
Cadmium (Cd)	0.005	0.00056 to 0.0012 (H)	0.00031 to 0.00053 (H)	<b>0.00261</b>	<b>0.00253</b>	<0.00020	<b>0.00067</b>	<0.00020	<0.00020
Chromium (Cr) (Total)	0.1	—	—	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Copper (Cu)	1.0 <sup>a</sup>	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 <sup>a</sup>	—	—	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060
Lead (Pb)	0.015 <sup>b</sup>	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 <sup>a</sup>	—	—	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Mercury (Hg)	0.002	—	—	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Nickel (Ni)	—	—	—	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
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 <sup>a</sup>	0.0006 to 0.0029 (H)	—	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Zinc (Zn)	5 <sup>a</sup>	0.049 to 0.107 (H)	0.049 to 0.108 (H)	<b>0.162</b>	<b>0.16</b>	<0.0100	<b>0.0407</b>	<0.0100	<0.0100
Temperature (°C)	—	—	Cold water aquatic life 22°C or less or a maximum daily average not >19°C <sup>c</sup> Salmonid spawning 13°C or less with a maximum daily average not >9°C	8.14	—	10.65	10.08	7.86	—
pH (su)	6.5 – 8.5 <sup>a</sup>	—	6.5 – 9.0	8.06	—	8.05	8.1	6.76	—
Hardness (as CaCO <sub>3</sub> )	—	—	—	77	76.9	35.4	45.4	39.8	<0.347
Oxidation Reduction Potential (mV)	—	—	—	216	—	220	221	258	—
Conductivity (µs/cm)	—	—	—	0.177	—	0.085	0.108	0.087	—
Turbidity (NTU)	<sup>b</sup>	Not >50 NTU instantaneous	Not >50 NTU instantaneous and no >25 NTU over a 10 day period	0	—	1.9	2.3	0.6	—
Dissolved Oxygen	—	—	>6 ppm	12.46	—	10.93	11.41	9.85	—
Total Dissolved Solids (g/L)	—	—	—	0.115	—	0.055	0.070	0.57	—

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)

<sup>a</sup> Secondary Standard Maximum Contaminant Level (MCL) – non-enforceable guideline.<sup>b</sup> Action level regulated by treatment technique.<sup>c</sup> 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





**Photo 13. Jim Creek #4 upstream of the confluence with Big Boulder Creek.**



**Photo 14. Big Boulder Creek #1 upstream of the confluence with Jim Creek.**





**Photo 15. Big Boulder Creek #2 downstream of the confluence with Jim Creek.**

### **3.2 Little Livingston Mine**

DEQ and USFS visited the Little Livingston Mine on August 7, 2013 (Photos 16 and 17). The weather was approximately 70°F, sunny, and clear. Structures remaining at the Livingston Mine include a buried adit (Photo 18) and old living quarters with a stove and gas can remaining within the building (Photo 19).

To assess this mine, sample collection included sediment and surface water samples from Livingston Creek and two unnamed tributaries to Livingston Creek. DEQ attempted to hike down to Livingston Creek from the Little Livingston Mine; however, the terrain was very steep and no water was present in the unnamed tributaries. DEQ decided to wait on collecting samples until a better access route to Livingston Creek was identified.



**Photo 16. Overview of the Little Livingston Mine vicinity.**



**Photo 17. Scenic view from Railroad Ridge between the Livingston and Little Livingston Mines.**





**Photo 18. Little Livingston adit.**



**Photo 19. Old living quarters.**

DEQ returned to sample Livingston Creek and the unnamed tributaries on September 30, 2013. The weather was approximately 30-35°F with rain at low elevations turning to snow at high elevations. The sample locations were accessed by hiking to Livingston Creek from Slate Creek Road. Slate Creek Road is approximately 10 miles west of Clayton, Idaho, south of Hwy 75.

Three sediment samples and three surface water samples were collected by DEQ (Figure 7). A summary of the laboratory results and field parameters are presented in Tables 5 and 6.

- *Southern Unnamed Tributary to Livingston Creek* (Photo 20): sediment (LL-UTS-SD1) and surface water (LL-UTS-SW1).
- *Northern Unnamed Tributary to Livingston Creek* (Photo 21): sediment (LL-UTN-SD2) and surface water (LL-UTN-SW2).
- *Livingston Creek* (Photo 22): sediment (LL-LC-SD3 and LL-LC-SD4 duplicate) and surface water (LL-LC-SW3 and LL-LC-SW4 duplicate).



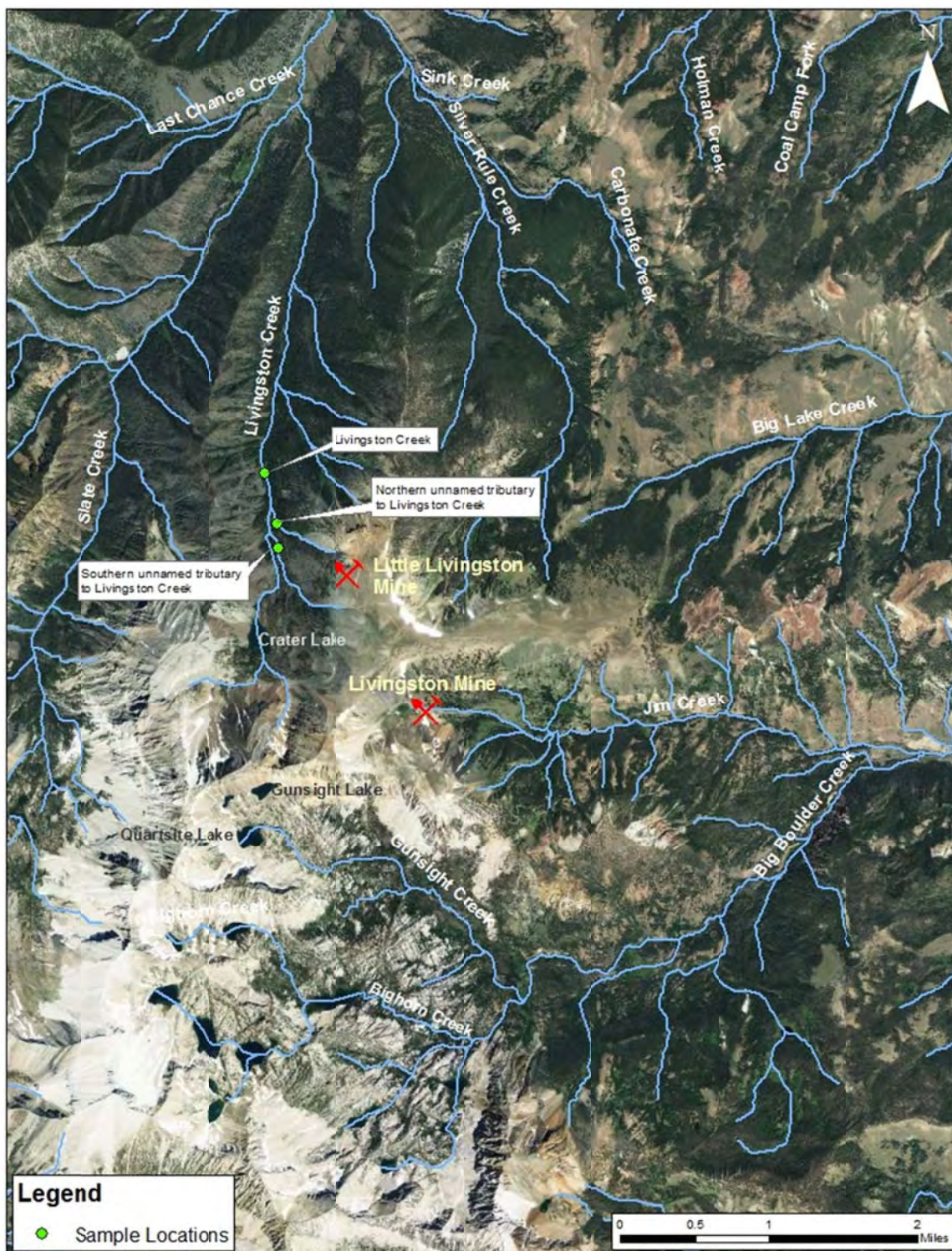


Figure 7. Sample locations and features of the Little Livingston Mine site.

**Table 5. Sediment analytical results for Little Livingston Mine samples collected on September 30, 2013.**

Metals	IDTLs (mg/kg)	Human BLM Risk Criteria Camper (mg/kg)	Eco BLM Risk Criteria Median (mg/kg)	Southern Unnamed Tributary LL-UTS-SD1 (mg/kg)	Northern Unnamed Tributary LL-UTN-SD2 (mg/kg)	Livingston Creek LL-LC-SD3 (mg/kg)	Livingston Creek Duplicate LL-LC-SD4 (mg/kg)	Background LV-BG-SD1 (mg/kg)
Antimony (Sb)	4.77	62	—	2.5	<b>15.6</b>	<b>28.7</b>	5.5	<2.0
Arsenic (As)	0.391	46	275	9.5	33.1	34	16.2	11.4
Barium (Ba)	896	—	—	74.5	<b>186</b>	95.2	<b>110</b>	36.4
Cadmium (Cd)	1.35	155	3	<b>24.2</b>	<b>16.8</b>	<b>9.48</b>	<b>7.57</b>	0.44
Chromium (Cr)	7.9 <sup>b</sup>	—	—	<b>34.2</b>	22	<b>31.1</b>	<b>30.3</b>	9.31
Copper (Cu)	921	5,745	136	<b>54.5</b>	<b>72.7</b>	<b>89.8</b>	<b>60.5</b>	6.41
Iron (Fe)	—	—	—	<b>41,500</b>	14,900	<b>38,700</b>	21,700	9,040
Lead (Pb)	49.6	1,000	125	<b>21.1</b>	<b>235</b>	<b>127</b>	<b>42.9</b>	5.74
Manganese (Mn)	223	21,679	—	<b>873</b>	<b>306</b>	162	125	92.4
Nickel (Ni)	59.1	3,094	—	<b>174</b>	<b>96.5</b>	<b>101</b>	<b>71.1</b>	9.85
Selenium <sup>a</sup> (Se)	2.03	774	—	9.7	<b>13.6</b>	<b>15.4</b>	8.7	<4.0
Silver <sup>a</sup> (Ag)	0.189	774	—	0.88	<b>3.54</b>	<b>3.9</b>	1.38	<0.50
Zinc (Zn)	886	46,455	307	<b>1,800</b>	<b>990</b>	<b>654</b>	<b>473</b>	61.4
Mercury <sup>a</sup> (Hg)	0.00509	46	8	<0.033	<b>0.107</b>	<0.033	<0.033	<0.033

Shaded values exceed criteria.

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

BLM Risk Criteria = Human criteria based on sediment exposure to campers; ecological criteria based on median soil exposure value for all wildlife and livestock (BLM, 2004)

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)

**Table 6. Surface water analytical and field parameter results for Little Livingston Mine samples collected on September 30, 2013 (in mg/L).**

Analyte/Parameter	EPA Drinking Water Standard MCL	DEQ Cold Water Biota Standard Acute	DEQ Cold Water Biota Standard Chronic	Southern Unnamed Tributary LL-UTS-SW1	Northern Unnamed Tributary LL-UTN-SW2	Livingston Creek LL-LC-SW3	Livingston Creek Duplicate LL-LC-SW4	Background LV-BG-SW1
Antimony (Sb)	0.006	—	—	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300
Arsenic (As)	0.01	0.34	0.15	<0.0030	<0.0030	<0.0030	<0.0030	0.006
Barium (Ba)	2	—	—	0.0059	<b>0.0208</b>	0.0057	0.0055	<0.0020
Cadmium (Cd)	0.005	0.00184 to 0.00255 (H)	0.00071 to 0.00089 (H)	<b>0.00072</b>	0.00046	0.00044	0.00046	<0.00020
Chromium (Cr) (Total)	0.1	—	—	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Copper (Cu)	1.0 <sup>a</sup>	0.0243 to 0.0352 (H)	0.0157 to 0.0219 (H)	<0.010	<0.010	<0.010	<0.010	<0.010
Iron (Fe)	0.3 <sup>a</sup>	—	—	<0.060	<0.060	<0.060	<0.060	<0.060
Lead (Pb)	0.015 <sup>b</sup>	0.097 to 0.148 (H)	0.0038 to 0.0058 (H)	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300
Manganese (Mn)	0.05 <sup>a</sup>	—	—	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Mercury (Hg)	0.002	—	—	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Nickel (Ni)	—	0.645 to 0.898 (H)	0.072 to 0.100 (H)	<0.010	<0.010	<0.010	<0.010	<0.010
Selenium (Se)	0.05	0.02 (T)	0.005 (T)	0.00539	0.00463	0.00627	0.00582	<0.00300
Silver (Ag)	0.10 <sup>a</sup>	0.0066 to 0.0130 (H)	—	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Zinc (Zn)	5 <sup>a</sup>	0.161 to 0.225 (H)	0.163 to 0.227 (H)	0.0265	<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 <sup>c</sup> Salmonid spawning 13°C or less with a maximum daily average not >9°C	4.16		5.87		7.86
pH (su)	6.5 – 8.5 <sup>a</sup>	—	6.5 – 9.0	7.46	--	7.82		6.76
Hardness (as CaCO <sub>3</sub> )	—	—	—	216	178	147	146	39.8
Oxidation Reduction Potential (mV)	—	—	—	237	--	253		258
Conductivity (µs/cm)	—	—	—	0.401	--	0.326		0.087
Turbidity (NTU)	<sup>b</sup>	Not >50 NTU instantaneous	Not >50 NTU instantaneous and no >25 NTU over a 10 day period	0.0	--	1.0		0.6
Dissolved Oxygen	—	—	>6 ppm	15.16	--	12.00		9.85
Total Dissolved Solids (g/L)	—	—	—	0.261	--	0.212		0.57

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)

<sup>a</sup> Secondary Standard Maximum Contaminant Level (MCL) – non-enforceable guideline.<sup>b</sup> Action level regulated by treatment technique.<sup>c</sup> 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





**Photo 20. Sample location along southern unnamed tributary to Livingston Creek.**



**Photo 21. Sample location along northern unnamed tributary to Livingston Creek.**





**Photo 22. Livingston Creek sample location.**

## **4 Migration/Exposure Pathways and Targets**

The purpose of this PA/SI is to evaluate the Livingston and Little Livingston Mines to identify if any releases or potentials for release are present to pathways and targets. Pathways and exposure routes that may lead to human or ecological receptors include: ground water pathways (Section 4.1), surface water pathways (Section 4.2), and soil exposure and air pathways (Section 4.3).

### **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) and along three ground water pathways illustrated by the following three scenarios:

- Heavy metals can leach from tailing piles and waste rock dumps, enter ephemeral or perennial drains, and contaminate the area's shallow ground water system.
- Heavy metals can leach from the local ore bodies and be transported through the geologic structure to the shallow ground water.
- Heavy metals can leach out of the ore bodies and be discharged from the underground workings as adit water, which is then conveyed through ephemeral and perennial drains to the shallow ground water system.

Potential drinking water systems within the 4-mile radius of the Livingston and Little Livingston Mine sites include no public water systems (PWS), eight domestic wells within the 4-mile radius of Livingston Mine, and seven domestic wells within the 4-mile radius of Little Livingston Mine (Figure 8). None of the domestic wells are located along Jim Creek or Big Boulder Creek,

downstream of Livingston Mine. One domestic well is located on Slate Creek, downstream of the confluence with Livingston Creek and approximately 3.5 miles downgradient of Little Livingston Mine.

Given the remote location of the Livingston and Little Livingston Mine sites and the minimal number of domestic wells within the 4-mile radius of the mine sites, the potential for release to ground water pathways is minimal to non-existent.

## **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. The 15-mile TDL for Livingston Mine begins where the main haulage drain portal discharges into Jim Creek, follows Jim Creek to Big Boulder Creek, and ends along the East Fork of the Salmon River. The 15-mile TDL for Little Livingston Creek begins at the northern and southern unnamed tributaries to Livingston Creek, follows Livingston Creek to Slate Creek, and ends along the Salmon River (Figure 8). Other surface water features, such as wetlands and high mountain lakes (including Crater Lake at the headwaters of Livingston Creek), are present within a 2-mile radius of both mine sites; however, none of these features are downstream of either mine site (Figure 9).

Analysis of the surface water pathways and targets for this PA/SI includes evaluation of analytical results for sediments and surface water (Sections 4.2.1) and identification of sensitive, rare, and threatened plant and animal species (Section 4.2.2), fisheries (Section 4.2.3), and sensitive waterways (Section 4.2.4).

### **4.2.1 Sediment and Surface Water Analytical Results**

Sediment laboratory analytical results were compared to the following criteria: 1) State of Idaho initial default target levels (IDTLs; DEQ 2004), 2) the United States Bureau of Land Management (BLM) human risk criteria for sediment exposure to campers, 3) the BLM ecological median risk criteria for wildlife and livestock (BLM 2004), and 4) site-specific background concentrations. The IDTLs are risk-based target levels that have been developed by DEQ for certain chemicals using conservative input parameters, a target acceptable risk of  $10^{-5}$ , and a hazard quotient of 1. The BLM criteria establish risk management levels related to recreational use and wildlife habitat.

Surface water laboratory analytical results were compared to the following criteria: 1) EPA's drinking water standards, 2) DEQ's cold water biota standards for acute and chronic, and 3) site-specific background concentrations. Drinking water standards are the primary maximum contaminant levels (MCL) used to protect public health by limiting the levels of contaminants in drinking water. The cold water biota standards are used to protect and restore the quality of Idaho's surface waters.

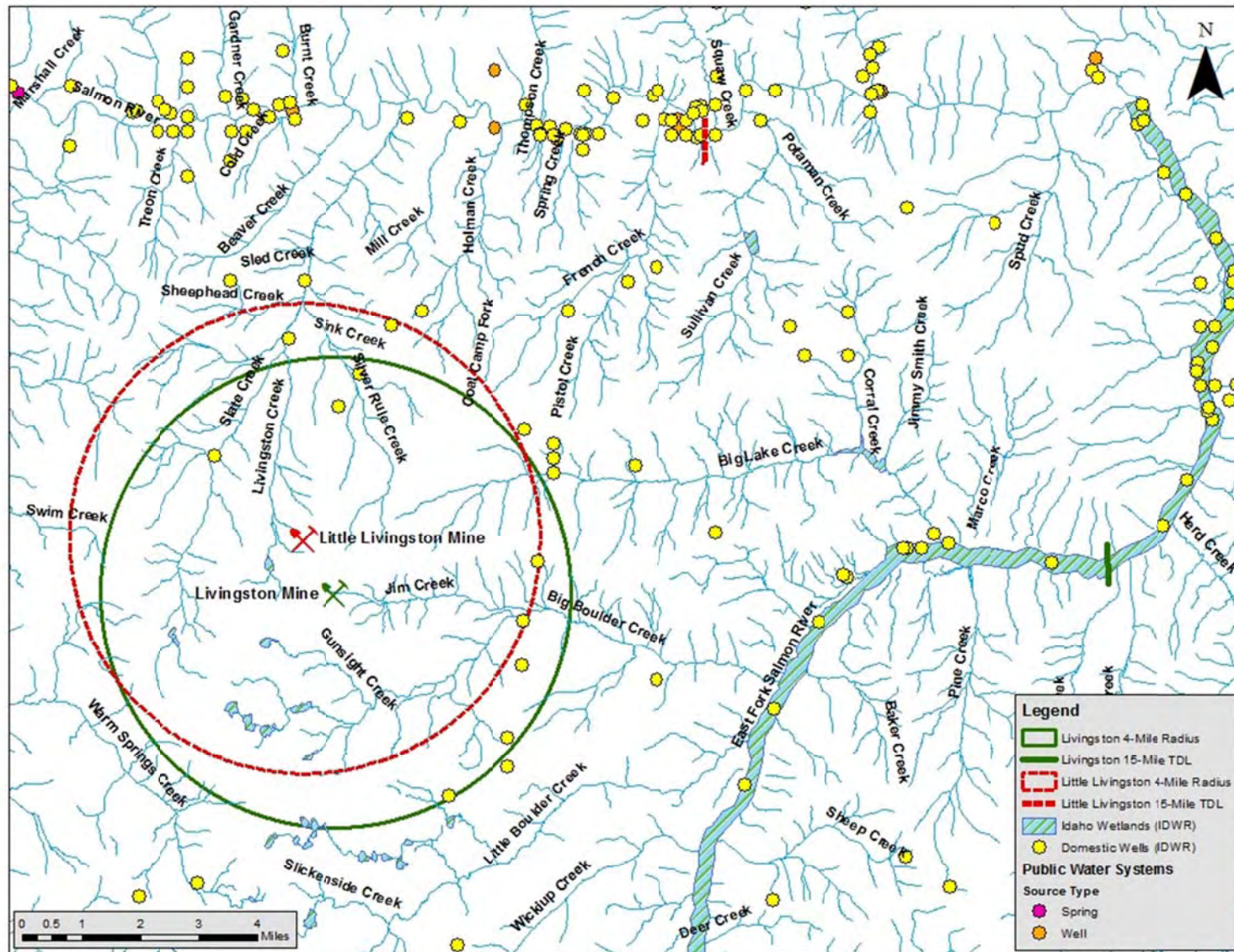


Figure 8. Map of the source water delineation, including the 15-mile surface water TDL for the Livingston Mine and Little Livingston Mine sites.



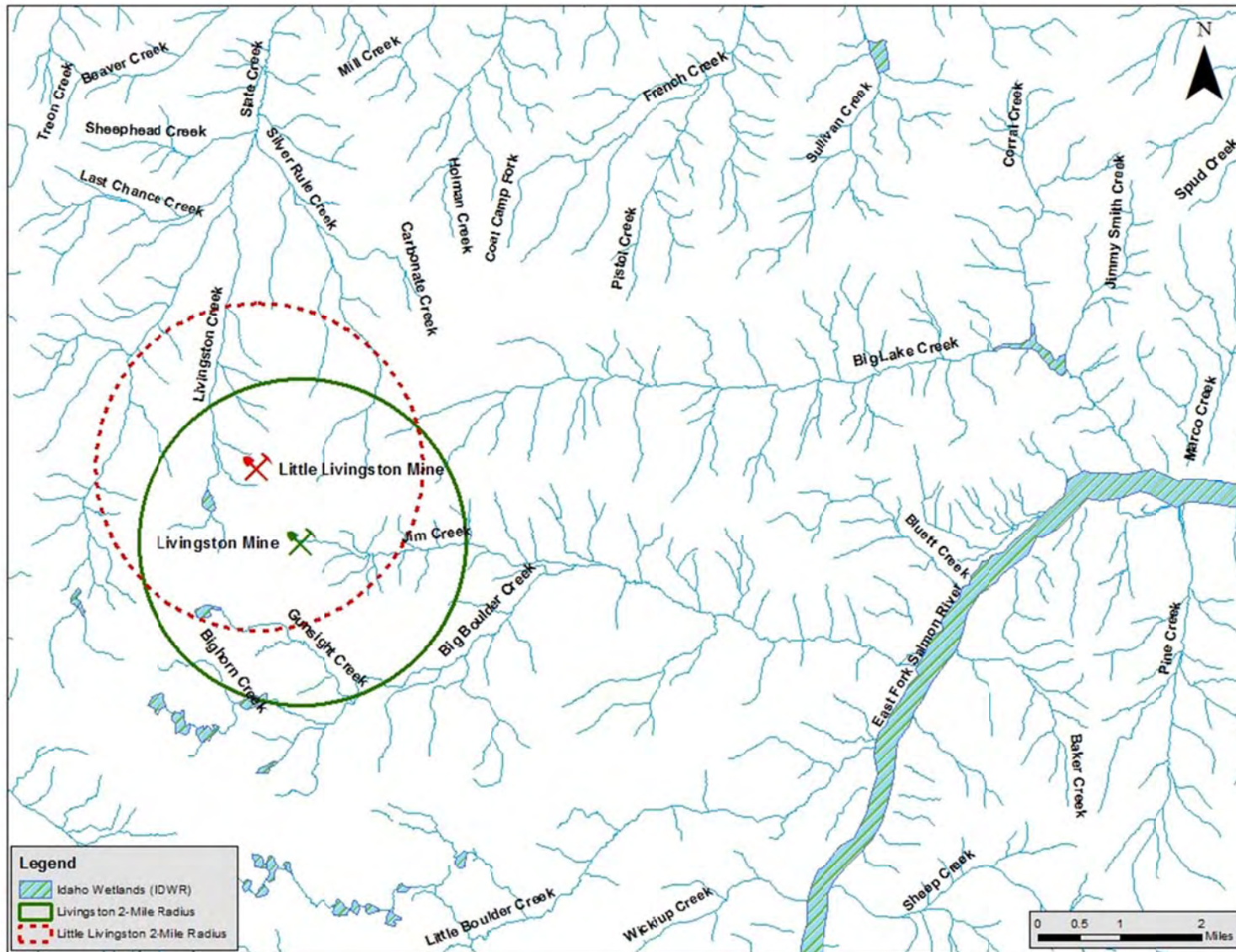


Figure 9. Wetlands in the area of the Livingston Mine and Little Livingston Mine sites.

Although the IDTLs and drinking water standards are used for comparison at remote locations, these criteria are more applicable to sites where “unrestricted uses,” such as residential development, are expected. The BLM criteria and the cold water biota standards are all directly applicable to the current land uses of Livingston and Little Livingston Mines and surrounding watersheds.

#### **4.2.1.1 Livingston Mine**

Eight sediment samples and nine surface water samples were collected with results presented in Section 3.1, Tables 1, 2, 3, and 4. The following observations are based on these results:

- *Sediment Screening Criteria:* Several analytes were detected at concentrations above the IDTLs; however, comparison to the BLM criteria gives a better representation of site conditions. Arsenic is the only analyte exceeding the human health criteria for campers and Cd, Pb, and Zn exceed the median ecological criteria.
- *Water Quality Standards:* Analytes detected above the drinking water MCL include Sb, Cd, and Mn. For some analytes, the cold water biota standards are more conservative than the MCL. Cadmium and Zn were detected above both the acute and chronic standards and Se was detected above only the chronic standard.
- *Sediment Background:* Arsenic and Cr were detected above IDTLs in the background sample. The laboratory practical quantitation limit (PQL) for Se, Ag, and Hg is higher than the IDTL; therefore, the estimated value is shown as above the IDTL. Several analytes, including Sb, As, Cd, Cr, Cu, Pb, Mn, Ni, Ag, and Zn, had detections at sample sites that were three times higher than background concentrations.
- *Water Quality Background:* None of the analytes, except As, were detected in the background sample; however, the As result is below all of the water quality standards. Sb, Cd, Mn, Ni, and Zn had detections at sample sites that were three times higher than background concentrations.
- *Main haulage drift portal and Jim Creek #1 (below the portal):* The highest sediment and surface water detections for the Livingston Mine were observed at these two sampling sites. Sediment detections were above the As human health criteria for campers and above the Cd, Pb, and Zn median ecological criteria. Surface water detections exceed the Cd MCL and the Cd and Zn cold water acute and chronic standards at both locations. At the portal, detections also exceed the Mn MCL and the Se cold water biota for both the acute and chronic standards.
- *Collapsed adit with vegetation overgrowth:* Surface water results show no detections of concern at this location. A sediment sample was not collected.
- *Newly collapsed adit:* Cd and Zn were detected in sediments above the median ecological criteria. For surface water, Sb and Cd were detected above the MCL and Zn was detected above the cold water biota for both the acute and chronic standards.
- *Waste rock dump seepage:* Mine wastes remaining in these waste dumps are mainly waste rock from underground workings since no milling operations took place at the



mine site. An area of approximately one-half acre in size, located on the surface of the waste rock dump directly across from the portal of the main haulage drift, was used to stockpile ore prior to being loaded on the tramway; approximately 30 cubic yards remain on site. A tramway operated to transport ore from Livingston Mine to Livingston Mill, located approximately 4 miles east of the mine. Downgradient of this rock dump, Cd and Zn were detected in sediments above the median ecological criteria. For surface water, Sb and Cd were detected above the MCL, Cd and Zn were detected above the cold water biota for both the acute and chronic standards, and Se was detected above the cold water biota chronic standard.

- *Jim Creek #2 (upstream of culvert) and Jim Creek #3 (downstream of culvert):* Results upstream and downstream of the culvert are similar with detections of Cd, Pb, and Zn in sediments above the median ecological criteria and detections of Cd and Zn in surface water above the cold water biota for both the acute and chronic standards.
- *Sediment at the confluence of Jim Creek and Big Boulder Creek:* Sediment samples collected from Jim Creek #4 (upstream of the confluence) show detections of Cd, Pb, and Zn above the median ecological criteria. These same analytes were detected above the median ecological criteria in Big Boulder Creek #2 (downstream of the confluence); however, detections are less than half the concentrations in Jim Creek. None of the analytes exceeded the BLM criteria at Big Boulder Creek #1, upstream of the confluence.
- *Surface water at the confluence of Jim Creek and Big Boulder Creek:* Surface water samples collected from Jim Creek #4 (upstream of the confluence) show detections of Cd and Zn above the cold water biota acute and chronic standards. Cadmium was also detected above the cold water acute and chronic standards in Big Boulder Creek #2 (downstream of the confluence). None of the analytes were detected at Big Boulder Creek #1, upstream of the confluence.
- *Surface water field parameters:* Evaluation of surface water field parameters demonstrate that the water at all sampling sites near Livingston Mine are near-neutral (pH = 6.58 to 7.57) and the downstream water at sampling sites near the confluences of Jim Creek and Big Boulder Creek are slightly alkaline (8.05 to 8.1). The neutral pH conditions observed in surface water draining from the mine adits is likely the result of natural buffering due to the limestone present in sedimentary rocks at Livingston Mine. The temperature at all of the sampling sites (3.62 to 13.74°C) is supportive of cold water aquatic life. Turbidity is below the standard at all locations with the highest level at the main haulage drift portal (20.5 NTU) and low readings (0 to 5.5 NTU) at all other locations.

#### **4.2.1.2 Little Livingston Mine**

Three sediment samples and three surface water samples were collected with results presented in Section 3.2, Tables 5 and 6. The following observations are based on the metals results:

- *Sediment Screening Criteria:* Several analytes were detected at concentrations above the IDTLs; however, comparison to the BLM criteria gives a better representation of site conditions. None of the analytes exceed the human health criteria for campers and Cd, Pb, and Zn exceed the median ecological criteria.

- *Water Quality Standards:* No analytes were detected above the drinking water MCL or the cold water biota acute standard. Selenium was the only analyte detected above the cold water biota chronic standard.
- *Comparisons to Background:* The background sample collected at Livingston Mine was used for this comparison. Sediment detections for all of the analytes, except As, were three times higher than background concentrations at one or more of the sample sites. Surface water detections of Ba and Cd were three times higher than background concentrations at one sample site.
- *Sediment:* Cadmium and Zn were detected above the median ecological criteria at all three sample locations; however, detections downstream in Livingston Creek are less than half the concentrations in the tributaries. Lead was detected above the median ecological criteria in the northern tributary and Livingston Creek. The duplicate results collected from Livingston Creek have high variability in analytical results with relative percent differences (RPDs) greater than 20 percent (see Section 4.2.1.3), which shows one Pb result is above the median ecological criteria.
- *Surface Water:* Se was detected above the cold water biota chronic standards in the southern tributary and Livingston Creek. None of the other analytes were detected above the standards. Evaluation of surface water field parameters demonstrate that the water is near-neutral (pH = 6.76 to 7.82). The temperature (4.16 to 7.86°C) is supportive of cold water aquatic life. Turbidity is low (0.0 to 1.0 NTU) and below the standard at all locations.

#### **4.2.1.3 Quality Assurance/Quality Control (QA/QC)**

Samples collected for evaluating QA/QC include two duplicate samples for sediment and surface water and one field blank. The analytical results for the sediment duplicate samples (Table 7) show that the RPD goal of 20 percent is met for the samples collected at the main haulage drift portal. However, the duplicate samples collected at Livingston Creek show high variability in metals concentrations within the creek sediment as all of the analytes, except Ba and Cr, have RPDs greater than 20 percent. The surface water duplicate samples meet the 20 percent goal for all metals at both of the sampling locations (Table 8).

The field blank was collected at the Jim Creek #4 sample site using distilled water and the same filtering process as the surface water samples. None of the target analytes were detected in the field blank (Table 4); all concentrations were below the laboratory practical quantitation limit (PQL).

**Table 7. Sediment duplicate sample results.**

Metals	Main Haulage LV-MHDW-SD2 (mg/kg)	Main Haulage Duplicate LV-MHDW-SD3 (mg/kg)	RPD %	Livingston Creek LL-LC-SD3 (mg/kg)	Livingston Creek Duplicate LL-LC-SD4 (mg/kg)	RPD %
Antimony (Sb)	7.6	7.5	1	28.7	5.5	136
Arsenic (As)	68.2	66	3	34	16.2	71
Barium (Ba)	39.7	38	4	95.2	110	14
Cadmium (Cd)	31.1	32.7	5	9.48	7.57	22
Chromium (Cr)	20.9	21.3	2	31.1	30.3	3
Copper (Cu)	116	109	6	89.8	60.5	39
Iron (Fe)	22,000	21,100	4	38,700	21,700	56
Lead (Pb)	712	723	2	127	42.9	99
Manganese (Mn)	708	624	13	162	125	26
Nickel (Ni)	66.8	61.5	8	101	71.1	35
Selenium (Se)	<4.0	<4.0	—	15.4	8.7	56
Silver (Ag)	1.97	2.08	5	3.9	1.38	95
Zinc (Zn)	4,920	4,850	1	654	473	32
Mercury (Hg)	0.053	0.065	20	<0.033	<0.033	—

Shaded values exceed relative percent difference (RPD) goal of 20%.

**Table 8. Surface water duplicate sample results.**

Metals	Main Haulage LV-MHDW-SW2 mg/L	Main Haulage Duplicate LV-MHDW-SW3 mg/L	RPD %	Livingston Creek LL-LC-SW3 mg/L	Livingston Creek Duplicate LL-LC-SW4 mg/L	RPD %
Antimony (Sb)	0.00518	0.00506	2	<0.00300	<0.00300	—
Arsenic (As)	<0.0030	<0.0030	—	<0.0030	<0.0030	—
Barium (Ba)	<0.0020	<0.0020	—	0.0057	0.0055	4
Cadmium (Cd)	0.0425	0.0417	2	0.00044	0.00046	4
Chromium (Cr) (Total)	<0.0060	<0.0060	—	<0.0060	<0.0060	—
Copper (Cu)	<0.010	<0.010	—	<0.010	<0.010	—
Iron (Fe)	<0.060	<0.060	—	<0.060	<0.060	—
Lead (Pb)	<0.00300	<0.00300	—	<0.00300	<0.00300	—
Manganese (Mn)	0.0746	0.0667	11	<0.0040	<0.0040	—
Mercury (Hg)	<0.00020	<0.00020	—	<0.00020	<0.00020	—
Nickel (Ni)	0.033	0.033	0	<0.010	<0.010	—
Selenium (Se)	0.0076	0.00733	4	0.00627	0.00582	7
Silver (Ag)	<0.000100	<0.000100	—	<0.000100	<0.000100	—
Zinc (Zn)	4.3	4.28	0	<0.0100	<0.0100	—

None of the values exceed the relative percent difference (RPD) goal of 20%.

#### 4.2.2 Sensitive, Rare, and Threatened Plant and Animal Species

Sensitive species can have large habitat ranges that overlap the vicinity of the Livingston and Little Livingston Mine sites. Due to the size of those ranges, these species may not receive significant exposure time to metals. Based on the list of *Endangered, Threatened, Proposed, and Candidate Species with Associated Proposed and Critical Habitats in Idaho* (USFWS 2013), the following species are identified for Custer County:

- Birds: Greater Sage-Grouse, *Centrocercus urophasianus*, candidate species and Yellow-Billed Cuckoo, *Coccyzus americanus*, proposed species.



- Mammals: Canada Lynx, *Lynx canadensis*, threatened species and North American Wolverine, *Gulo gulo luscus*, proposed species.
- Fish: Bull Trout, *Salvelinus confluentus*, threatened species-designated critical habitat.
- Plants: Whitebark Pine, *Pinus albicaulis*, candidate species.

No rare or sensitive plant species are documented to exist within the 4-mile radius of the Livingston and Little Livingston Mines (Figure 10). Six ‘no status’ plant species are present:

- Northern wormwood (*Artemisia campestris* ssp. *borealis* var. *purshii*)
- White Clouds milkvetch (*Astragalus vexilliflexus* var. *nubilus*)
- Engelmann’s sedge (*Carex engelmannii*)
- Rockcress draba (*Draba globosa*)
- Farr’s willow (*Salix farriae*)
- Wedge-leaf saxifrage (*Saxifraga adscendens* ssp. *oregonensis*)

Animals within the 4-mile radius of the Livingston and Little Livingston Mine sites include five ‘no status’ nongame animals and the recently delisted Gray Wolf (Figure 10). The lynx (*Lynx Canadensis*), ‘listed threatened’, was observed just outside of the 4-mile radius. Game animals are regulated by the Idaho Department of Fish and Game (IDFG). The animal species include:

- No status:
  - A Stonefly (*Setvena bradleyi*)
  - North American Wolverine (*Gulo gulo luscus*)
  - Common Loon (*Gavia immer*)
  - Columbia Spotted Frog (*Rana luteiventris*)
  - American Pika (*Ochotona princeps*)
- Recently delisted in Idaho:
  - Gray Wolf (*Canis lupus*) – Nez Perce Pack

During the Livingston Mine site visit, evidence of cattle grazing was observed at the background and waste rock dump seepage sampling locations. No evidence of cattle grazing was present at the Little Livingston Mine.

#### 4.2.3 Fisheries

The following fish species have been observed by the Idaho Department of Fish and Game (IDFG) within the 4-mile radius of the Livingston and Little Livingston Mine sites (Table 9 and Figure 11). This area is classified as “known occupied for the bull trout” and “known occupied for the Chinook salmon.”

**Table 9. Fish presence within 4-mile radius and surrounding area of the Livingston Mine and Little Livingston Mine sites.**

<b>Streams</b>	<b>Fish</b>	<b>Sensitive Species</b>
Livingston Creek Swimm Creek Last Chance Creek Holman Creek Big Lake Creek	Westslope cutthroat trout ( <i>Oncorhynchus clarkia lewisi</i> )	No
Slate Creek	Westslope cutthroat trout ( <i>Oncorhynchus clarkia lewisi</i> ) Chinook salmon ( <i>Oncorhynchus tshawytscha</i> ) Steelhead ( <i>Oncorhynchus mykiss</i> ) Bull trout ( <i>Salvelinus confluentus</i> )	No Yes No Yes
Silver Rule Creek	Westslope cutthroat trout ( <i>Oncorhynchus clarkia lewisi</i> ) Bull trout ( <i>Salvelinus confluentus</i> )	No Yes
Big Boulder Creek	Westslope cutthroat trout ( <i>Oncorhynchus clarkia lewisi</i> ) Chinook salmon ( <i>Oncorhynchus tshawytscha</i> ) Steelhead ( <i>Oncorhynchus mykiss</i> ) Bull trout ( <i>Salvelinus confluentus</i> )	No Yes No Yes

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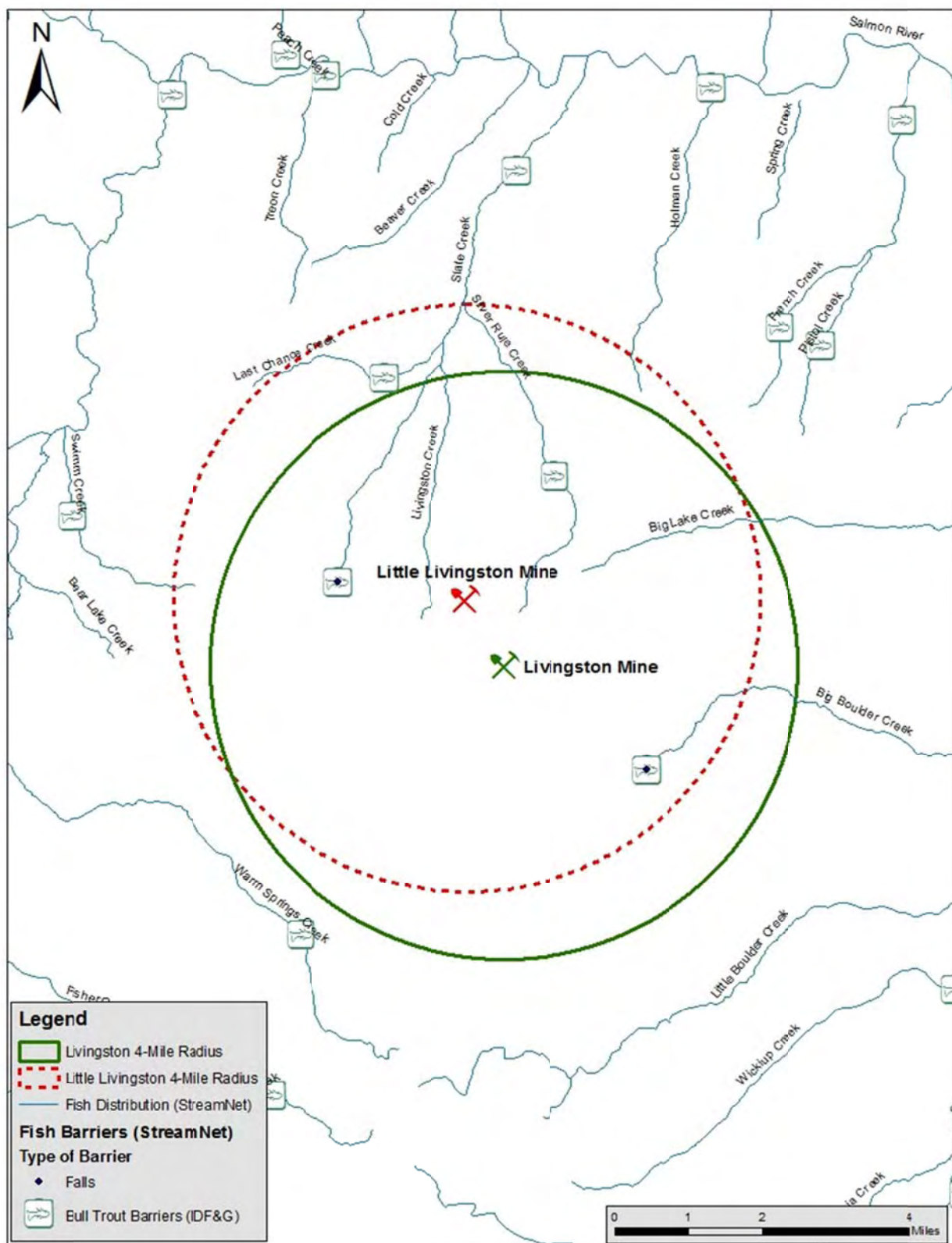


Figure 11. Fisheries within a 4-mile radius and in the vicinity of the Livingston Mine and Little Livingston Mine sites.

#### **4.2.4 Sensitive Waterways**

The Clean Water Act (CWA) requires that the State of Idaho prepare an Integrated Report listing: (1) current conditions of all state waters (§305(b) list) and (2) waters that are impaired and need a total maximum daily load (TMDL; §303(d) list). §305(b)-listed streams, are shown on Figure 12. As part of this PA/SI, sediment and water quality samples were collected from Jim Creek (ID17060201SL105\_02), Big Boulder Creek (ID17060201SL105\_03), Livingston Creek (ID17060201SL099\_02) and tributaries to these creeks. All of these creeks are tributaries to the Salmon River (Upper Salmon River subbasin HUC 17060201) and contained in the Upper Salmon River HUC.

As listed in DEQ's Integrated Report, Jim Creek is grouped within Big Boulder Creek (source to mouth) and identified to be fully supporting for both cold water aquatic life and secondary contact recreation. Livingston Creek (grouped within the source to mouth of Slate Creek) is not supporting for cold water aquatic life and fully supporting for primary contact recreation.

### **4.3 Soil Exposures and Air Pathways**

The mine waste dumps located at the Livingston and Little Livingston Mine sites are mainly comprised of country rock and do not appear to emit fugitive dust. All of the mine waste remaining is waste rock from underground workings since no milling operations took place at the mine site. Therefore, the air pathway was not assessed as part of this PA/SI since it is not a likely pathway of contaminant release to humans or the environment.

Soil samples were not collected as part of this PA/SI. Soil sampling is recommended to be conducted during future sampling events. The nearest residence is approximately four miles east of the Livingston Mine. No schools or day care facilities are located within four miles of the mine sites.



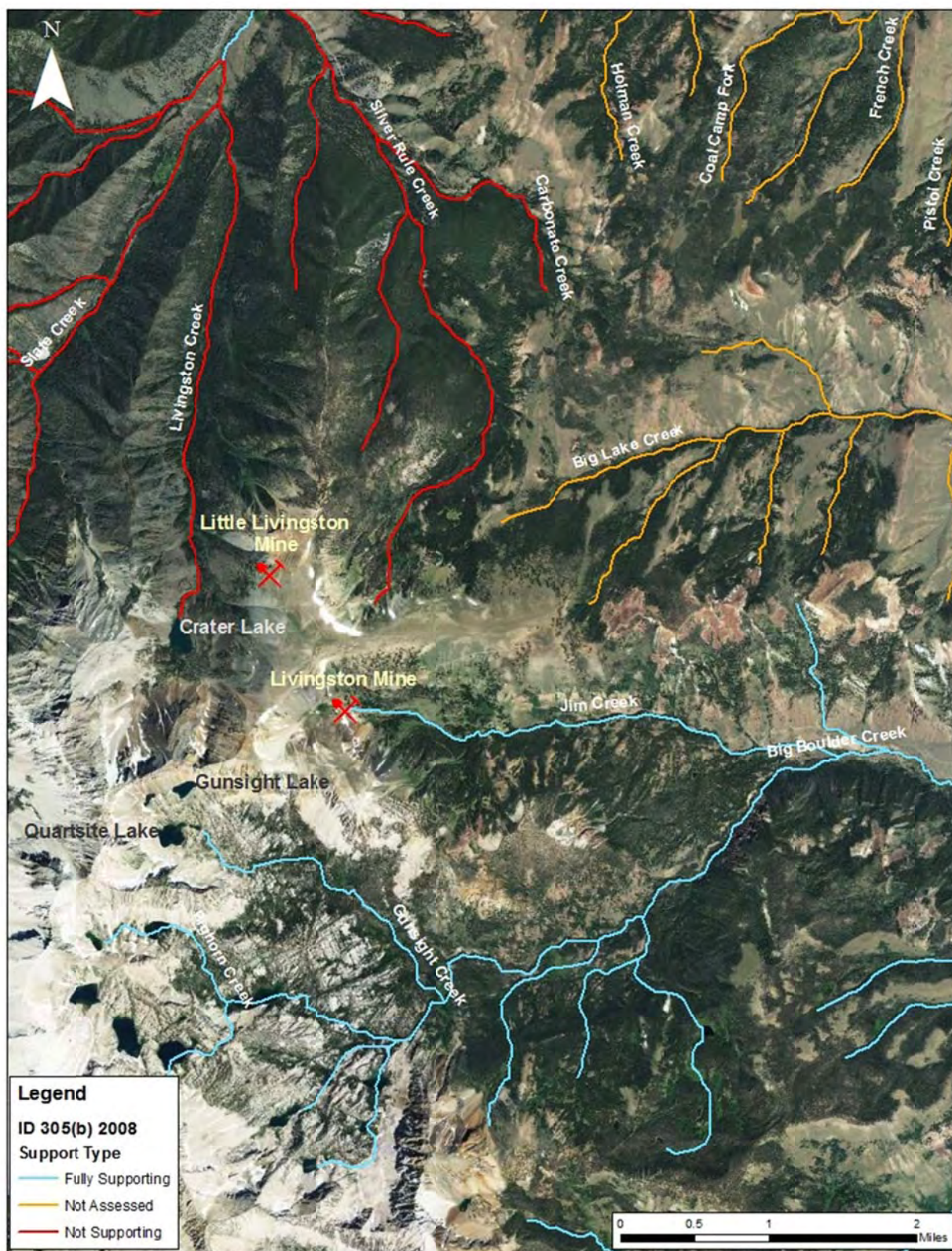


Figure 12. State of Idaho §305(b)-listed streams.



## 5 Summary and Conclusions

The purpose of this PA/SI is to assess the threat posed to human health and the environment and determine the need for additional investigation or remediation at the Livingston and Little Livingston Mine sites. During the 2013 field season, surface water and sediment samples for the mine sites were evaluated. USFS is currently working on an agreement with the private landowner; therefore, soil sampling will be planned for a future field season.

### 5.1 Livingston Mine

Evaluation of the Livingston Mine sediment and surface water sample results show that the mine site is contributing several metals to Jim Creek and tributaries, especially Cd and Zn which were detected in both sediments and surface water. Sediment concentrations of Sb, As, Cd, Cu, Pb, Mn, Ni, Ag, and Zn and surface water concentrations of Sb, Cd, Mn, Ni, and Zn were detected three times higher than background.

Although several metals detected in sediment samples were above IDTLs, the current use for this site is recreational. In the vicinity of the mine site, only As was detected above the human health BLM risk criteria for campers at the main haulage drift portal and approximately 175 feet downgradient at the Jim Creek #1 sampling location; however, As was not detected in the surface water.

Metals were detected in surface water above the MCLs at the main haulage (Cd and Mn), the newly collapsed adit and waste dump seep (Sb and Cd); however, these locations are not currently used as drinking water sources. Comparison of these concentrations to the BLM human risk management criteria for surface water exposure to campers (BLM 2004), which is applicable since the current use for this site is recreational, demonstrates that these metals are detected below these BLM criteria (Sb criteria = 0.124 mg/L, Cd criteria = 0.155 mg/L and Mn criteria = 1.548 mg/L).

Metals above the BLM sediment median ecological criteria (Cd, Pb, and Zn) and the cold water biota standards (Cd, Mn, Se and Zn) could pose a risk to wildlife in the vicinity of the mine site; however, surface water close to adit drainages and seeps will not likely be used as cold water biota habitat. Evaluation of metals detected in streams, the current cold water biota habitat, show detections of only Cd and Zn above the cold water biota standards. Livestock grazing was observed near the background and waste dump seep locations; therefore, detections of Sb, Cd, Se and Zn in surface water near the waste dump seep could pose a hazard to livestock. Surface water exposure criteria specific to livestock could not be found to perform a species-specific assessment.

Sampling locations approximately 3.5 miles downgradient of the mine site, near the confluence of Jim Creek and Big Boulder Creek, show metals contributions from Jim Creek to Big Boulder Creek above the median ecological criteria in sediments (Cd, Pb, and Zn) and above the cold water biota standards in surface water (Cd). Although Zn was detected in Jim Creek above the cold water biota standards, Zn contributions to Big Boulder Creek are below the standards. Concentrations were detected within the range observed near the mine site; however, these

concentrations could be influenced by the close proximity of these sampling locations to the former Livingston Mill site and remediated tailings impoundment (Figure 6).

## 5.2 Little Livingston Mine

Evaluation of the Little Livingston Mine included collection of sediment and surface water samples approximately 0.5 mile downgradient from the mine site. Sediment results show detections of all of the metals (except As) at levels three times higher than background. Only Ba and Cd were detected at levels three times higher than background in surface water samples. The background sample collected at Livingston Mine was used for this comparison; however, this background location may not be an accurate representation for Livingston Creek. USFS observed some evidence of small scale mining activity above Crater Lake (at the headwaters of Livingston Creek). This mining may or may not be related to activities conducted at Little Livingston Mine and could be a potential source contributing to Livingston Creek.

Although several metals detected in sediment samples were above IDTLs, the current use for this site is recreational. None of the metals were detected above the human health BLM risk criteria for campers and three metals (Cd, Pb, and Zn) exceed the BLM median ecological criteria in sediments. Selenium was the only metal detected above a standard (cold water biota chronic) in the surface water samples.

## 5.3 Recommendations

Based on existing conditions and uses, historic information, data observations made during the site visit, potential pathways of contaminants to receptors, and potential exposures to ecological and human receptors, DEQ recommends **Further Site Inspections** to make a final determination for Livingston and Little Livingston Mines.

Recommendations for further site inspections of the Livingston and Little Livingston Mines include soil sampling of the waste dumps, roads and recreational use areas to determine if any sources of metals remain at the sites that: 1) could be an exposure pathway to recreational users, wildlife or livestock or 2) could be an ongoing contributing source to Jim Creek and the watershed surrounding Livingston Mine or the tributaries to Livingston Creek and the watershed surrounding Little Livingston Mine. In addition, mining activities above Crater Lake should be examined to determine if it could be a potential source contributing metals to Livingston Creek and if a different background sampling location should be recommended for Little Livingston Mine. If exposure pathways or ongoing sources are identified, recommendations for risk management efforts and/or remedial actions to reduce or eliminate risk should be identified.

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## 6.1 GIS Coverages

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## **Appendix A. Laboratory Sample Reports**



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# CHAIN OF CUSTODY RECORD

SVL Analytical, Inc. • One Government Gulch • Kellogg, ID 83837 • (208) 764-1258 • FAX: (208) 763-0891

Page 3 of 3

W3H0323

FOR SVL USE ONLY  
SVL JOB #

TEMP on Receipt:

Table 1. - Matrix Type

1 = Surface Water, 2 = Ground Water  
3 = Soil/Sediment, 4 = Rinse, 5 = Oil  
6 = Waste, 7 = Other

Report to Company: IDFQ  
Contact: Dana Swift  
Address: 1410 N. Hildon  
Boise, ID 83706  
Phone Number: 208-373-0296  
FAX Number: 208-373-0154  
E-mail: dana\_swift@idq.idaho.gov

Invoice Sent To: Dana Swift  
Contact: \_\_\_\_\_  
Address: Same  
Phone Number: \_\_\_\_\_  
FAX Number: \_\_\_\_\_  
PO#: \_\_\_\_\_

Project Name: Livingston Mine  
Sampler's Signature: Dana Swift

Indicate State of sample origination: ID

Sample ID	Collection	Date	Time	Collected by: (Init.)	Misc.	Preservative(s)					Other (Specify)	Analyses Required	Rush Instructions (Days)	Comments	
						Unpreserved	HNO <sub>3</sub> Filtered	HNO <sub>3</sub> Unfiltered	H <sub>2</sub> SO <sub>4</sub>	NaOH					
1 LV-BG-SW1		8/7/13	2:25	DS	1										Sediment Metals include 14: As, Ba, Cd, Cr, Pb, Hg, Se, Ag, Cu, Fe, Mn, Zn, Sb, Ni Air dry sediment before analysis.
2 LV-BG-SD1		8/7/13	2:25	DS	3										
3 LV-MHDW-SW2		8/7/13	3:05	DS	1										
4 LV-MHDW-SW3		8/7/13	3:05	DS	1										
5 LV-MHDW-SD2		8/7/13	3:05	DS	3										
6 LV-MHDW-SD3		8/7/13	3:05	DS	3										
7 LV-MHCA-SW4		8/7/13	3:55	DS	1										
8 LV-MHCA-SD4		8/7/13	3:55	DS	3										
9 LV-CAD-SW5		8/7/13	4:15	DS	1										
10 LV-AD-SD5		8/7/13	4:50	DS	3										
Relinquished by: <u>Dana Swift</u>												Date: <u>8/13/13</u>	Time: <u>15:45</u>		
Relinquished by:												Date:	Time:		

SVL-COC 9/05



# CHAIN OF CUSTODY RECORD

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

Page 2 of 3

W3H0323

FOR SVL USE ONLY  
SVL JOB # \_\_\_\_\_  
TEMP on Receipt: \_\_\_\_\_

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

Report to Company: IDEA  
Contact: Dana Swift  
Address: 1410 N. Hilton  
Boise, ID 83706  
Phone Number: 208-373-0296  
FAX Number: 208-373-0154  
E-mail: dana\_swift@deg.idaho.gov

Invoice Sent To: Dana Swift  
Contact: \_\_\_\_\_  
Address: Same  
Phone Number: \_\_\_\_\_  
FAX Number: \_\_\_\_\_  
PO#: \_\_\_\_\_

Project Name: Livingston Mine  
Sampler's Signature: Dana Swift

Indicate State of sample origination: ED

Sample ID	Collection	Date	Time	Collected by: (Init.)	Misc.	Preservative(s)				Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO <sub>3</sub> Filtered	HNO <sub>3</sub> Unfiltered	HCl	H <sub>2</sub> SO <sub>4</sub>	NaOH	Other (Specify)	Analyses Required	Rush Instructions (Days)	Comments	
						HNO <sub>3</sub> Filtered	HNO <sub>3</sub> Unfiltered	HCl	H <sub>2</sub> SO <sub>4</sub>													NaOH
1 LV-AD-SW6		8/7/13	4:50	DS	1								X						X			Sediment Metals include 14: As, Ba, Cd, Cr, Pb, Hg, Se, Ag, Cu, Fe, Mn, Zn, Sb, Ni Air dry sediment before analysis.
2 LV-SEEP-SW7		8/7/13	5:15	DS	1							X							X			
3 LV-SEEP-SO6		8/7/13	5:25	DS	3						X								X			
4 LV-JC-SW8		8/7/13	5:40	DS	1						X								X			
5 LV-JC-SO7		8/7/13	5:40	DS	3						X								X			
6 LV-JC-SO8		8/7/13	6:15	DS	3						X								X			
7 LV-JC-SW9		8/7/13	6:15	DS	1						X								X			
8 LV-JC3-SO9		8/8/13	9:05	DS	3						X								X			
9 LV-JC3-SO10		8/8/13	9:05	DS	3						X								X			
10 LV-JC3-SW10		8/8/13	9:05	DS	1						X								X			
Requisitioned by: <u>Dana Swift</u>																			Date: <u>8/13/13</u>	Time: <u>15:45</u>		
Requisitioned by: _____																			Date: _____	Time: _____		

SVL-COC 9/03

White: LAB COPY Yellow: CUSTOMER COPY

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



# SAMPLE RECEIPT/CHAIN-OF-CUSTODY CHECKLIST

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

Date of acceptance:

8/13/13

By:

CR Seery

SVL Work No:

4340323

Item	Description	V	VC	NV	NA	Comments
1	Client or project name	✓				IDEQ
2	Date and time of receipt at lab	✓				8/13/13 15:45
3	Received by	✓				mark Duce
4	Temperature blank or cooler temperature				✓	Temp. - °C.
5	Were the sample(s) received on ice				✓	no
6	Custody tape/bottle seals				✓	no
7	Condition of samples upon receipt (leaking; bubbles in VOA vials)	✓				Good
8	Sample numbers/IDs agree with COC	✓				
9	Sample date & time agree with COC	✓				
10	Number of containers for each sample	✓				
11	The correct preservative for the analysis requested	✓				
12	Did an SVL employee preserve sample(s) upon receipt				✓	
13	Type of container for each sample / volume received	✓				
14	Analysis requested for each sample	✓				
15	Sample matrix description	✓				
16	COC properly completed & legible	✓				
17	Corrections properly made (initials & date)				✓	
18	Additional comments or records of sample condition or treatment (unlisted or missing samples at laboratory, aliquot taken, sample hold, samples subcontracted, communications between client and laboratory)				✓	
19	Shipper's air bill	✓				

V- Verified

VC- Verified Corrections Made

NV- Not Verified

NA- Not Applicable

Additional Comments:

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One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

## ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Sampled By	Date Received
LV-BG-SW1	W3H0323-01	Surface Water	07-Aug-13 14:25	DS	13-Aug-2013
LV-BG-SD1	W3H0323-02	Sediment	07-Aug-13 14:25	DS	13-Aug-2013
LV-MHDW-SW2	W3H0323-03	Surface Water	07-Aug-13 15:05	DS	13-Aug-2013
LV-MHDW-SW3	W3H0323-04	Surface Water	07-Aug-13 15:05	DS	13-Aug-2013
LV-MHDW-SD2	W3H0323-05	Sediment	07-Aug-13 15:05	DS	13-Aug-2013
LV-MHDW-SD3	W3H0323-06	Sediment	07-Aug-13 15:05	DS	13-Aug-2013
LV-MHCA-SW4	W3H0323-07	Surface Water	07-Aug-13 15:55	DS	13-Aug-2013
LV-MHCA-SD4	W3H0323-08	Sediment	07-Aug-13 15:55	DS	13-Aug-2013
LV-CAD-SW5	W3H0323-09	Surface Water	07-Aug-13 16:15	DS	13-Aug-2013
LV-AD-SD5	W3H0323-10	Sediment	07-Aug-13 16:50	DS	13-Aug-2013
LV-AD-SW6	W3H0323-11	Surface Water	07-Aug-13 16:50	DS	13-Aug-2013
LV-SEEP-SW7	W3H0323-12	Surface Water	07-Aug-13 17:15	DS	13-Aug-2013
LV-SEEP-SD6	W3H0323-13	Sediment	07-Aug-13 17:25	DS	13-Aug-2013
LV-JC-SW8	W3H0323-14	Surface Water	07-Aug-13 17:40	DS	13-Aug-2013
LV-JC-SD7	W3H0323-15	Sediment	07-Aug-13 17:40	DS	13-Aug-2013
LV-JC-SD8	W3H0323-16	Sediment	07-Aug-13 18:15	DS	13-Aug-2013
LV-JC-SW9	W3H0323-17	Surface Water	07-Aug-13 18:15	DS	13-Aug-2013
LV-JC3-SD9	W3H0323-18	Sediment	08-Aug-13 09:05	DS	13-Aug-2013
LV-JC3-SD10	W3H0323-19	Sediment	08-Aug-13 09:05	DS	13-Aug-2013
LV-JC3-SW10	W3H0323-20	Surface Water	08-Aug-13 09:05	DS	13-Aug-2013

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.

## Case Narrative

08/27/2013: Sediment samples were air dried and not sieved.

SVL holds the following certifications:

AZ:0538, CA:2080, FL(NELAC):E87993, ID:ID00019 & ID00965 (Microbiology), NV:ID000192007A, WA:C573

Work order Report Page 1 of 25



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

Client Sample ID: LV-BG-SW1

SVL Sample ID: W3H0323-01 (Surface Water)

Sampled: 07-Aug-13 14:25

Received: 13-Aug-13

Sampled By: DS

Sample Report Page 1 of 1

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total Recoverable--reportable as Total per 40 CFR 136)</b>										
SM 2340B	Hardness (as CaCO <sub>3</sub> )	39.8	mg/L	0.347	0.198		N/A		08/26/13 16:34	
<b>Metals (Dissolved)</b>										
EPA 200.7	Barium	< 0.0020	mg/L	0.0020	0.0006		W333430	AS	08/26/13 16:34	
EPA 200.7	Calcium	14.2	mg/L	0.040	0.015		W333430	AS	08/26/13 16:34	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0008		W333430	AS	08/26/13 16:34	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W333430	AS	08/26/13 16:34	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.019		W333430	AS	08/26/13 16:34	
EPA 200.7	Magnesium	1.04	mg/L	0.060	0.039		W333430	AS	08/26/13 16:34	
EPA 200.7	Manganese	< 0.0040	mg/L	0.0040	0.0012		W333430	AS	08/26/13 16:34	
EPA 200.7	Nickel	< 0.010	mg/L	0.010	0.003		W333430	AS	08/26/13 16:34	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0025		W333430	AS	08/26/13 16:34	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00010		W333359	KWH	08/27/13 10:10	
EPA 200.8	Arsenic	0.0060	mg/L	0.0030	0.0003		W333359	KWH	08/27/13 10:10	
EPA 200.8	Cadmium	< 0.00020	mg/L	0.00020	0.00003		W333359	KWH	08/27/13 10:10	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W333359	KWH	08/27/13 10:10	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00026		W333359	KWH	08/27/13 10:10	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W333359	KWH	08/27/13 10:10	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W334089	STA	08/22/13 13:01	

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

John Kern  
Laboratory Director





One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

Client Sample ID: LV-BG-SD1

SVL Sample ID: W3H0323-02 (Sediment)

Sampled: 07-Aug-13 14:25

Received: 13-Aug-13

Sampled By: DS

Sample Report Page 1 of 1

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	< 2.0	mg/kg	2.0	0.6		W333407	AS	08/27/13 12:19	
EPA 6010B	Arsenic	11.4	mg/kg	2.5	0.6		W333407	AS	08/27/13 12:19	
EPA 6010B	Barium	36.4	mg/kg	0.200	0.032		W333407	AS	08/27/13 12:19	
EPA 6010B	Cadmium	0.44	mg/kg	0.20	0.03		W333407	AS	08/27/13 12:19	
EPA 6010B	Chromium	9.31	mg/kg	0.60	0.06		W333407	AS	08/27/13 12:19	
EPA 6010B	Copper	6.41	mg/kg	1.00	0.35		W333407	AS	08/27/13 12:19	
EPA 6010B	Iron	9040	mg/kg	6.0	1.2		W333407	AS	08/27/13 12:19	M3
EPA 6010B	Lead	5.74	mg/kg	0.75	0.25		W333407	AS	08/27/13 12:19	
EPA 6010B	Manganese	92.4	mg/kg	0.40	0.16		W333407	AS	08/27/13 12:19	
EPA 6010B	Nickel	9.85	mg/kg	1.00	0.31		W333407	AS	08/27/13 12:19	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	0.9		W333407	AS	08/27/13 12:19	
EPA 6010B	Silver	< 0.50	mg/kg	0.50	0.08		W333407	AS	08/27/13 12:19	
EPA 6010B	Zinc	61.4	mg/kg	1.00	0.16		W333407	AS	08/27/13 12:19	
EPA 7471A	Mercury	< 0.033	mg/kg	0.033	0.004		W334244	STA	08/27/13 13:54	

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

**John Kern**  
Laboratory Director



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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

Client Sample ID: LV-MHDW-SW2

SVL Sample ID: W3H0323-03 (Surface Water)

Sample Report Page 1 of 1

Sampled: 07-Aug-13 15:05

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
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**Metals (Total Recoverable--reportable as Total per 40 CFR 136)**

SM 2340B	Hardness (as CaCO <sub>3</sub> )	140	mg/L	0.347	0.198		N/A		08/26/13 16:50	
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**Metals (Dissolved)**

EPA 200.7	Barium	< 0.0020	mg/L	0.0020	0.0006		W333430	AS	08/26/13 16:50	
EPA 200.7	Calcium	46.0	mg/L	0.040	0.015		W333430	AS	08/26/13 16:50	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0008		W333430	AS	08/26/13 16:50	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W333430	AS	08/26/13 16:50	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.019		W333430	AS	08/26/13 16:50	
EPA 200.7	Magnesium	6.23	mg/L	0.060	0.039		W333430	AS	08/26/13 16:50	
EPA 200.7	Manganese	0.0746	mg/L	0.0040	0.0012		W333430	AS	08/26/13 16:50	
EPA 200.7	Nickel	0.033	mg/L	0.010	0.003		W333430	AS	08/26/13 16:50	
EPA 200.7	Zinc	4.30	mg/L	0.0100	0.0025		W333430	AS	08/26/13 16:50	
EPA 200.8	Antimony	0.00518	mg/L	0.00300	0.00010		W333359	KWH	08/27/13 10:24	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W333359	KWH	08/27/13 10:24	
EPA 200.8	Cadmium	0.0425	mg/L	0.00020	0.00003		W333359	KWH	08/27/13 10:24	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W333359	KWH	08/27/13 10:24	
EPA 200.8	Selenium	0.00760	mg/L	0.00300	0.00026		W333359	KWH	08/27/13 10:24	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W333359	KWH	08/27/13 10:24	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W334089	STA	08/22/13 13:06	

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

John Kern  
Laboratory Director



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Kellogg ID 83837-0929

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

Project Name: **Livingston Mine 2013**Work Order: **W3H0323**

Reported: 27-Aug-13 16:30

Client Sample ID: **LV-MHDW-SW3**SVL Sample ID: **W3H0323-04 (Surface Water)**

Sample Report Page 1 of 1

Sampled: 07-Aug-13 15:05

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total Recoverable--reportable as Total per 40 CFR 136)</b>										
SM 2340B	Hardness (as CaCO3)	141	mg/L	0.347	0.198		N/A		08/26/13 16:56	
<b>Metals (Dissolved)</b>										
EPA 200.7	Barium	< 0.0020	mg/L	0.0020	0.0006		W333430	AS	08/26/13 16:56	
EPA 200.7	Calcium	46.2	mg/L	0.040	0.015		W333430	AS	08/26/13 16:56	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0008		W333430	AS	08/26/13 16:56	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W333430	AS	08/26/13 16:56	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.019		W333430	AS	08/26/13 16:56	
EPA 200.7	Magnesium	6.33	mg/L	0.060	0.039		W333430	AS	08/26/13 16:56	
EPA 200.7	Manganese	0.0667	mg/L	0.0040	0.0012		W333430	AS	08/26/13 16:56	
EPA 200.7	Nickel	0.033	mg/L	0.010	0.003		W333430	AS	08/26/13 16:56	
EPA 200.7	Zinc	4.28	mg/L	0.0100	0.0025		W333430	AS	08/26/13 16:56	
EPA 200.8	Antimony	0.00506	mg/L	0.00300	0.00010		W333359	KWH	08/27/13 10:28	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W333359	KWH	08/27/13 10:28	
EPA 200.8	Cadmium	0.0417	mg/L	0.00020	0.00003		W333359	KWH	08/27/13 10:28	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W333359	KWH	08/27/13 10:28	
EPA 200.8	Selenium	0.00733	mg/L	0.00300	0.00026		W333359	KWH	08/27/13 10:28	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W333359	KWH	08/27/13 10:28	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W334089	STA	08/22/13 13:10	

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

**John Kern**  
Laboratory Director



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

Client Sample ID: LV-MHDW-SD2

SVL Sample ID: W3H0323-05 (Sediment)

Sample Report Page 1 of 1

Sampled: 07-Aug-13 15:05

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	7.6	mg/kg	2.0	0.6		W333407	AS	08/27/13 12:36	
EPA 6010B	Arsenic	68.2	mg/kg	2.5	0.6		W333407	AS	08/27/13 12:36	
EPA 6010B	Barium	39.7	mg/kg	0.200	0.032		W333407	AS	08/27/13 12:36	
EPA 6010B	Cadmium	31.1	mg/kg	0.20	0.03		W333407	AS	08/27/13 12:36	
EPA 6010B	Chromium	20.9	mg/kg	0.60	0.06		W333407	AS	08/27/13 12:36	
EPA 6010B	Copper	116	mg/kg	1.00	0.35		W333407	AS	08/27/13 12:36	
EPA 6010B	Iron	22000	mg/kg	6.0	1.2		W333407	AS	08/27/13 12:36	
EPA 6010B	Lead	712	mg/kg	0.75	0.25		W333407	AS	08/27/13 12:36	
EPA 6010B	Manganese	708	mg/kg	0.40	0.16		W333407	AS	08/27/13 12:36	
EPA 6010B	Nickel	66.8	mg/kg	1.00	0.31		W333407	AS	08/27/13 12:36	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	0.9		W333407	AS	08/27/13 12:36	
EPA 6010B	Silver	1.97	mg/kg	0.50	0.08		W333407	AS	08/27/13 12:36	
EPA 6010B	Zinc	4920	mg/kg	10.0	1.60	10	W333407	AS	08/27/13 13:23	D2
EPA 7471A	Mercury	0.053	mg/kg	0.033	0.004		W334244	STA	08/27/13 13:59	

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

John Kern  
Laboratory Director





One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

Client Sample ID: LV-MHDW-SD3

SVL Sample ID: W3H0323-06 (Sediment)

Sample Report Page 1 of 1

Sampled: 07-Aug-13 15:05

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	7.5	mg/kg	2.0	0.6		W333407	AS	08/27/13 12:42	
EPA 6010B	Arsenic	66.0	mg/kg	2.5	0.6		W333407	AS	08/27/13 12:42	
EPA 6010B	Barium	38.0	mg/kg	0.200	0.032		W333407	AS	08/27/13 12:42	
EPA 6010B	Cadmium	32.7	mg/kg	0.20	0.03		W333407	AS	08/27/13 12:42	
EPA 6010B	Chromium	21.3	mg/kg	0.60	0.06		W333407	AS	08/27/13 12:42	
EPA 6010B	Copper	109	mg/kg	1.00	0.35		W333407	AS	08/27/13 12:42	
EPA 6010B	Iron	21100	mg/kg	6.0	1.2		W333407	AS	08/27/13 12:42	
EPA 6010B	Lead	723	mg/kg	0.75	0.25		W333407	AS	08/27/13 12:42	
EPA 6010B	Manganese	624	mg/kg	0.40	0.16		W333407	AS	08/27/13 12:42	
EPA 6010B	Nickel	61.5	mg/kg	1.00	0.31		W333407	AS	08/27/13 12:42	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	0.9		W333407	AS	08/27/13 12:42	
EPA 6010B	Silver	2.08	mg/kg	0.50	0.08		W333407	AS	08/27/13 12:42	
EPA 6010B	Zinc	4850	mg/kg	10.0	1.60	10	W333407	AS	08/27/13 13:17	D2
EPA 7471A	Mercury	0.065	mg/kg	0.033	0.004		W334244	STA	08/27/13 14:01	

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

John Kern  
Laboratory Director



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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

Client Sample ID: LV-MHCA-SW4

SVL Sample ID: W3H0323-07 (Surface Water)

Sample Report Page 1 of 1

Sampled: 07-Aug-13 15:55

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
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**Metals (Total Recoverable--reportable as Total per 40 CFR 136)**

SM 2340B	Hardness (as CaCO3)	68.7	mg/L	0.347	0.198		N/A		08/26/13 17:01	
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**Metals (Dissolved)**

EPA 200.7	Barium	< 0.0020	mg/L	0.0020	0.0006		W333430	AS	08/26/13 17:01	
EPA 200.7	Calcium	23.3	mg/L	0.040	0.015		W333430	AS	08/26/13 17:01	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0008		W333430	AS	08/26/13 17:01	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W333430	AS	08/26/13 17:01	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.019		W333430	AS	08/26/13 17:01	
EPA 200.7	Magnesium	2.58	mg/L	0.060	0.039		W333430	AS	08/26/13 17:01	
EPA 200.7	Manganese	0.0164	mg/L	0.0040	0.0012		W333430	AS	08/26/13 17:01	
EPA 200.7	Nickel	< 0.010	mg/L	0.010	0.003		W333430	AS	08/26/13 17:01	
EPA 200.7	Zinc	1.04	mg/L	0.0100	0.0025		W333430	AS	08/26/13 17:01	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00010		W333359	KWH	08/27/13 10:33	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W333359	KWH	08/27/13 10:33	
EPA 200.8	Cadmium	0.0110	mg/L	0.00020	0.00003		W333359	KWH	08/27/13 10:33	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W333359	KWH	08/27/13 10:33	
EPA 200.8	Selenium	0.00347	mg/L	0.00300	0.00026		W333359	KWH	08/27/13 10:33	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W333359	KWH	08/27/13 10:33	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W334089	STA	08/22/13 13:12	

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

John Kern  
Laboratory Director



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(208) 784-1258

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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

Client Sample ID: LV-MHCA-SD4

SVL Sample ID: W3H0323-08 (Sediment)

Sampled: 07-Aug-13 15:55

Received: 13-Aug-13

Sampled By: DS

Sample Report Page 1 of 1

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	6.6	mg/kg	2.0	0.6		W333407	AS	08/27/13 12:47	
EPA 6010B	Arsenic	64.4	mg/kg	2.5	0.6		W333407	AS	08/27/13 12:47	
EPA 6010B	Barium	37.7	mg/kg	0.200	0.032		W333407	AS	08/27/13 12:47	
EPA 6010B	Cadmium	22.0	mg/kg	0.20	0.03		W333407	AS	08/27/13 12:47	
EPA 6010B	Chromium	17.5	mg/kg	0.60	0.06		W333407	AS	08/27/13 12:47	
EPA 6010B	Copper	57.3	mg/kg	1.00	0.35		W333407	AS	08/27/13 12:47	
EPA 6010B	Iron	17100	mg/kg	6.0	1.2		W333407	AS	08/27/13 12:47	
EPA 6010B	Lead	499	mg/kg	0.75	0.25		W333407	AS	08/27/13 12:47	
EPA 6010B	Manganese	454	mg/kg	0.40	0.16		W333407	AS	08/27/13 12:47	
EPA 6010B	Nickel	49.3	mg/kg	1.00	0.31		W333407	AS	08/27/13 12:47	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	0.9		W333407	AS	08/27/13 12:47	
EPA 6010B	Silver	1.32	mg/kg	0.50	0.08		W333407	AS	08/27/13 12:47	
EPA 6010B	Zinc	3010	mg/kg	1.00	0.16		W333407	AS	08/27/13 12:47	
EPA 7471A	Mercury	0.070	mg/kg	0.033	0.004		W334244	STA	08/27/13 14:03	

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

John Kern  
Laboratory Director



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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

Client Sample ID: LV-CAD-SW5

SVL Sample ID: W3H0323-09 (Surface Water)

Sample Report Page 1 of 1

Sampled: 07-Aug-13 16:15

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total Recoverable--reportable as Total per 40 CFR 136)</b>										
SM 2340B	Hardness (as CaCO3)	44.0	mg/L	0.347	0.198		N/A		08/26/13 17:06	
<b>Metals (Dissolved)</b>										
EPA 200.7	Barium	< 0.0020	mg/L	0.0020	0.0006		W333430	AS	08/26/13 17:06	
EPA 200.7	Calcium	16.4	mg/L	0.040	0.015		W333430	AS	08/26/13 17:06	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0008		W333430	AS	08/26/13 17:06	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W333430	AS	08/26/13 17:06	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.019		W333430	AS	08/26/13 17:06	
EPA 200.7	Magnesium	0.766	mg/L	0.060	0.039		W333430	AS	08/26/13 17:06	
EPA 200.7	Manganese	< 0.0040	mg/L	0.0040	0.0012		W333430	AS	08/26/13 17:06	
EPA 200.7	Nickel	< 0.010	mg/L	0.010	0.003		W333430	AS	08/26/13 17:06	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0025		W333430	AS	08/26/13 17:06	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00010		W333359	KWH	08/27/13 10:37	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W333359	KWH	08/27/13 10:37	
EPA 200.8	Cadmium	0.00033	mg/L	0.00020	0.00003		W333359	KWH	08/27/13 10:37	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W333359	KWH	08/27/13 10:37	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00026		W333359	KWH	08/27/13 10:37	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W333359	KWH	08/27/13 10:37	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W334089	STA	08/22/13 13:14	

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

John Kern  
Laboratory Director





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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

Client Sample ID: LV-AD-SD5

SVL Sample ID: W3H0323-10 (Sediment)

Sample Report Page 1 of 1

Sampled: 07-Aug-13 16:50

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	2.7	mg/kg	2.0	0.6		W333407	AS	08/27/13 12:53	
EPA 6010B	Arsenic	15.7	mg/kg	2.5	0.6		W333407	AS	08/27/13 12:53	
EPA 6010B	Barium	28.5	mg/kg	0.200	0.032		W333407	AS	08/27/13 12:53	
EPA 6010B	Cadmium	6.41	mg/kg	0.20	0.03		W333407	AS	08/27/13 12:53	
EPA 6010B	Chromium	10.4	mg/kg	0.60	0.06		W333407	AS	08/27/13 12:53	
EPA 6010B	Copper	25.2	mg/kg	1.00	0.35		W333407	AS	08/27/13 12:53	
EPA 6010B	Iron	12900	mg/kg	6.0	1.2		W333407	AS	08/27/13 12:53	
EPA 6010B	Lead	89.3	mg/kg	0.75	0.25		W333407	AS	08/27/13 12:53	
EPA 6010B	Manganese	170	mg/kg	0.40	0.16		W333407	AS	08/27/13 12:53	
EPA 6010B	Nickel	30.0	mg/kg	1.00	0.31		W333407	AS	08/27/13 12:53	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	0.9		W333407	AS	08/27/13 12:53	
EPA 6010B	Silver	< 0.50	mg/kg	0.50	0.08		W333407	AS	08/27/13 12:53	
EPA 6010B	Zinc	813	mg/kg	1.00	0.16		W333407	AS	08/27/13 12:53	
EPA 7471A	Mercury	< 0.033	mg/kg	0.033	0.004		W334244	STA	08/27/13 14:05	

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

John Kern  
Laboratory Director



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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

Client Sample ID: LV-AD-SW6

SVL Sample ID: W3H0323-11 (Surface Water)

Sample Report Page 1 of 1

Sampled: 07-Aug-13 16:50

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
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**Metals (Total Recoverable--reportable as Total per 40 CFR 136)**

SM 2340B	Hardness (as CaCO3)	161	mg/L	0.347	0.198		N/A		08/26/13 17:12	
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**Metals (Dissolved)**

EPA 200.7	Barium	< 0.0020	mg/L	0.0020	0.0006		W333430	AS	08/26/13 17:12	
EPA 200.7	Calcium	53.5	mg/L	0.040	0.015		W333430	AS	08/26/13 17:12	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0008		W333430	AS	08/26/13 17:12	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W333430	AS	08/26/13 17:12	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.019		W333430	AS	08/26/13 17:12	
EPA 200.7	Magnesium	6.56	mg/L	0.060	0.039		W333430	AS	08/26/13 17:12	
EPA 200.7	Manganese	0.0335	mg/L	0.0040	0.0012		W333430	AS	08/26/13 17:12	
EPA 200.7	Nickel	0.015	mg/L	0.010	0.003		W333430	AS	08/26/13 17:12	
EPA 200.7	Zinc	1.92	mg/L	0.0100	0.0025		W333430	AS	08/26/13 17:12	
EPA 200.8	Antimony	0.00994	mg/L	0.00300	0.00010		W333359	KWH	08/27/13 10:42	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W333359	KWH	08/27/13 10:42	
EPA 200.8	Cadmium	0.0119	mg/L	0.00020	0.00003		W333359	KWH	08/27/13 10:42	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W333359	KWH	08/27/13 10:42	
EPA 200.8	Selenium	0.00445	mg/L	0.00300	0.00026		W333359	KWH	08/27/13 10:42	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W333359	KWH	08/27/13 10:42	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W334089	STA	08/22/13 13:16	

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

John Kern  
Laboratory Director



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

Project Name: **Livingston Mine 2013**Work Order: **W3H0323**

Reported: 27-Aug-13 16:30

Client Sample ID: **LV-SEEP-SW7**SVL Sample ID: **W3H0323-12 (Surface Water)**

Sample Report Page 1 of 1

Sampled: 07-Aug-13 17:15

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total Recoverable--reportable as Total per 40 CFR 136)</b>										
SM 2340B	Hardness (as CaCO3)	136	mg/L	0.347	0.198		N/A		08/26/13 17:28	
<b>Metals (Dissolved)</b>										
EPA 200.7	Barium	0.0020	mg/L	0.0020	0.0006		W333430	AS	08/26/13 17:28	
EPA 200.7	Calcium	45.5	mg/L	0.040	0.015		W333430	AS	08/26/13 17:28	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0008		W333430	AS	08/26/13 17:28	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W333430	AS	08/26/13 17:28	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.019		W333430	AS	08/26/13 17:28	
EPA 200.7	Magnesium	5.52	mg/L	0.060	0.039		W333430	AS	08/26/13 17:28	
EPA 200.7	Manganese	0.0178	mg/L	0.0040	0.0012		W333430	AS	08/26/13 17:28	
EPA 200.7	Nickel	0.016	mg/L	0.010	0.003		W333430	AS	08/26/13 17:28	
EPA 200.7	Zinc	2.07	mg/L	0.0100	0.0025		W333430	AS	08/26/13 17:28	
EPA 200.8	Antimony	0.00694	mg/L	0.00300	0.00010		W333359	KWH	08/27/13 10:59	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W333359	KWH	08/27/13 10:59	
EPA 200.8	Cadmium	0.0258	mg/L	0.00020	0.00003		W333359	KWH	08/27/13 10:59	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W333359	KWH	08/27/13 10:59	
EPA 200.8	Selenium	0.00551	mg/L	0.00300	0.00026		W333359	KWH	08/27/13 10:59	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W333359	KWH	08/27/13 10:59	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W334089	STA	08/22/13 13:17	

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

**John Kern**  
Laboratory Director



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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

Client Sample ID: LV-SEEP-SD6

SVL Sample ID: W3H0323-13 (Sediment)

Sample Report Page 1 of 1

Sampled: 07-Aug-13 17:25

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	3.5	mg/kg	2.0	0.6		W333407	AS	08/27/13 12:59	
EPA 6010B	Arsenic	20.7	mg/kg	2.5	0.6		W333407	AS	08/27/13 12:59	
EPA 6010B	Barium	26.0	mg/kg	0.200	0.032		W333407	AS	08/27/13 12:59	
EPA 6010B	Cadmium	12.6	mg/kg	0.20	0.03		W333407	AS	08/27/13 12:59	
EPA 6010B	Chromium	11.8	mg/kg	0.60	0.06		W333407	AS	08/27/13 12:59	
EPA 6010B	Copper	23.4	mg/kg	1.00	0.35		W333407	AS	08/27/13 12:59	
EPA 6010B	Iron	12600	mg/kg	6.0	1.2		W333407	AS	08/27/13 12:59	
EPA 6010B	Lead	114	mg/kg	0.75	0.25		W333407	AS	08/27/13 12:59	
EPA 6010B	Manganese	275	mg/kg	0.40	0.16		W333407	AS	08/27/13 12:59	
EPA 6010B	Nickel	34.2	mg/kg	1.00	0.31		W333407	AS	08/27/13 12:59	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	0.9		W333407	AS	08/27/13 12:59	
EPA 6010B	Silver	0.87	mg/kg	0.50	0.08		W333407	AS	08/27/13 12:59	
EPA 6010B	Zinc	1940	mg/kg	1.00	0.16		W333407	AS	08/27/13 12:59	
EPA 7471A	Mercury	< 0.033	mg/kg	0.033	0.004		W334244	STA	08/27/13 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





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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

Client Sample ID: LV-JC-SW8

SVL Sample ID: W3H0323-14 (Surface Water)

Sample Report Page 1 of 1

Sampled: 07-Aug-13 17:40

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total Recoverable--reportable as Total per 40 CFR 136)</b>										
SM 2340B	Hardness (as CaCO3)	58.1	mg/L	0.347	0.198		N/A		08/26/13 17:33	
<b>Metals (Dissolved)</b>										
EPA 200.7	Barium	0.0032	mg/L	0.0020	0.0006		W333430	AS	08/26/13 17:33	
EPA 200.7	Calcium	20.6	mg/L	0.040	0.015		W333430	AS	08/26/13 17:33	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0008		W333430	AS	08/26/13 17:33	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W333430	AS	08/26/13 17:33	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.019		W333430	AS	08/26/13 17:33	
EPA 200.7	Magnesium	1.58	mg/L	0.060	0.039		W333430	AS	08/26/13 17:33	
EPA 200.7	Manganese	< 0.0040	mg/L	0.0040	0.0012		W333430	AS	08/26/13 17:33	
EPA 200.7	Nickel	< 0.010	mg/L	0.010	0.003		W333430	AS	08/26/13 17:33	
EPA 200.7	Zinc	0.281	mg/L	0.0100	0.0025		W333430	AS	08/26/13 17:33	
EPA 200.8	Antimony	0.00362	mg/L	0.00300	0.00010		W333359	KWH	08/27/13 11:04	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W333359	KWH	08/27/13 11:04	
EPA 200.8	Cadmium	0.00383	mg/L	0.00020	0.00003		W333359	KWH	08/27/13 11:04	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W333359	KWH	08/27/13 11:04	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00026		W333359	KWH	08/27/13 11:04	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W333359	KWH	08/27/13 11:04	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W334089	STA	08/22/13 13:19	

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

John Kern  
Laboratory Director



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

Client Sample ID: LV-JC-SD7

SVL Sample ID: W3H0323-15 (Sediment)

Sample Report Page 1 of 1

Sampled: 07-Aug-13 17:40

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	7.5	mg/kg	2.0	0.6		W333407	AS	08/27/13 13:29	
EPA 6010B	Arsenic	39.4	mg/kg	2.5	0.6		W333407	AS	08/27/13 13:29	
EPA 6010B	Barium	50.5	mg/kg	0.200	0.032		W333407	AS	08/27/13 13:29	
EPA 6010B	Cadmium	11.9	mg/kg	0.20	0.03		W333407	AS	08/27/13 13:29	
EPA 6010B	Chromium	21.0	mg/kg	0.60	0.06		W333407	AS	08/27/13 13:29	
EPA 6010B	Copper	31.0	mg/kg	1.00	0.35		W333407	AS	08/27/13 13:29	
EPA 6010B	Iron	15100	mg/kg	6.0	1.2		W333407	AS	08/27/13 13:29	
EPA 6010B	Lead	252	mg/kg	0.75	0.25		W333407	AS	08/27/13 13:29	
EPA 6010B	Manganese	305	mg/kg	0.40	0.16		W333407	AS	08/27/13 13:29	
EPA 6010B	Nickel	40.3	mg/kg	1.00	0.31		W333407	AS	08/27/13 13:29	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	0.9		W333407	AS	08/27/13 13:29	
EPA 6010B	Silver	2.24	mg/kg	0.50	0.08		W333407	AS	08/27/13 13:29	
EPA 6010B	Zinc	1620	mg/kg	1.00	0.16		W333407	AS	08/27/13 13:29	
EPA 7471A	Mercury	< 0.033	mg/kg	0.033	0.004		W334244	STA	08/27/13 14:14	

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John Kern  
Laboratory Director



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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

Client Sample ID: LV-JC-SD8

SVL Sample ID: W3H0323-16 (Sediment)

Sample Report Page 1 of 1

Sampled: 07-Aug-13 18:15

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	4.8	mg/kg	2.0	0.6		W333407	AS	08/27/13 13:35	
EPA 6010B	Arsenic	35.1	mg/kg	2.5	0.6		W333407	AS	08/27/13 13:35	
EPA 6010B	Barium	34.1	mg/kg	0.200	0.032		W333407	AS	08/27/13 13:35	
EPA 6010B	Cadmium	17.9	mg/kg	0.20	0.03		W333407	AS	08/27/13 13:35	
EPA 6010B	Chromium	17.8	mg/kg	0.60	0.06		W333407	AS	08/27/13 13:35	
EPA 6010B	Copper	35.5	mg/kg	1.00	0.35		W333407	AS	08/27/13 13:35	
EPA 6010B	Iron	14400	mg/kg	6.0	1.2		W333407	AS	08/27/13 13:35	
EPA 6010B	Lead	289	mg/kg	0.75	0.25		W333407	AS	08/27/13 13:35	
EPA 6010B	Manganese	349	mg/kg	0.40	0.16		W333407	AS	08/27/13 13:35	
EPA 6010B	Nickel	40.3	mg/kg	1.00	0.31		W333407	AS	08/27/13 13:35	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	0.9		W333407	AS	08/27/13 13:35	
EPA 6010B	Silver	1.24	mg/kg	0.50	0.08		W333407	AS	08/27/13 13:35	
EPA 6010B	Zinc	2200	mg/kg	1.00	0.16		W333407	AS	08/27/13 13:35	
EPA 7471A	Mercury	< 0.033	mg/kg	0.033	0.004		W334244	STA	08/27/13 14:16	

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

John Kern  
Laboratory Director



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1410 N. Hilton  
Boise, ID 83706

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

Client Sample ID: LV-JC-SW9

SVL Sample ID: W3H0323-17 (Surface Water)

Sample Report Page 1 of 1

Sampled: 07-Aug-13 18:15

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
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**Metals (Total Recoverable--reportable as Total per 40 CFR 136)**

SM 2340B	Hardness (as CaCO3)	89.6	mg/L	0.347	0.198		N/A		08/26/13 17:39	
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**Metals (Dissolved)**

EPA 200.7	Barium	0.0049	mg/L	0.0020	0.0006		W333430	AS	08/26/13 17:39	
EPA 200.7	Calcium	30.8	mg/L	0.040	0.015		W333430	AS	08/26/13 17:39	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0008		W333430	AS	08/26/13 17:39	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W333430	AS	08/26/13 17:39	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.019		W333430	AS	08/26/13 17:39	
EPA 200.7	Magnesium	3.09	mg/L	0.060	0.039		W333430	AS	08/26/13 17:39	
EPA 200.7	Manganese	< 0.0040	mg/L	0.0040	0.0012		W333430	AS	08/26/13 17:39	
EPA 200.7	Nickel	< 0.010	mg/L	0.010	0.003		W333430	AS	08/26/13 17:39	
EPA 200.7	Zinc	0.672	mg/L	0.0100	0.0025		W333430	AS	08/26/13 17:39	
EPA 200.8	Antimony	0.00486	mg/L	0.00300	0.00010		W333359	KWH	08/27/13 11:08	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W333359	KWH	08/27/13 11:08	
EPA 200.8	Cadmium	0.0115	mg/L	0.00020	0.00003		W333359	KWH	08/27/13 11:08	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W333359	KWH	08/27/13 11:08	
EPA 200.8	Selenium	0.00367	mg/L	0.00300	0.00026		W333359	KWH	08/27/13 11:08	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W333359	KWH	08/27/13 11:08	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W334089	STA	08/22/13 13:21	

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

John Kern  
Laboratory Director





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

Project Name: **Livingston Mine 2013**Work Order: **W3H0323**

Reported: 27-Aug-13 16:30

Client Sample ID: **LV-JC3-SD9**SVL Sample ID: **W3H0323-18 (Sediment)**

Sample Report Page 1 of 1

Sampled: 08-Aug-13 09:05

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	4.1	mg/kg	2.0	0.6		W333407	AS	08/27/13 13:41	
EPA 6010B	Arsenic	33.2	mg/kg	2.5	0.6		W333407	AS	08/27/13 13:41	
EPA 6010B	Barium	341	mg/kg	0.200	0.032		W333407	AS	08/27/13 13:41	
EPA 6010B	Cadmium	21.3	mg/kg	0.20	0.03		W333407	AS	08/27/13 13:41	
EPA 6010B	Chromium	45.4	mg/kg	0.60	0.06		W333407	AS	08/27/13 13:41	
EPA 6010B	Copper	45.1	mg/kg	1.00	0.35		W333407	AS	08/27/13 13:41	
EPA 6010B	Iron	24600	mg/kg	6.0	1.2		W333407	AS	08/27/13 13:41	
EPA 6010B	Lead	337	mg/kg	0.75	0.25		W333407	AS	08/27/13 13:41	
EPA 6010B	Manganese	442	mg/kg	0.40	0.16		W333407	AS	08/27/13 13:41	
EPA 6010B	Nickel	67.0	mg/kg	1.00	0.31		W333407	AS	08/27/13 13:41	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	0.9		W333407	AS	08/27/13 13:41	
EPA 6010B	Silver	1.61	mg/kg	0.50	0.08		W333407	AS	08/27/13 13:41	
EPA 6010B	Zinc	1720	mg/kg	1.00	0.16		W333407	AS	08/27/13 13:41	
EPA 7471A	Mercury	0.070	mg/kg	0.033	0.004		W334244	STA	08/27/13 14:18	

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

**John Kern**  
Laboratory Director



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

Project Name: **Livingston Mine 2013**Work Order: **W3H0323**

Reported: 27-Aug-13 16:30

Client Sample ID: **LV-JC3-SD10**SVL Sample ID: **W3H0323-19 (Sediment)**

Sample Report Page 1 of 1

Sampled: 08-Aug-13 09:05

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	4.1	mg/kg	2.0	0.6		W333407	AS	08/27/13 13:47	
EPA 6010B	Arsenic	34.7	mg/kg	2.5	0.6		W333407	AS	08/27/13 13:47	
EPA 6010B	Barium	302	mg/kg	0.200	0.032		W333407	AS	08/27/13 13:47	
EPA 6010B	Cadmium	21.3	mg/kg	0.20	0.03		W333407	AS	08/27/13 13:47	
EPA 6010B	Chromium	44.3	mg/kg	0.60	0.06		W333407	AS	08/27/13 13:47	
EPA 6010B	Copper	44.0	mg/kg	1.00	0.35		W333407	AS	08/27/13 13:47	
EPA 6010B	Iron	23100	mg/kg	6.0	1.2		W333407	AS	08/27/13 13:47	
EPA 6010B	Lead	401	mg/kg	0.75	0.25		W333407	AS	08/27/13 13:47	
EPA 6010B	Manganese	396	mg/kg	0.40	0.16		W333407	AS	08/27/13 13:47	
EPA 6010B	Nickel	64.5	mg/kg	1.00	0.31		W333407	AS	08/27/13 13:47	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	0.9		W333407	AS	08/27/13 13:47	
EPA 6010B	Silver	1.59	mg/kg	0.50	0.08		W333407	AS	08/27/13 13:47	
EPA 6010B	Zinc	1760	mg/kg	1.00	0.16		W333407	AS	08/27/13 13:47	
EPA 7471A	Mercury	0.078	mg/kg	0.033	0.004		W334244	STA	08/27/13 14:19	

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

**John Kern**  
Laboratory Director



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

Client Sample ID: LV-JC3-SW10

SVL Sample ID: W3H0323-20 (Surface Water)

Sample Report Page 1 of 1

Sampled: 08-Aug-13 09:05

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
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**Metals (Total Recoverable--reportable as Total per 40 CFR 136)**

SM 2340B	Hardness (as CaCO3)	77.0	mg/L	0.347	0.198		N/A		08/26/13 17:44	
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**Metals (Dissolved)**

EPA 200.7	Barium	0.0044	mg/L	0.0020	0.0006		W333430	AS	08/26/13 17:44	
EPA 200.7	Calcium	26.3	mg/L	0.040	0.015		W333430	AS	08/26/13 17:44	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0008		W333430	AS	08/26/13 17:44	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W333430	AS	08/26/13 17:44	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.019		W333430	AS	08/26/13 17:44	
EPA 200.7	Magnesium	2.78	mg/L	0.060	0.039		W333430	AS	08/26/13 17:44	
EPA 200.7	Manganese	< 0.0040	mg/L	0.0040	0.0012		W333430	AS	08/26/13 17:44	
EPA 200.7	Nickel	< 0.010	mg/L	0.010	0.003		W333430	AS	08/26/13 17:44	
EPA 200.7	Zinc	0.162	mg/L	0.0100	0.0025		W333430	AS	08/26/13 17:44	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00010		W333359	KWH	08/27/13 11:13	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W333359	KWH	08/27/13 11:13	
EPA 200.8	Cadmium	0.00261	mg/L	0.00020	0.00003		W333359	KWH	08/27/13 11:13	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W333359	KWH	08/27/13 11:13	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00026		W333359	KWH	08/27/13 11:13	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W333359	KWH	08/27/13 11:13	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W334089	STA	08/22/13 13:23	

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

John Kern  
Laboratory Director



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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

**Quality Control - BLANK Data**

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>								
EPA 6010B	Antimony	mg/kg	<2.0	0.6	2.0	W333407	27-Aug-13	
EPA 6010B	Arsenic	mg/kg	<2.5	0.6	2.5	W333407	27-Aug-13	
EPA 6010B	Barium	mg/kg	<0.200	0.032	0.200	W333407	27-Aug-13	
EPA 6010B	Cadmium	mg/kg	<0.20	0.03	0.20	W333407	27-Aug-13	
EPA 6010B	Chromium	mg/kg	<0.60	0.06	0.60	W333407	27-Aug-13	
EPA 6010B	Copper	mg/kg	<1.00	0.35	1.00	W333407	27-Aug-13	
EPA 6010B	Iron	mg/kg	<6.0	1.2	6.0	W333407	27-Aug-13	
EPA 6010B	Lead	mg/kg	<0.75	0.25	0.75	W333407	27-Aug-13	
EPA 6010B	Manganese	mg/kg	<0.40	0.16	0.40	W333407	27-Aug-13	
EPA 6010B	Nickel	mg/kg	<1.00	0.31	1.00	W333407	27-Aug-13	
EPA 6010B	Selenium	mg/kg	<4.0	0.9	4.0	W333407	27-Aug-13	
EPA 6010B	Silver	mg/kg	<0.50	0.08	0.50	W333407	27-Aug-13	
EPA 6010B	Zinc	mg/kg	<1.00	0.16	1.00	W333407	27-Aug-13	
EPA 7471A	Mercury	mg/kg	<0.033	0.004	0.033	W334244	27-Aug-13	

**Metals (Dissolved)**

EPA 200.7	Barium	mg/L	<0.0020	0.0006	0.0020	W333430	26-Aug-13	
EPA 200.7	Calcium	mg/L	<0.040	0.015	0.040	W333430	26-Aug-13	
EPA 200.7	Chromium	mg/L	<0.0060	0.0008	0.0060	W333430	26-Aug-13	
EPA 200.7	Copper	mg/L	<0.010	0.006	0.010	W333430	26-Aug-13	
EPA 200.7	Iron	mg/L	<0.060	0.019	0.060	W333430	26-Aug-13	
EPA 200.7	Magnesium	mg/L	<0.060	0.039	0.060	W333430	26-Aug-13	
EPA 200.7	Manganese	mg/L	<0.0040	0.0012	0.0040	W333430	26-Aug-13	
EPA 200.7	Nickel	mg/L	<0.010	0.003	0.010	W333430	26-Aug-13	
EPA 200.7	Zinc	mg/L	<0.0100	0.0025	0.0100	W333430	26-Aug-13	
EPA 200.8	Antimony	mg/L	<0.00300	0.00010	0.00300	W333359	27-Aug-13	
EPA 200.8	Arsenic	mg/L	<0.0030	0.0003	0.0030	W333359	27-Aug-13	
EPA 200.8	Cadmium	mg/L	<0.00020	0.00003	0.00020	W333359	27-Aug-13	
EPA 200.8	Lead	mg/L	<0.00300	0.000048	0.00300	W333359	27-Aug-13	
EPA 200.8	Selenium	mg/L	<0.00300	0.00026	0.00300	W333359	27-Aug-13	
EPA 200.8	Silver	mg/L	<0.000100	0.000012	0.000100	W333359	27-Aug-13	
EPA 245.1	Mercury	mg/L	<0.00020	0.000045	0.00020	W334089	22-Aug-13	

**Quality Control - LABORATORY CONTROL SAMPLE Data**

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>									
EPA 6010B	Antimony	mg/kg	113	100	113	80 - 120	W333407	27-Aug-13	
EPA 6010B	Arsenic	mg/kg	112	100	112	80 - 120	W333407	27-Aug-13	
EPA 6010B	Barium	mg/kg	117	100	117	80 - 120	W333407	27-Aug-13	
EPA 6010B	Cadmium	mg/kg	113	100	113	80 - 120	W333407	27-Aug-13	
EPA 6010B	Chromium	mg/kg	115	100	115	80 - 120	W333407	27-Aug-13	
EPA 6010B	Copper	mg/kg	115	100	115	80 - 120	W333407	27-Aug-13	
EPA 6010B	Iron	mg/kg	1090	1000	109	80 - 120	W333407	27-Aug-13	
EPA 6010B	Lead	mg/kg	111	100	111	80 - 120	W333407	27-Aug-13	
EPA 6010B	Manganese	mg/kg	112	100	112	80 - 120	W333407	27-Aug-13	
EPA 6010B	Nickel	mg/kg	105	100	105	80 - 120	W333407	27-Aug-13	
EPA 6010B	Selenium	mg/kg	109	100	109	80 - 120	W333407	27-Aug-13	
EPA 6010B	Silver	mg/kg	5.77	5.00	115	80 - 120	W333407	27-Aug-13	
EPA 6010B	Zinc	mg/kg	113	100	113	80 - 120	W333407	27-Aug-13	
EPA 7471A	Mercury	mg/kg	0.808	0.833	97.0	80 - 120	W334244	27-Aug-13	

SVL holds the following certifications:

AZ:0538, CA:2080, FL(NELAC):E87993, ID:ID00019 &amp; ID00965 (Microbiology), NV:ID000192007A, WA:C573

Work order Report Page 22 of 25





One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

**Quality Control - LABORATORY CONTROL SAMPLE Data (Continued)**

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
<b>Metals (Dissolved)</b>									
EPA 200.7	Barium	mg/L	0.997	1.00	99.7	85 - 115	W333430	26-Aug-13	
EPA 200.7	Calcium	mg/L	19.3	20.0	96.4	85 - 115	W333430	26-Aug-13	
EPA 200.7	Chromium	mg/L	0.992	1.00	99.2	85 - 115	W333430	26-Aug-13	
EPA 200.7	Copper	mg/L	1.03	1.00	103	85 - 115	W333430	26-Aug-13	
EPA 200.7	Iron	mg/L	9.52	10.0	95.2	85 - 115	W333430	26-Aug-13	
EPA 200.7	Magnesium	mg/L	19.9	20.0	99.5	85 - 115	W333430	26-Aug-13	
EPA 200.7	Manganese	mg/L	0.971	1.00	97.1	85 - 115	W333430	26-Aug-13	
EPA 200.7	Nickel	mg/L	0.944	1.00	94.4	85 - 115	W333430	26-Aug-13	
EPA 200.7	Zinc	mg/L	0.975	1.00	97.5	85 - 115	W333430	26-Aug-13	
EPA 200.8	Antimony	mg/L	0.0254	0.0250	102	85 - 115	W333359	27-Aug-13	
EPA 200.8	Arsenic	mg/L	0.0248	0.0250	99.2	85 - 115	W333359	27-Aug-13	
EPA 200.8	Cadmium	mg/L	0.0248	0.0250	99.0	85 - 115	W333359	27-Aug-13	
EPA 200.8	Lead	mg/L	0.0245	0.0250	98.0	85 - 115	W333359	27-Aug-13	
EPA 200.8	Selenium	mg/L	0.0251	0.0250	100	85 - 115	W333359	27-Aug-13	
EPA 200.8	Silver	mg/L	0.0254	0.0250	101	85 - 115	W333359	27-Aug-13	
EPA 245.1	Mercury	mg/L	0.00487	0.00500	97.4	85 - 115	W334089	22-Aug-13	

**Quality Control - MATRIX SPIKE Data**

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	mg/kg	84.7	<2.0	100	84.7	75 - 125	W333407	27-Aug-13	
EPA 6010B	Arsenic	mg/kg	124	11.4	100	112	75 - 125	W333407	27-Aug-13	
EPA 6010B	Barium	mg/kg	154	36.4	100	118	75 - 125	W333407	27-Aug-13	
EPA 6010B	Cadmium	mg/kg	110	0.44	100	110	75 - 125	W333407	27-Aug-13	
EPA 6010B	Chromium	mg/kg	122	9.31	100	112	75 - 125	W333407	27-Aug-13	
EPA 6010B	Copper	mg/kg	120	6.41	100	113	75 - 125	W333407	27-Aug-13	
EPA 6010B	Iron	mg/kg	9930	9040	1000	89.6	75 - 125	W333407	27-Aug-13	M3
EPA 6010B	Lead	mg/kg	114	5.74	100	109	75 - 125	W333407	27-Aug-13	
EPA 6010B	Manganese	mg/kg	201	92.4	100	109	75 - 125	W333407	27-Aug-13	
EPA 6010B	Nickel	mg/kg	112	9.85	100	102	75 - 125	W333407	27-Aug-13	
EPA 6010B	Selenium	mg/kg	111	<4.0	100	109	75 - 125	W333407	27-Aug-13	
EPA 6010B	Silver	mg/kg	5.87	<0.50	5.00	117	75 - 125	W333407	27-Aug-13	
EPA 6010B	Zinc	mg/kg	171	61.4	100	109	75 - 125	W333407	27-Aug-13	
EPA 7471A	Mercury	mg/kg	0.160	<0.033	0.167	91.0	75 - 125	W334244	27-Aug-13	

**Metals (Dissolved)**

EPA 200.7	Barium	mg/L	0.991	<0.0020	1.00	99.1	70 - 130	W333430	26-Aug-13	
EPA 200.7	Barium	mg/L	0.937	0.0043	1.00	93.3	70 - 130	W333430	26-Aug-13	
EPA 200.7	Calcium	mg/L	33.1	14.2	20.0	94.4	70 - 130	W333430	26-Aug-13	
EPA 200.7	Calcium	mg/L	44.2	26.3	20.0	89.8	70 - 130	W333430	26-Aug-13	
EPA 200.7	Chromium	mg/L	0.972	<0.0060	1.00	97.2	70 - 130	W333430	26-Aug-13	
EPA 200.7	Chromium	mg/L	0.926	<0.0060	1.00	92.6	70 - 130	W333430	26-Aug-13	
EPA 200.7	Copper	mg/L	0.996	<0.010	1.00	99.6	70 - 130	W333430	26-Aug-13	
EPA 200.7	Copper	mg/L	0.958	<0.010	1.00	95.8	70 - 130	W333430	26-Aug-13	
EPA 200.7	Iron	mg/L	9.57	<0.060	10.0	95.7	70 - 130	W333430	26-Aug-13	
EPA 200.7	Iron	mg/L	9.14	<0.060	10.0	91.4	70 - 130	W333430	26-Aug-13	
EPA 200.7	Magnesium	mg/L	20.8	1.04	20.0	98.7	70 - 130	W333430	26-Aug-13	
EPA 200.7	Magnesium	mg/L	21.4	2.75	20.0	93.4	70 - 130	W333430	26-Aug-13	
EPA 200.7	Manganese	mg/L	0.953	<0.0040	1.00	95.2	70 - 130	W333430	26-Aug-13	
EPA 200.7	Manganese	mg/L	0.917	<0.0040	1.00	91.7	70 - 130	W333430	26-Aug-13	
EPA 200.7	Nickel	mg/L	0.940	<0.010	1.00	94.0	70 - 130	W333430	26-Aug-13	
EPA 200.7	Nickel	mg/L	0.901	<0.010	1.00	90.1	70 - 130	W333430	26-Aug-13	

SVL holds the following certifications:

AZ:0538, CA:2080, FL(NELAC):E87993, ID:ID00019 &amp; ID00965 (Microbiology), NV:ID000192007A, WA:C573

Work order Report Page 23 of 25



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

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

Project Name: Livingston Mine 2013

Work Order: W3H0323

Reported: 27-Aug-13 16:30

**Quality Control - MATRIX SPIKE Data (Continued)**

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
<b>Metals (Dissolved) (Continued)</b>										
EPA 200.7	Zinc	mg/L	0.977	<0.0100	1.00	97.7	70 - 130	W333430	26-Aug-13	
EPA 200.7	Zinc	mg/L	1.08	0.160	1.00	91.5	70 - 130	W333430	26-Aug-13	
EPA 200.8	Antimony	mg/L	0.0248	<0.00300	0.0250	97.6	70 - 130	W333359	27-Aug-13	
EPA 200.8	Antimony	mg/L	0.0255	<0.00300	0.0250	95.9	70 - 130	W333359	27-Aug-13	
EPA 200.8	Arsenic	mg/L	0.0294	0.0060	0.0250	93.7	70 - 130	W333359	27-Aug-13	
EPA 200.8	Arsenic	mg/L	0.0251	<0.0030	0.0250	94.9	70 - 130	W333359	27-Aug-13	
EPA 200.8	Cadmium	mg/L	0.0246	<0.00020	0.0250	98.3	70 - 130	W333359	27-Aug-13	
EPA 200.8	Cadmium	mg/L	0.0265	0.00253	0.0250	95.9	70 - 130	W333359	27-Aug-13	
EPA 200.8	Lead	mg/L	0.0241	<0.00300	0.0250	96.3	70 - 130	W333359	27-Aug-13	
EPA 200.8	Lead	mg/L	0.0245	<0.00300	0.0250	97.4	70 - 130	W333359	27-Aug-13	
EPA 200.8	Selenium	mg/L	0.0270	<0.00300	0.0250	99.4	70 - 130	W333359	27-Aug-13	
EPA 200.8	Selenium	mg/L	0.0268	<0.00300	0.0250	98.5	70 - 130	W333359	27-Aug-13	
EPA 200.8	Silver	mg/L	0.0248	<0.000100	0.0250	99.1	70 - 130	W333359	27-Aug-13	
EPA 200.8	Silver	mg/L	0.0240	<0.000100	0.0250	96.1	70 - 130	W333359	27-Aug-13	
EPA 245.1	Mercury	mg/L	0.00104	<0.00020	0.00100	104	70 - 130	W334089	22-Aug-13	
EPA 245.1	Mercury	mg/L	0.00094	<0.00020	0.00100	93.9	70 - 130	W334089	22-Aug-13	

**Quality Control - MATRIX SPIKE DUPLICATE Data**

Method	Analyte	Units	MSD Result	Spike Result	Spike Level	RPD	RPD Limit	Batch ID	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	mg/kg	87.4	84.7	100	3.1	20	W333407	27-Aug-13	
EPA 6010B	Arsenic	mg/kg	139	124	100	11.4	20	W333407	27-Aug-13	M1
EPA 6010B	Barium	mg/kg	174	154	100	11.9	20	W333407	27-Aug-13	M1
EPA 6010B	Cadmium	mg/kg	123	110	100	10.5	20	W333407	27-Aug-13	
EPA 6010B	Chromium	mg/kg	135	122	100	10.4	20	W333407	27-Aug-13	M1
EPA 6010B	Copper	mg/kg	134	120	100	11.0	20	W333407	27-Aug-13	M1
EPA 6010B	Iron	mg/kg	12000	9930	1000	18.4	20	W333407	27-Aug-13	M3
EPA 6010B	Lead	mg/kg	126	114	100	9.4	20	W333407	27-Aug-13	
EPA 6010B	Manganese	mg/kg	232	201	100	14.2	20	W333407	27-Aug-13	M1
EPA 6010B	Nickel	mg/kg	124	112	100	10.3	20	W333407	27-Aug-13	
EPA 6010B	Selenium	mg/kg	124	111	100	10.3	20	W333407	27-Aug-13	
EPA 6010B	Silver	mg/kg	6.37	5.87	5.00	8.3	20	W333407	27-Aug-13	M1
EPA 6010B	Zinc	mg/kg	197	171	100	14.4	20	W333407	27-Aug-13	M1
EPA 7471A	Mercury	mg/kg	0.160	0.160	0.167	0.0	20	W334244	27-Aug-13	

**Metals (Dissolved)**

EPA 200.7	Barium	mg/L	0.931	0.991	1.00	6.3	20	W333430	26-Aug-13	
EPA 200.7	Calcium	mg/L	31.9	33.1	20.0	3.7	20	W333430	26-Aug-13	
EPA 200.7	Chromium	mg/L	0.917	0.972	1.00	5.9	20	W333430	26-Aug-13	
EPA 200.7	Copper	mg/L	0.941	0.996	1.00	5.7	20	W333430	26-Aug-13	
EPA 200.7	Iron	mg/L	9.06	9.57	10.0	5.5	20	W333430	26-Aug-13	
EPA 200.7	Magnesium	mg/L	19.7	20.8	20.0	5.4	20	W333430	26-Aug-13	
EPA 200.7	Manganese	mg/L	0.909	0.953	1.00	4.8	20	W333430	26-Aug-13	
EPA 200.7	Nickel	mg/L	0.884	0.940	1.00	6.1	20	W333430	26-Aug-13	
EPA 200.7	Zinc	mg/L	0.920	0.977	1.00	6.1	20	W333430	26-Aug-13	
EPA 200.8	Antimony	mg/L	0.0253	0.0248	0.0250	2.1	20	W333359	27-Aug-13	
EPA 200.8	Arsenic	mg/L	0.0309	0.0294	0.0250	5.0	20	W333359	27-Aug-13	
EPA 200.8	Cadmium	mg/L	0.0249	0.0246	0.0250	1.2	20	W333359	27-Aug-13	
EPA 200.8	Lead	mg/L	0.0247	0.0241	0.0250	2.4	20	W333359	27-Aug-13	
EPA 200.8	Selenium	mg/L	0.0288	0.0270	0.0250	6.3	20	W333359	27-Aug-13	
EPA 200.8	Silver	mg/L	0.0249	0.0248	0.0250	0.5	20	W333359	27-Aug-13	
EPA 245.1	Mercury	mg/L	0.00103	0.00104	0.00100	1.0	20	W334089	22-Aug-13	

SVL holds the following certifications:

AZ:0538, CA:2080, FL(NELAC):E87993, ID:ID00019 &amp; ID00965 (Microbiology), NV:ID000192007A, WA:C573

Work order Report Page 24 of 25



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

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

**Project Name: Livingston Mine 2013**  
Work Order: **W3H0323**  
Reported: 27-Aug-13 16:30

### Notes and Definitions

D2	Sample required dilution due to high concentration of target analyte.
M1	Matrix spike recovery was high, but the LCS recovery was acceptable.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to spike level. The LCS was acceptable.
LCS	Laboratory Control Sample (Blank Spike)
RPD	Relative Percent Difference
UDL	A result is less than the detection limit
R > 4S	% recovery not applicable, sample concentration more than four times greater than spike level
<RL	A result is less than the reporting limit
MRL	Method Reporting Limit
MDL	Method Detection Limit
N/A	Not Applicable



**FOR SVL USE ONLY**  
**SVL JOB #**

TEMP on Receipt: \_\_\_\_\_

Table 1. — Matrix Type

**1 = Surface Water, 2 = Ground Water**

3 = Soil/Sediment, 4 = Rinsate, 5 = Oil

6 = Waste. 7 = Other

---

Project Name: Livingston Mine

**Sampler's Signature:** 

Indicate State of sample origination:

## Analyses Required

---

### Comments

Sediment Metals include  
14: As, Ba, Cd, Cr, Pb, Hg,  
Se, Ag, Cu, Fe, Mn, Zn, Sb,  
Ni

Air dry sediment before analysis.

Sample ID
Please take care to distinguish between:

## Thanks!

LV-JC3-SW11
LV-FB-SW12
LV-BCB-SW13
LV-BCB-SD11
LV-BCA-SD12
LV-BCA-SW14

Don't  
8/2/18

Disbursed by: Sam Liff

Quished by: <u>Sam [Signature]</u>	Date: <u>11-1-93</u>	Time: <u>11:10</u>	Received by:
------------------------------------	----------------------	--------------------	--------------

Date: \_\_\_\_\_ Time: \_\_\_\_\_  
 Received by: \_\_\_\_\_

Date: 8/13/20

Date: \_\_\_\_\_

154115-

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

Dispose

Return

2

## Sample

White: LAB COPY      Yellow: CUSTOMER COPY

SVL-COC 9/05



# SAMPLE RECEIPT/CHAIN-OF-CUSTODY CHECKLIST

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

Date of acceptance: 8/13/13

By: CR Seely

SVL Work No: W3 H0324

Item	Description	V	VC	NV	NA	Comments
1	Client or project name	✓				IDEQ
2	Date and time of receipt at lab	✓				8/13/13 15:45
3	Received by	✓				Mark Duce
4	Temperature blank or cooler temperature				✓	Temp. - °C.
5	Were the sample(s) received on ice				✓	NO
6	Custody tape/bottle seals				✓	NO
7	Condition of samples upon receipt (leaking; bubbles in VOA vials)	✓				Good
8	Sample numbers/IDs agree with COC	✓				
9	Sample date & time agree with COC	✓				
10	Number of containers for each sample	✓				
11	The correct preservative for the analysis requested	✓				
12	Did an SVL employee preserve sample(s) upon receipt				✓	
13	Type of container for each sample / volume received	✓				
14	Analysis requested for each sample	✓				
15	Sample matrix description	✓				
16	COC properly completed & legible	✓				
17	Corrections properly made (initials & date)				✓	
18	Additional comments or records of sample condition or treatment (unlisted or missing samples at laboratory, aliquot taken, sample hold, samples subcontracted, communications between client and laboratory)				✓	
19	Shipper's air bill	✓				

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

Additional Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



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

**Project Name: Livingston Mine 2013**

**Work Order: W3H0324**

**Reported: 27-Aug-13 16:31**

#### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Sampled By	Date Received
LV-JC3-SW11	W3H0324-01	Surface Water	08-Aug-13 09:05	DS	13-Aug-2013
LV-FB--SW12	W3H0324-02	Field blank	08-Aug-13 09:05	DS	13-Aug-2013
LV-BCB-SW13	W3H0324-03	Surface Water	08-Aug-13 09:40	DS	13-Aug-2013
LV-BCB-SD11	W3H0324-04	Sediment	08-Aug-13 09:40	DS	13-Aug-2013
LV-BCA-SD12	W3H0324-05	Sediment	08-Aug-13 10:05	DS	13-Aug-2013
LV-BCA-SW14	W3H0324-06	Surface Water	08-Aug-13 10:05	DS	13-Aug-2013

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.

#### Case Narrative

08/27/13mab: Sediment samples were air dried and not sieved.



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

Project Name: Livingston Mine 2013

Work Order: W3H0324

Reported: 27-Aug-13 16:31

Client Sample ID: LV-JC3-SW11

SVL Sample ID: W3H0324-01 (Surface Water)

Sample Report Page 1 of 1

Sampled: 08-Aug-13 09:05

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
--------	---------	--------	-------	----	-----	----------	-------	---------	----------	-------

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

SM 2340B	Hardness (as CaCO <sub>3</sub> )	76.9	mg/L	0.347	0.198		N/A		08/26/13 17:50	
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**Metals (Dissolved)**

EPA 200.7	Barium	0.0043	mg/L	0.0020	0.0006		W333430	AS	08/26/13 17:50	
EPA 200.7	Calcium	26.3	mg/L	0.040	0.015		W333430	AS	08/26/13 17:50	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0008		W333430	AS	08/26/13 17:50	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W333430	AS	08/26/13 17:50	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.019		W333430	AS	08/26/13 17:50	
EPA 200.7	Magnesium	2.75	mg/L	0.060	0.039		W333430	AS	08/26/13 17:50	
EPA 200.7	Manganese	< 0.0040	mg/L	0.0040	0.0012		W333430	AS	08/26/13 17:50	
EPA 200.7	Nickel	< 0.010	mg/L	0.010	0.003		W333430	AS	08/26/13 17:50	
EPA 200.7	Zinc	0.160	mg/L	0.0100	0.0025		W333430	AS	08/26/13 17:50	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00010		W333359	KWH	08/27/13 11:17	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W333359	KWH	08/27/13 11:17	
EPA 200.8	Cadmium	0.00253	mg/L	0.00020	0.00003		W333359	KWH	08/27/13 11:17	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W333359	KWH	08/27/13 11:17	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00026		W333359	KWH	08/27/13 11:17	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W333359	KWH	08/27/13 11:17	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W334089	STA	08/22/13 13:28	

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

John Kern  
Laboratory Director



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

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

Project Name: Livingston Mine 2013

Work Order: W3H0324

Reported: 27-Aug-13 16:31

Client Sample ID: LV-FB--SW12

SVL Sample ID: W3H0324-02 (Field blank)

Sample Report Page 1 of 1

Sampled: 08-Aug-13 09:05

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
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**Metals (Total Recoverable--reportable as Total per 40 CFR 136)**

SM 2340B	Hardness (as CaCO <sub>3</sub> )	< 0.347	mg/L	0.347	0.198		N/A		08/26/13 18:00	
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**Metals (Dissolved)**

EPA 200.7	Barium	< 0.0020	mg/L	0.0020	0.0006		W333430	AS	08/26/13 18:00	
EPA 200.7	Calcium	0.046	mg/L	0.040	0.015		W333430	AS	08/26/13 18:00	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0008		W333430	AS	08/26/13 18:00	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W333430	AS	08/26/13 18:00	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.019		W333430	AS	08/26/13 18:00	
EPA 200.7	Magnesium	< 0.060	mg/L	0.060	0.039		W333430	AS	08/26/13 18:00	
EPA 200.7	Manganese	< 0.0040	mg/L	0.0040	0.0012		W333430	AS	08/26/13 18:00	
EPA 200.7	Nickel	< 0.010	mg/L	0.010	0.003		W333430	AS	08/26/13 18:00	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0025		W333430	AS	08/26/13 18:00	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00010		W333359	KWH	08/27/13 11:26	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W333359	KWH	08/27/13 11:26	
EPA 200.8	Cadmium	< 0.00020	mg/L	0.00020	0.00003		W333359	KWH	08/27/13 11:26	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W333359	KWH	08/27/13 11:26	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00026		W333359	KWH	08/27/13 11:26	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W333359	KWH	08/27/13 11:26	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W334089	STA	08/22/13 13:30	

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

John Kern  
Laboratory Director



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

IDEQ (Boise)  
1410 N. Hilton  
Boise, ID 83706Project Name: Livingston Mine 2013  
Work Order: W3H0324  
Reported: 27-Aug-13 16:31

Client Sample ID: LV-BCB-SW13

SVL Sample ID: W3H0324-03 (Surface Water)

Sample Report Page 1 of 1

Sampled: 08-Aug-13 09:40  
Received: 13-Aug-13  
Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total Recoverable--reportable as Total per 40 CFR 136)</b>										
SM 2340B	Hardness (as CaCO3)	45.4	mg/L	0.347	0.198		N/A		08/26/13 18:06	
<b>Metals (Dissolved)</b>										
EPA 200.7	Barium	0.0022	mg/L	0.0020	0.0006		W333430	AS	08/26/13 18:06	
EPA 200.7	Calcium	16.1	mg/L	0.040	0.015		W333430	AS	08/26/13 18:06	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0008		W333430	AS	08/26/13 18:06	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W333430	AS	08/26/13 18:06	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.019		W333430	AS	08/26/13 18:06	
EPA 200.7	Magnesium	1.27	mg/L	0.060	0.039		W333430	AS	08/26/13 18:06	
EPA 200.7	Manganese	< 0.0040	mg/L	0.0040	0.0012		W333430	AS	08/26/13 18:06	
EPA 200.7	Nickel	< 0.010	mg/L	0.010	0.003		W333430	AS	08/26/13 18:06	
EPA 200.7	Zinc	0.0407	mg/L	0.0100	0.0025		W333430	AS	08/26/13 18:06	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00010		W333359	KWH	08/27/13 11:31	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W333359	KWH	08/27/13 11:31	
EPA 200.8	Cadmium	0.00067	mg/L	0.00020	0.00003		W333359	KWH	08/27/13 11:31	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W333359	KWH	08/27/13 11:31	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00026		W333359	KWH	08/27/13 11:31	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W333359	KWH	08/27/13 11:31	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W334091	STA	08/22/13 13:35	

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

John Kern  
Laboratory Director





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Kellogg ID 83837-0929

(208) 784-1258

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

Project Name: **Livingston Mine 2013**Work Order: **W3H0324**

Reported: 27-Aug-13 16:31

Client Sample ID: **LV-BCB-SD11**SVL Sample ID: **W3H0324-04 (Sediment)**

Sample Report Page 1 of 1

Sampled: 08-Aug-13 09:40

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	2.9	mg/kg	2.0	0.6		W333407	AS	08/27/13 13:52	
EPA 6010B	Arsenic	21.5	mg/kg	2.5	0.6		W333407	AS	08/27/13 13:52	
EPA 6010B	Barium	329	mg/kg	0.200	0.032		W333407	AS	08/27/13 13:52	
EPA 6010B	Cadmium	8.42	mg/kg	0.20	0.03		W333407	AS	08/27/13 13:52	
EPA 6010B	Chromium	33.6	mg/kg	0.60	0.06		W333407	AS	08/27/13 13:52	
EPA 6010B	Copper	30.5	mg/kg	1.00	0.35		W333407	AS	08/27/13 13:52	
EPA 6010B	Iron	22700	mg/kg	6.0	1.2		W333407	AS	08/27/13 13:52	
EPA 6010B	Lead	173	mg/kg	0.75	0.25		W333407	AS	08/27/13 13:52	
EPA 6010B	Manganese	624	mg/kg	0.40	0.16		W333407	AS	08/27/13 13:52	
EPA 6010B	Nickel	49.0	mg/kg	1.00	0.31		W333407	AS	08/27/13 13:52	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	0.9		W333407	AS	08/27/13 13:52	
EPA 6010B	Silver	1.06	mg/kg	0.50	0.08		W333407	AS	08/27/13 13:52	
EPA 6010B	Zinc	827	mg/kg	1.00	0.16		W333407	AS	08/27/13 13:52	
EPA 7471A	Mercury	0.033	mg/kg	0.033	0.004		W334244	STA	08/27/13 14:21	

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

**John Kern**  
Laboratory Director



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

Project Name: Livingston Mine 2013

Work Order: W3H0324

Reported: 27-Aug-13 16:31

Client Sample ID: LV-BCA-SD12

SVL Sample ID: W3H0324-05 (Sediment)

Sample Report Page 1 of 1

Sampled: 08-Aug-13 10:05

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	< 2.0	mg/kg	2.0	0.6		W333407	AS	08/27/13 13:58	
EPA 6010B	Arsenic	9.0	mg/kg	2.5	0.6		W333407	AS	08/27/13 13:58	
EPA 6010B	Barium	216	mg/kg	0.200	0.032		W333407	AS	08/27/13 13:58	
EPA 6010B	Cadmium	< 0.20	mg/kg	0.20	0.03		W333407	AS	08/27/13 13:58	
EPA 6010B	Chromium	29.0	mg/kg	0.60	0.06		W333407	AS	08/27/13 13:58	
EPA 6010B	Copper	21.4	mg/kg	1.00	0.35		W333407	AS	08/27/13 13:58	
EPA 6010B	Iron	20100	mg/kg	6.0	1.2		W333407	AS	08/27/13 13:58	
EPA 6010B	Lead	11.0	mg/kg	0.75	0.25		W333407	AS	08/27/13 13:58	
EPA 6010B	Manganese	356	mg/kg	0.40	0.16		W333407	AS	08/27/13 13:58	
EPA 6010B	Nickel	37.4	mg/kg	1.00	0.31		W333407	AS	08/27/13 13:58	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	0.9		W333407	AS	08/27/13 13:58	
EPA 6010B	Silver	< 0.50	mg/kg	0.50	0.08		W333407	AS	08/27/13 13:58	
EPA 6010B	Zinc	92.6	mg/kg	1.00	0.16		W333407	AS	08/27/13 13:58	
EPA 7471A	Mercury	0.043	mg/kg	0.033	0.004		W334244	STA	08/27/13 14:23	

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

John Kern  
Laboratory Director



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

Project Name: Livingston Mine 2013

Work Order: W3H0324

Reported: 27-Aug-13 16:31

Client Sample ID: LV-BCA-SW14

SVL Sample ID: W3H0324-06 (Surface Water)

Sample Report Page 1 of 1

Sampled: 08-Aug-13 10:05

Received: 13-Aug-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
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**Metals (Total Recoverable--reportable as Total per 40 CFR 136)**

SM 2340B	Hardness (as CaCO3)	35.4	mg/L	0.347	0.198		N/A		08/26/13 18:11	
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**Metals (Dissolved)**

EPA 200.7	Barium	< 0.0020	mg/L	0.0020	0.0006		W333430	AS	08/26/13 18:11	
EPA 200.7	Calcium	12.9	mg/L	0.040	0.015		W333430	AS	08/26/13 18:11	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0008		W333430	AS	08/26/13 18:11	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W333430	AS	08/26/13 18:11	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.019		W333430	AS	08/26/13 18:11	
EPA 200.7	Magnesium	0.781	mg/L	0.060	0.039		W333430	AS	08/26/13 18:11	
EPA 200.7	Manganese	< 0.0040	mg/L	0.0040	0.0012		W333430	AS	08/26/13 18:11	
EPA 200.7	Nickel	< 0.010	mg/L	0.010	0.003		W333430	AS	08/26/13 18:11	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0025		W333430	AS	08/26/13 18:11	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00010		W333359	KWH	08/27/13 11:35	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W333359	KWH	08/27/13 11:35	
EPA 200.8	Cadmium	< 0.00020	mg/L	0.00020	0.00003		W333359	KWH	08/27/13 11:35	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W333359	KWH	08/27/13 11:35	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00026		W333359	KWH	08/27/13 11:35	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W333359	KWH	08/27/13 11:35	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W334091	STA	08/22/13 13:41	

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

John Kern  
Laboratory Director



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

Project Name: Livingston Mine 2013

Work Order: W3H0324

Reported: 27-Aug-13 16:31

## Quality Control - BLANK Data

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>								
EPA 6010B	Antimony	mg/kg	<2.0	0.6	2.0	W333407	27-Aug-13	
EPA 6010B	Arsenic	mg/kg	<2.5	0.6	2.5	W333407	27-Aug-13	
EPA 6010B	Barium	mg/kg	<0.200	0.032	0.200	W333407	27-Aug-13	
EPA 6010B	Cadmium	mg/kg	<0.20	0.03	0.20	W333407	27-Aug-13	
EPA 6010B	Chromium	mg/kg	<0.60	0.06	0.60	W333407	27-Aug-13	
EPA 6010B	Copper	mg/kg	<1.00	0.35	1.00	W333407	27-Aug-13	
EPA 6010B	Iron	mg/kg	<6.0	1.2	6.0	W333407	27-Aug-13	
EPA 6010B	Lead	mg/kg	<0.75	0.25	0.75	W333407	27-Aug-13	
EPA 6010B	Manganese	mg/kg	<0.40	0.16	0.40	W333407	27-Aug-13	
EPA 6010B	Nickel	mg/kg	<1.00	0.31	1.00	W333407	27-Aug-13	
EPA 6010B	Selenium	mg/kg	<4.0	0.9	4.0	W333407	27-Aug-13	
EPA 6010B	Silver	mg/kg	<0.50	0.08	0.50	W333407	27-Aug-13	
EPA 6010B	Zinc	mg/kg	<1.00	0.16	1.00	W333407	27-Aug-13	
EPA 7471A	Mercury	mg/kg	<0.033	0.004	0.033	W334244	27-Aug-13	

## Metals (Dissolved)

EPA 200.7	Barium	mg/L	<0.0020	0.0006	0.0020	W333430	26-Aug-13	
EPA 200.7	Calcium	mg/L	<0.040	0.015	0.040	W333430	26-Aug-13	
EPA 200.7	Chromium	mg/L	<0.0060	0.0008	0.0060	W333430	26-Aug-13	
EPA 200.7	Copper	mg/L	<0.010	0.006	0.010	W333430	26-Aug-13	
EPA 200.7	Iron	mg/L	<0.060	0.019	0.060	W333430	26-Aug-13	
EPA 200.7	Magnesium	mg/L	<0.060	0.039	0.060	W333430	26-Aug-13	
EPA 200.7	Manganese	mg/L	<0.0040	0.0012	0.0040	W333430	26-Aug-13	
EPA 200.7	Nickel	mg/L	<0.010	0.003	0.010	W333430	26-Aug-13	
EPA 200.7	Zinc	mg/L	<0.0100	0.0025	0.0100	W333430	26-Aug-13	
EPA 200.8	Antimony	mg/L	<0.00300	0.00010	0.00300	W333359	27-Aug-13	
EPA 200.8	Arsenic	mg/L	<0.0030	0.0003	0.0030	W333359	27-Aug-13	
EPA 200.8	Cadmium	mg/L	<0.00020	0.00003	0.00020	W333359	27-Aug-13	
EPA 200.8	Lead	mg/L	<0.00300	0.000048	0.00300	W333359	27-Aug-13	
EPA 200.8	Selenium	mg/L	<0.00300	0.00026	0.00300	W333359	27-Aug-13	
EPA 200.8	Silver	mg/L	<0.000100	0.000012	0.000100	W333359	27-Aug-13	
EPA 245.1	Mercury	mg/L	<0.00020	0.000045	0.00020	W334089	22-Aug-13	
EPA 245.1	Mercury	mg/L	<0.00020	0.000045	0.00020	W334091	22-Aug-13	

## Quality Control - LABORATORY CONTROL SAMPLE Data

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>									
EPA 6010B	Antimony	mg/kg	113	100	113	80 - 120	W333407	27-Aug-13	
EPA 6010B	Arsenic	mg/kg	112	100	112	80 - 120	W333407	27-Aug-13	
EPA 6010B	Barium	mg/kg	117	100	117	80 - 120	W333407	27-Aug-13	
EPA 6010B	Cadmium	mg/kg	113	100	113	80 - 120	W333407	27-Aug-13	
EPA 6010B	Chromium	mg/kg	115	100	115	80 - 120	W333407	27-Aug-13	
EPA 6010B	Copper	mg/kg	115	100	115	80 - 120	W333407	27-Aug-13	
EPA 6010B	Iron	mg/kg	1090	1000	109	80 - 120	W333407	27-Aug-13	
EPA 6010B	Lead	mg/kg	111	100	111	80 - 120	W333407	27-Aug-13	
EPA 6010B	Manganese	mg/kg	112	100	112	80 - 120	W333407	27-Aug-13	
EPA 6010B	Nickel	mg/kg	105	100	105	80 - 120	W333407	27-Aug-13	
EPA 6010B	Selenium	mg/kg	109	100	109	80 - 120	W333407	27-Aug-13	
EPA 6010B	Silver	mg/kg	5.77	5.00	115	80 - 120	W333407	27-Aug-13	
EPA 6010B	Zinc	mg/kg	113	100	113	80 - 120	W333407	27-Aug-13	
EPA 7471A	Mercury	mg/kg	0.808	0.833	97.0	80 - 120	W334244	27-Aug-13	

SVL holds the following certifications:

AZ:0538, CA:2080, FL(NELAC):E87993, ID:ID00019 &amp; ID00965 (Microbiology), NV:ID000192007A, WA:C573

Work order Report Page 8 of 11



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

Project Name: Livingston Mine 2013

Work Order: W3H0324

Reported: 27-Aug-13 16:31

## Quality Control - LABORATORY CONTROL SAMPLE Data (Continued)

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
<b>Metals (Dissolved)</b>									
EPA 200.7	Barium	mg/L	0.997	1.00	99.7	85 - 115	W333430	26-Aug-13	
EPA 200.7	Calcium	mg/L	19.3	20.0	96.4	85 - 115	W333430	26-Aug-13	
EPA 200.7	Chromium	mg/L	0.992	1.00	99.2	85 - 115	W333430	26-Aug-13	
EPA 200.7	Copper	mg/L	1.03	1.00	103	85 - 115	W333430	26-Aug-13	
EPA 200.7	Iron	mg/L	9.52	10.0	95.2	85 - 115	W333430	26-Aug-13	
EPA 200.7	Magnesium	mg/L	19.9	20.0	99.5	85 - 115	W333430	26-Aug-13	
EPA 200.7	Manganese	mg/L	0.971	1.00	97.1	85 - 115	W333430	26-Aug-13	
EPA 200.7	Nickel	mg/L	0.944	1.00	94.4	85 - 115	W333430	26-Aug-13	
EPA 200.7	Zinc	mg/L	0.975	1.00	97.5	85 - 115	W333430	26-Aug-13	
EPA 200.8	Antimony	mg/L	0.0254	0.0250	102	85 - 115	W333359	27-Aug-13	
EPA 200.8	Arsenic	mg/L	0.0248	0.0250	99.2	85 - 115	W333359	27-Aug-13	
EPA 200.8	Cadmium	mg/L	0.0248	0.0250	99.0	85 - 115	W333359	27-Aug-13	
EPA 200.8	Lead	mg/L	0.0245	0.0250	98.0	85 - 115	W333359	27-Aug-13	
EPA 200.8	Selenium	mg/L	0.0251	0.0250	100	85 - 115	W333359	27-Aug-13	
EPA 200.8	Silver	mg/L	0.0254	0.0250	101	85 - 115	W333359	27-Aug-13	
EPA 245.1	Mercury	mg/L	0.00487	0.00500	97.4	85 - 115	W334089	22-Aug-13	
EPA 245.1	Mercury	mg/L	0.00442	0.00500	88.4	85 - 115	W334091	22-Aug-13	

## Quality Control - MATRIX SPIKE Data

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	mg/kg	84.7	<2.0	100	84.7	75 - 125	W333407	27-Aug-13	
EPA 6010B	Arsenic	mg/kg	124	11.4	100	112	75 - 125	W333407	27-Aug-13	
EPA 6010B	Barium	mg/kg	154	36.4	100	118	75 - 125	W333407	27-Aug-13	
EPA 6010B	Cadmium	mg/kg	110	0.44	100	110	75 - 125	W333407	27-Aug-13	
EPA 6010B	Chromium	mg/kg	122	9.31	100	112	75 - 125	W333407	27-Aug-13	
EPA 6010B	Copper	mg/kg	120	6.41	100	113	75 - 125	W333407	27-Aug-13	
EPA 6010B	Iron	mg/kg	9930	9040	1000	89.6	75 - 125	W333407	27-Aug-13	
EPA 6010B	Lead	mg/kg	114	5.74	100	109	75 - 125	W333407	27-Aug-13	M3
EPA 6010B	Manganese	mg/kg	201	92.4	100	109	75 - 125	W333407	27-Aug-13	
EPA 6010B	Nickel	mg/kg	112	9.85	100	102	75 - 125	W333407	27-Aug-13	
EPA 6010B	Selenium	mg/kg	111	<4.0	100	109	75 - 125	W333407	27-Aug-13	
EPA 6010B	Silver	mg/kg	5.87	<0.50	5.00	117	75 - 125	W333407	27-Aug-13	
EPA 6010B	Zinc	mg/kg	171	61.4	100	109	75 - 125	W333407	27-Aug-13	
EPA 7471A	Mercury	mg/kg	0.160	<0.033	0.167	91.0	75 - 125	W334244	27-Aug-13	

## Metals (Dissolved)

EPA 200.7	Barium	mg/L	0.991	<0.0020	1.00	99.1	70 - 130	W333430	26-Aug-13	
EPA 200.7	Barium	mg/L	0.937	0.0043	1.00	93.3	70 - 130	W333430	26-Aug-13	
EPA 200.7	Calcium	mg/L	33.1	14.2	20.0	94.4	70 - 130	W333430	26-Aug-13	
EPA 200.7	Calcium	mg/L	44.2	26.3	20.0	89.8	70 - 130	W333430	26-Aug-13	
EPA 200.7	Chromium	mg/L	0.972	<0.0060	1.00	97.2	70 - 130	W333430	26-Aug-13	
EPA 200.7	Chromium	mg/L	0.926	<0.0060	1.00	92.6	70 - 130	W333430	26-Aug-13	
EPA 200.7	Copper	mg/L	0.996	<0.010	1.00	99.6	70 - 130	W333430	26-Aug-13	
EPA 200.7	Copper	mg/L	0.958	<0.010	1.00	95.8	70 - 130	W333430	26-Aug-13	
EPA 200.7	Iron	mg/L	9.57	<0.060	10.0	95.7	70 - 130	W333430	26-Aug-13	
EPA 200.7	Iron	mg/L	9.14	<0.060	10.0	91.4	70 - 130	W333430	26-Aug-13	
EPA 200.7	Magnesium	mg/L	20.8	1.04	20.0	98.7	70 - 130	W333430	26-Aug-13	
EPA 200.7	Magnesium	mg/L	21.4	2.75	20.0	93.4	70 - 130	W333430	26-Aug-13	
EPA 200.7	Manganese	mg/L	0.953	<0.0040	1.00	95.2	70 - 130	W333430	26-Aug-13	
EPA 200.7	Manganese	mg/L	0.917	<0.0040	1.00	91.7	70 - 130	W333430	26-Aug-13	
EPA 200.7	Nickel	mg/L	0.940	<0.010	1.00	94.0	70 - 130	W333430	26-Aug-13	

SVL holds the following certifications:

AZ:0538, CA:2080, FL(NELAC):E87993, ID:ID00019 &amp; ID00965 (Microbiology), NV:ID000192007A, WA:C573

Work order Report Page 9 of 11





One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

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

Project Name: Livingston Mine 2013  
Work Order: W3H0324  
Reported: 27-Aug-13 16:31

**Quality Control - MATRIX SPIKE Data (Continued)**

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
<b>Metals (Dissolved) (Continued)</b>										
EPA 200.7	Nickel	mg/L	0.901	<0.010	1.00	90.1	70 - 130	W333430	26-Aug-13	
EPA 200.7	Zinc	mg/L	0.977	<0.0100	1.00	97.7	70 - 130	W333430	26-Aug-13	
EPA 200.7	Zinc	mg/L	1.08	0.160	1.00	91.5	70 - 130	W333430	26-Aug-13	
EPA 200.8	Antimony	mg/L	0.0248	<0.00300	0.0250	97.6	70 - 130	W333359	27-Aug-13	
EPA 200.8	Antimony	mg/L	0.0255	<0.00300	0.0250	95.9	70 - 130	W333359	27-Aug-13	
EPA 200.8	Arsenic	mg/L	0.0294	0.0060	0.0250	93.7	70 - 130	W333359	27-Aug-13	
EPA 200.8	Arsenic	mg/L	0.0251	<0.0030	0.0250	94.9	70 - 130	W333359	27-Aug-13	
EPA 200.8	Cadmium	mg/L	0.0246	<0.00020	0.0250	98.3	70 - 130	W333359	27-Aug-13	
EPA 200.8	Cadmium	mg/L	0.0265	0.00253	0.0250	95.9	70 - 130	W333359	27-Aug-13	
EPA 200.8	Lead	mg/L	0.0241	<0.00300	0.0250	96.3	70 - 130	W333359	27-Aug-13	
EPA 200.8	Lead	mg/L	0.0245	<0.00300	0.0250	97.4	70 - 130	W333359	27-Aug-13	
EPA 200.8	Selenium	mg/L	0.0270	<0.00300	0.0250	99.4	70 - 130	W333359	27-Aug-13	
EPA 200.8	Selenium	mg/L	0.0268	<0.00300	0.0250	98.5	70 - 130	W333359	27-Aug-13	
EPA 200.8	Silver	mg/L	0.0248	<0.000100	0.0250	99.1	70 - 130	W333359	27-Aug-13	
EPA 200.8	Silver	mg/L	0.0240	<0.000100	0.0250	96.1	70 - 130	W333359	27-Aug-13	
EPA 245.1	Mercury	mg/L	0.00104	<0.00020	0.00100	104	70 - 130	W334089	22-Aug-13	
EPA 245.1	Mercury	mg/L	0.00094	<0.00020	0.00100	93.9	70 - 130	W334089	22-Aug-13	
EPA 245.1	Mercury	mg/L	0.00093	<0.00020	0.00100	92.9	70 - 130	W334091	22-Aug-13	
EPA 245.1	Mercury	mg/L	0.00093	<0.00020	0.00100	92.9	70 - 130	W334091	22-Aug-13	

**Quality Control - MATRIX SPIKE DUPLICATE Data**

Method	Analyte	Units	MSD Result	Spike Result	Spike Level	RPD	RPD Limit	Batch ID	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	mg/kg	87.4	84.7	100	3.1	20	W333407	27-Aug-13	
EPA 6010B	Arsenic	mg/kg	139	124	100	11.4	20	W333407	27-Aug-13	M1
EPA 6010B	Barium	mg/kg	174	154	100	11.9	20	W333407	27-Aug-13	M1
EPA 6010B	Cadmium	mg/kg	123	110	100	10.5	20	W333407	27-Aug-13	
EPA 6010B	Chromium	mg/kg	135	122	100	10.4	20	W333407	27-Aug-13	M1
EPA 6010B	Copper	mg/kg	134	120	100	11.0	20	W333407	27-Aug-13	M1
EPA 6010B	Iron	mg/kg	12000	9930	1000	18.4	20	W333407	27-Aug-13	M3
EPA 6010B	Lead	mg/kg	126	114	100	9.4	20	W333407	27-Aug-13	
EPA 6010B	Manganese	mg/kg	232	201	100	14.2	20	W333407	27-Aug-13	M1
EPA 6010B	Nickel	mg/kg	124	112	100	10.3	20	W333407	27-Aug-13	
EPA 6010B	Selenium	mg/kg	124	111	100	10.3	20	W333407	27-Aug-13	
EPA 6010B	Silver	mg/kg	6.37	5.87	5.00	8.3	20	W333407	27-Aug-13	M1
EPA 6010B	Zinc	mg/kg	197	171	100	14.4	20	W333407	27-Aug-13	M1
EPA 7471A	Mercury	mg/kg	0.160	0.160	0.167	0.0	20	W334244	27-Aug-13	

**Metals (Dissolved)**

EPA 200.7	Barium	mg/L	0.931	0.991	1.00	6.3	20	W333430	26-Aug-13	
EPA 200.7	Calcium	mg/L	31.9	33.1	20.0	3.7	20	W333430	26-Aug-13	
EPA 200.7	Chromium	mg/L	0.917	0.972	1.00	5.9	20	W333430	26-Aug-13	
EPA 200.7	Copper	mg/L	0.941	0.996	1.00	5.7	20	W333430	26-Aug-13	
EPA 200.7	Iron	mg/L	9.06	9.57	10.0	5.5	20	W333430	26-Aug-13	
EPA 200.7	Magnesium	mg/L	19.7	20.8	20.0	5.4	20	W333430	26-Aug-13	
EPA 200.7	Manganese	mg/L	0.909	0.953	1.00	4.8	20	W333430	26-Aug-13	
EPA 200.7	Nickel	mg/L	0.884	0.940	1.00	6.1	20	W333430	26-Aug-13	
EPA 200.7	Zinc	mg/L	0.920	0.977	1.00	6.1	20	W333430	26-Aug-13	
EPA 200.8	Antimony	mg/L	0.0253	0.0248	0.0250	2.1	20	W333359	27-Aug-13	
EPA 200.8	Arsenic	mg/L	0.0309	0.0294	0.0250	5.0	20	W333359	27-Aug-13	
EPA 200.8	Cadmium	mg/L	0.0249	0.0246	0.0250	1.2	20	W333359	27-Aug-13	
EPA 200.8	Lead	mg/L	0.0247	0.0241	0.0250	2.4	20	W333359	27-Aug-13	

SVL holds the following certifications:

AZ:0538, CA:2080, FL(NELAC):E87993, ID:ID00019 &amp; ID00965 (Microbiology), NV:ID000192007A, WA:C573

Work order Report Page 10 of 11



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

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

**Project Name: Livingston Mine 2013**Work Order: **W3H0324**

Reported: 27-Aug-13 16:31

**Quality Control - MATRIX SPIKE DUPLICATE Data****(Continued)**

Method	Analyte	Units	MSD Result	Spike Result	Spike Level	RPD	RPD Limit	Batch ID	Analyzed	Notes
<b>Metals (Dissolved) (Continued)</b>										
EPA 200.8	Selenium	mg/L	0.0288	0.0270	0.0250	6.3	20	W333359	27-Aug-13	
EPA 200.8	Silver	mg/L	0.0249	0.0248	0.0250	0.5	20	W333359	27-Aug-13	
EPA 245.1	Mercury	mg/L	0.00103	0.00104	0.00100	1.0	20	W334089	22-Aug-13	
EPA 245.1	Mercury	mg/L	0.00096	0.00093	0.00100	3.2	20	W334091	22-Aug-13	

**Notes and Definitions**

M1	Matrix spike recovery was high, but the LCS recovery was acceptable.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to spike level. The LCS was acceptable.
LCS	Laboratory Control Sample (Blank Spike)
RPD	Relative Percent Difference
UDL	A result is less than the detection limit
R > 4S	% recovery not applicable, sample concentration more than four times greater than spike level
<RL	A result is less than the reporting limit
MRL	Method Reporting Limit
MDL	Method Detection Limit
N/A	Not Applicable





# CHAIN OF CUSTODY RECORD

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

Page 1 of 1

W3J0080

FOR SVL USE ONLY  
SVL JOB #  
TEMP on Receipt: 17.8

Report to Company: INER  
Contact: Dana Swift  
Address: 1410 N. Hilton  
Boise, ID 83706  
Phone Number: 208-373-0296  
FAX Number: 208-373-0154  
E-mail: dana.swift@deg.idaho.gov

Invoice Sent To: 508 to Dana Swift  
Contact: 508 to Dean Morgan, USFS  
Address: \_\_\_\_\_  
Phone Number: \_\_\_\_\_  
FAX Number: \_\_\_\_\_  
PO#: \_\_\_\_\_

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

Project Name: Livingston Mine  
Sampler's Signature: Dana Swift

Indicate State of sample origination: DO

USACE? ☐ Yes ☒ No

Sample ID	Collection	Date	Time	Collected by: (init.)	Matrix Type (From Table 1)	Misc.	Preservative(s)					Other (Specify)	Analyses Required	Rush Instructions (Days)	Comments		
							HNO <sub>3</sub> Filtered	HNO <sub>3</sub> Unfiltered	HCl	H <sub>2</sub> SO <sub>4</sub>	NaOH						
1 LL-UTS-SD1		9/30/13	12:40	DS	3	1										Sediment metals: As, Ba, Cd, Cr, Pb, Hg, Se, Ag, Cu, Fe, Mn, Zn, Sb, Ni Air dry sediments and filter to 2mm.	
2 LL-UTS-SW1		12:40	DS		1	1											
3 LL-UTN-SD2		1:10	DS		3	1											
4 LL-UTN-SW2		1:10	DS		1	1											
5 LL-LC-SD3		1:40	DS		3	1											
6 LL-LC-SD4		1:40	DS		3	1											
7 LL-LC-SW3		1:40	DS		1	1											
8 LL-LC-SW4		1:40	DS		1	1											
9																	
10																	

Requisitioned by: Dana Swift  
Requisitioned by: \_\_\_\_\_

Date: 10/2/13 Time: 10:30  
Date: \_\_\_\_\_ Time: \_\_\_\_\_

Received by: \_\_\_\_\_  
Received by: \_\_\_\_\_

White: LAB COPY Yellow: CUSTOMER COPY

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

SVL-COC 9/05

## Crystal Sevy

---

**From:** Chris Meyer [chris@svl.net]  
**Sent:** Wednesday, October 02, 2013 12:44 PM  
**To:** 'Crystal Sevy'  
**Cc:** 'Kirby Gray'; 'Melba Bencich'  
**Subject:** FW: Samples for Livingston and Clayton  
Please note samples arriving tomorrow from DEQ.

Melba – we need to split the costs again. I highlighted information below. Thanks!

---

**From:** Dana.Swift@deq.idaho.gov [mailto:Dana.Swift@deq.idaho.gov]  
**Sent:** Wednesday, October 02, 2013 10:00 AM  
**To:** Chris@svl.net  
**Subject:** RE: Samples for Livingston and Clayton

Chris,  
We shipped these samples today, expect them tomorrow, FedEx # 875838872463

Thanks,  
Dana

---

**From:** Dana Swift  
**Sent:** Tuesday, September 17, 2013 1:54 PM  
**To:** Chris@svl.net  
**Subject:** Samples for Livingston and Clayton

Chris,  
We are planning to collect some sediment and water samples next week from 2 sites. We won't be able to ship the samples until Sept 30<sup>th</sup>. We have enough leftover bottles and nitric acid so we won't need you to send anything; just wanted to give you the heads up to expect the samples.

Livingston Mine (same analyte lists and methods as performed for the August samples):

- 5 dissolved metals water samples: analytes (As, Ba, Cd, Cr, Pb, Hg, Se, Ag, Cu, Fe, Mn, Zn, Sb and Ni), method: 200.7 ICP w/ As, Cd, Pb, Se, Sb, Ag by 200.8 ICP-MS / Hg by 245.1 CVAA
- 4 sediment samples: air dry at lab and sieve to 2 mm: As, Ba, Cd, Cr, Pb, Hg, Se, Ag, Cu, Fe, Mn, Zn, Sb and Ni, 200.7 ICP
- Split invoice 50% DEQ, Dana Swift/50% Forest Service, Dean Morgan

Clayton Slag Pile:

- 6 dissolved metals water samples, analyte list and methods are the same as Livingston except no Ni
- 5 total metals sediment samples, analyte list and methods are the same as Livingston except no Ni
- Invoice 100% to DEQ, Dana Swift

Thanks,  
Dana

Dana Swift, Mine Waste Project Coordinator  
Idaho Department of Environmental Quality, 1410 N. Hilton, Boise, ID 83706  
Phone: 208-373-0296, Cell: 208-871-3944, [dana.swift@deq.idaho.gov](mailto:dana.swift@deq.idaho.gov)

10/2/2013



# SAMPLE RECEIPT/CHAIN-OF-CUSTODY CHECKLIST

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

Date of acceptance: 10/3/13 By: CR Sewy  
SVL Work No: W3J0080

Item	Description	V	VC	NV	NA	Comments
1	Client or project name	✓				IDEQ
2	Date and time of receipt at lab	✓				10-3-13 12:30
3	Received by	✓				Mark Duce
4	Temperature blank or cooler temperature	✓				Temp. 17.8°C. Soil & HNO <sub>3</sub> only
5	Were the sample(s) received on ice				✓	NO
6	Custody tape/bottle seals				✓	NO
7	Condition of samples upon receipt (leaking; bubbles in VOA vials)	✓				Good
8	Sample numbers/IDs agree with COC	✓				
9	Sample date & time agree with COC	✓				
10	Number of containers for each sample	✓				
11	The correct preservative for the analysis requested	✓				
12	Did an SVL employee preserve sample(s) upon receipt				✓	
13	Type of container for each sample / volume received	✓				
14	Analysis requested for each sample	✓				
15	Sample matrix description	✓				
16	COC properly completed & legible	✓				
17	Corrections properly made (initials & date)				✓	
18	Additional comments or records of sample condition or treatment (unlisted or missing samples at laboratory, aliquot taken, sample hold, samples subcontracted, communications between client and laboratory)				✓	
19	Shipper's air bill	✓				

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

Additional Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

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

Project Name: **Livingston Mine 2013**Work Order: **W3J0080**

Reported: 18-Oct-13 14:02

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Sampled By	Date Received
LL-UTS-SD1	W3J0080-01	Sediment	30-Sep-13 12:40	DS	03-Oct-2013
LL-UTS-SW1	W3J0080-02	Surface Water	30-Sep-13 12:40	DS	03-Oct-2013
LL-UTN-SD2	W3J0080-03	Sediment	30-Sep-13 13:10	DS	03-Oct-2013
LL-UTN-SW2	W3J0080-04	Surface Water	30-Sep-13 13:10	DS	03-Oct-2013
LL-LC-SD3	W3J0080-05	Sediment	30-Sep-13 13:40	DS	03-Oct-2013
LL-LC-SD4	W3J0080-06	Sediment	30-Sep-13 13:40	DS	03-Oct-2013
LL-LC-SW3	W3J0080-07	Surface Water	30-Sep-13 13:40	DS	03-Oct-2013
LL-LC-SW4	W3J0080-08	Surface Water	30-Sep-13 13:40	DS	03-Oct-2013

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.



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

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

Project Name: **Livingston Mine 2013**Work Order: **W3J0080**

Reported: 18-Oct-13 14:02

Client Sample ID: **LL-UTS-SD1**SVL Sample ID: **W3J0080-01 (Sediment)**

Sample Report Page 1 of 1

Sampled: 30-Sep-13 12:40

Received: 03-Oct-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	2.5	mg/kg	2.0	0.8		W342062	DT	10/16/13 13:25	
EPA 6010B	Arsenic	9.5	mg/kg	2.5	0.8		W342062	DT	10/16/13 13:25	
EPA 6010B	Barium	74.5	mg/kg	0.200	0.050		W342062	DT	10/16/13 13:25	
EPA 6010B	Cadmium	24.2	mg/kg	0.20	0.04		W342062	DT	10/16/13 13:25	
EPA 6010B	Chromium	34.2	mg/kg	0.60	0.06		W342062	DT	10/16/13 13:25	
EPA 6010B	Copper	54.5	mg/kg	1.00	0.35		W342062	DT	10/16/13 13:25	
EPA 6010B	Iron	41500	mg/kg	6.0	2.0		W342062	DT	10/16/13 13:25	
EPA 6010B	Lead	21.1	mg/kg	0.75	0.47		W342062	DT	10/16/13 13:25	
EPA 6010B	Manganese	873	mg/kg	0.40	0.10		W342062	DT	10/16/13 13:25	
EPA 6010B	Nickel	174	mg/kg	1.00	0.31		W342062	DT	10/16/13 13:25	
EPA 6010B	Selenium	9.7	mg/kg	4.0	0.9		W342062	DT	10/16/13 13:25	
EPA 6010B	Silver	0.88	mg/kg	0.50	0.08		W342062	DT	10/16/13 13:25	
EPA 6010B	Zinc	1800	mg/kg	1.00	0.41		W342062	DT	10/16/13 13:25	
EPA 7471A	Mercury	< 0.033	mg/kg	0.033	0.004		W341121	STA	10/10/13 16:18	

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

**John Kern**  
Laboratory Director



One Government Gulch - PO Box 929

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

Project Name: Livingston Mine 2013

Work Order: W3J0080

Reported: 18-Oct-13 14:02

Client Sample ID: LL-UTS-SW1

SVL Sample ID: W3J0080-02 (Surface Water)

Sample Report Page 1 of 1

Sampled: 30-Sep-13 12:40

Received: 03-Oct-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
--------	---------	--------	-------	----	-----	----------	-------	---------	----------	-------

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

SM 2340B	Hardness (as CaCO <sub>3</sub> )	216	mg/L	0.347	0.198		N/A		10/18/13 11:26	
----------	----------------------------------	-----	------	-------	-------	--	-----	--	----------------	--

**Metals (Dissolved)**

EPA 200.7	Barium	0.0059	mg/L	0.0020	0.0005		W340371	DT	10/18/13 11:26	
EPA 200.7	Calcium	81.9	mg/L	0.040	0.015		W340371	DT	10/18/13 11:26	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0015		W340371	DT	10/18/13 11:26	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W340371	DT	10/18/13 11:26	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.023		W340371	DT	10/18/13 11:26	
EPA 200.7	Magnesium	2.71	mg/L	0.060	0.039		W340371	DT	10/18/13 11:26	
EPA 200.7	Manganese	< 0.0040	mg/L	0.0040	0.0010		W340371	DT	10/18/13 11:26	
EPA 200.7	Nickel	< 0.010	mg/L	0.010	0.003		W340371	DT	10/18/13 11:26	
EPA 200.7	Zinc	0.0265	mg/L	0.0100	0.0023		W340371	DT	10/18/13 11:26	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00010		W341022	KWH	10/15/13 09:24	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W341022	KWH	10/15/13 09:24	
EPA 200.8	Cadmium	0.00072	mg/L	0.00020	0.00003		W341022	KWH	10/15/13 09:24	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W341022	KWH	10/15/13 09:24	
EPA 200.8	Selenium	0.00539	mg/L	0.00300	0.00026		W341022	KWH	10/15/13 09:24	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W341022	KWH	10/15/13 09:24	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W340335	STA	10/08/13 13:26	

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

John Kern  
Laboratory Director



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(208) 784-1258

Fax (208) 783-0891

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

Project Name: **Livingston Mine 2013**Work Order: **W3J0080**

Reported: 18-Oct-13 14:02

Client Sample ID: **LL-UTN-SD2**SVL Sample ID: **W3J0080-03 (Sediment)**

Sample Report Page 1 of 1

Sampled: 30-Sep-13 13:10

Received: 03-Oct-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	15.6	mg/kg	2.0	0.8		W342062	DT	10/16/13 13:31	
EPA 6010B	Arsenic	33.1	mg/kg	2.5	0.8		W342062	DT	10/16/13 13:31	
EPA 6010B	Barium	186	mg/kg	0.200	0.050		W342062	DT	10/16/13 13:31	
EPA 6010B	Cadmium	16.8	mg/kg	0.20	0.04		W342062	DT	10/16/13 13:31	
EPA 6010B	Chromium	22.0	mg/kg	0.60	0.06		W342062	DT	10/16/13 13:31	
EPA 6010B	Copper	72.7	mg/kg	1.00	0.35		W342062	DT	10/16/13 13:31	
EPA 6010B	Iron	14900	mg/kg	6.0	2.0		W342062	DT	10/16/13 13:31	
EPA 6010B	Lead	235	mg/kg	0.75	0.47		W342062	DT	10/16/13 13:31	
EPA 6010B	Manganese	306	mg/kg	0.40	0.10		W342062	DT	10/16/13 13:31	
EPA 6010B	Nickel	96.5	mg/kg	1.00	0.31		W342062	DT	10/16/13 13:31	
EPA 6010B	Selenium	13.6	mg/kg	4.0	0.9		W342062	DT	10/16/13 13:31	
EPA 6010B	Silver	3.54	mg/kg	0.50	0.08		W342062	DT	10/16/13 13:31	
EPA 6010B	Zinc	990	mg/kg	1.00	0.41		W342062	DT	10/16/13 13:31	
EPA 7471A	Mercury	0.107	mg/kg	0.033	0.004		W341121	STA	10/10/13 16:23	

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

**John Kern**  
Laboratory Director





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

Project Name: Livingston Mine 2013

Work Order: W3J0080

Reported: 18-Oct-13 14:02

Client Sample ID: LL-UTN-SW2

SVL Sample ID: W3J0080-04 (Surface Water)

Sample Report Page 1 of 1

Sampled: 30-Sep-13 13:10

Received: 03-Oct-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
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**Metals (Total Recoverable--reportable as Total per 40 CFR 136)**

SM 2340B	Hardness (as CaCO3)	178	mg/L	0.347	0.198		N/A		10/18/13 11:28	
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**Metals (Dissolved)**

EPA 200.7	Barium	0.0208	mg/L	0.0020	0.0005		W340371	DT	10/18/13 11:28	
EPA 200.7	Calcium	68.5	mg/L	0.040	0.015		W340371	DT	10/18/13 11:28	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0015		W340371	DT	10/18/13 11:28	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W340371	DT	10/18/13 11:28	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.023		W340371	DT	10/18/13 11:28	
EPA 200.7	Magnesium	1.66	mg/L	0.060	0.039		W340371	DT	10/18/13 11:28	
EPA 200.7	Manganese	< 0.0040	mg/L	0.0040	0.0010		W340371	DT	10/18/13 11:28	
EPA 200.7	Nickel	< 0.010	mg/L	0.010	0.003		W340371	DT	10/18/13 11:28	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0023		W340371	DT	10/18/13 11:28	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00010		W341022	KWH	10/15/13 09:29	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W341022	KWH	10/15/13 09:29	
EPA 200.8	Cadmium	0.00046	mg/L	0.00020	0.00003		W341022	KWH	10/15/13 09:29	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W341022	KWH	10/15/13 09:29	
EPA 200.8	Selenium	0.00463	mg/L	0.00300	0.00026		W341022	KWH	10/15/13 09:29	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W341022	KWH	10/15/13 09:29	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W340335	STA	10/08/13 13:29	

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

John Kern  
Laboratory Director



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

Project Name: Livingston Mine 2013

Work Order: W3J0080

Reported: 18-Oct-13 14:02

Client Sample ID: LL-LC-SD3

SVL Sample ID: W3J0080-05 (Sediment)

Sample Report Page 1 of 1

Sampled: 30-Sep-13 13:40

Received: 03-Oct-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	28.7	mg/kg	2.0	0.8		W342062	DT	10/16/13 13:37	
EPA 6010B	Arsenic	34.0	mg/kg	2.5	0.8		W342062	DT	10/16/13 13:37	
EPA 6010B	Barium	95.2	mg/kg	0.200	0.050		W342062	DT	10/16/13 13:37	
EPA 6010B	Cadmium	9.48	mg/kg	0.20	0.04		W342062	DT	10/16/13 13:37	
EPA 6010B	Chromium	31.1	mg/kg	0.60	0.06		W342062	DT	10/16/13 13:37	
EPA 6010B	Copper	89.8	mg/kg	1.00	0.35		W342062	DT	10/16/13 13:37	
EPA 6010B	Iron	38700	mg/kg	6.0	2.0		W342062	DT	10/16/13 13:37	
EPA 6010B	Lead	127	mg/kg	0.75	0.47		W342062	DT	10/16/13 13:37	
EPA 6010B	Manganese	162	mg/kg	0.40	0.10		W342062	DT	10/16/13 13:37	
EPA 6010B	Nickel	101	mg/kg	1.00	0.31		W342062	DT	10/16/13 13:37	
EPA 6010B	Selenium	15.4	mg/kg	4.0	0.9		W342062	DT	10/16/13 13:37	
EPA 6010B	Silver	3.90	mg/kg	0.50	0.08		W342062	DT	10/16/13 13:37	
EPA 6010B	Zinc	654	mg/kg	1.00	0.41		W342062	DT	10/16/13 13:37	
EPA 7471A	Mercury	< 0.033	mg/kg	0.033	0.004		W341121	STA	10/10/13 16:25	

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

John Kern  
Laboratory Director



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

Project Name: Livingston Mine 2013

Work Order: W3J0080

Reported: 18-Oct-13 14:02

Client Sample ID: LL-LC-SD4

SVL Sample ID: W3J0080-06 (Sediment)

Sampled: 30-Sep-13 13:40

Received: 03-Oct-13

Sampled By: DS

Sample Report Page 1 of 1

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	5.5	mg/kg	2.0	0.8		W342062	DT	10/16/13 13:43	
EPA 6010B	Arsenic	16.2	mg/kg	2.5	0.8		W342062	DT	10/16/13 13:43	
EPA 6010B	Barium	110	mg/kg	0.200	0.050		W342062	DT	10/16/13 13:43	
EPA 6010B	Cadmium	7.57	mg/kg	0.20	0.04		W342062	DT	10/16/13 13:43	
EPA 6010B	Chromium	30.3	mg/kg	0.60	0.06		W342062	DT	10/16/13 13:43	
EPA 6010B	Copper	60.5	mg/kg	1.00	0.35		W342062	DT	10/16/13 13:43	
EPA 6010B	Iron	21700	mg/kg	6.0	2.0		W342062	DT	10/16/13 13:43	
EPA 6010B	Lead	42.9	mg/kg	0.75	0.47		W342062	DT	10/16/13 13:43	
EPA 6010B	Manganese	125	mg/kg	0.40	0.10		W342062	DT	10/16/13 13:43	
EPA 6010B	Nickel	71.1	mg/kg	1.00	0.31		W342062	DT	10/16/13 13:43	
EPA 6010B	Selenium	8.7	mg/kg	4.0	0.9		W342062	DT	10/16/13 13:43	
EPA 6010B	Silver	1.38	mg/kg	0.50	0.08		W342062	DT	10/16/13 13:43	
EPA 6010B	Zinc	473	mg/kg	1.00	0.41		W342062	DT	10/16/13 13:43	
EPA 7471A	Mercury	< 0.033	mg/kg	0.033	0.004		W341121	STA	10/10/13 16:27	

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

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Laboratory Director



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

Project Name: Livingston Mine 2013

Work Order: W3J0080

Reported: 18-Oct-13 14:02

Client Sample ID: LL-LC-SW3

SVL Sample ID: W3J0080-07 (Surface Water)

Sample Report Page 1 of 1

Sampled: 30-Sep-13 13:40

Received: 03-Oct-13

Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total Recoverable--reportable as Total per 40 CFR 136)</b>										
SM 2340B	Hardness (as CaCO3)	147	mg/L	0.347	0.198		N/A		10/18/13 11:37	
<b>Metals (Dissolved)</b>										
EPA 200.7	Barium	0.0057	mg/L	0.0020	0.0005		W340371	DT	10/18/13 11:37	
EPA 200.7	Calcium	56.2	mg/L	0.040	0.015		W340371	DT	10/18/13 11:37	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0015		W340371	DT	10/18/13 11:37	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W340371	DT	10/18/13 11:37	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.023		W340371	DT	10/18/13 11:37	
EPA 200.7	Magnesium	1.64	mg/L	0.060	0.039		W340371	DT	10/18/13 11:37	
EPA 200.7	Manganese	< 0.0040	mg/L	0.0040	0.0010		W340371	DT	10/18/13 11:37	
EPA 200.7	Nickel	< 0.010	mg/L	0.010	0.003		W340371	DT	10/18/13 11:37	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0023		W340371	DT	10/18/13 11:37	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00010		W341022	KWH	10/15/13 09:30	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W341022	KWH	10/15/13 09:30	
EPA 200.8	Cadmium	0.00044	mg/L	0.00020	0.00003		W341022	KWH	10/15/13 09:30	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W341022	KWH	10/15/13 09:30	
EPA 200.8	Selenium	0.00627	mg/L	0.00300	0.00026		W341022	KWH	10/15/13 09:30	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W341022	KWH	10/15/13 09:30	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W340335	STA	10/08/13 13:31	

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

John Kern  
Laboratory Director



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

Project Name: **Livingston Mine 2013**  
Work Order: **W3J0080**  
Reported: 18-Oct-13 14:02

Client Sample ID: **LL-LC-SW4**SVL Sample ID: **W3J0080-08 (Surface Water)**

Sample Report Page 1 of 1

Sampled: 30-Sep-13 13:40  
Received: 03-Oct-13  
Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
<b>Metals (Total Recoverable--reportable as Total per 40 CFR 136)</b>										
SM 2340B	Hardness (as CaCO <sub>3</sub> )	146	mg/L	0.347	0.198		N/A		10/18/13 11:39	
<b>Metals (Dissolved)</b>										
EPA 200.7	Barium	0.0055	mg/L	0.0020	0.0005		W340371	DT	10/18/13 11:39	
EPA 200.7	Calcium	55.8	mg/L	0.040	0.015		W340371	DT	10/18/13 11:39	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0015		W340371	DT	10/18/13 11:39	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W340371	DT	10/18/13 11:39	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.023		W340371	DT	10/18/13 11:39	
EPA 200.7	Magnesium	1.64	mg/L	0.060	0.039		W340371	DT	10/18/13 11:39	
EPA 200.7	Manganese	< 0.0040	mg/L	0.0040	0.0010		W340371	DT	10/18/13 11:39	
EPA 200.7	Nickel	< 0.010	mg/L	0.010	0.003		W340371	DT	10/18/13 11:39	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0023		W340371	DT	10/18/13 11:39	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00010		W341022	KWH	10/15/13 09:32	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W341022	KWH	10/15/13 09:32	
EPA 200.8	Cadmium	0.00046	mg/L	0.00020	0.00003		W341022	KWH	10/15/13 09:32	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W341022	KWH	10/15/13 09:32	
EPA 200.8	Selenium	0.00582	mg/L	0.00300	0.00026		W341022	KWH	10/15/13 09:32	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W341022	KWH	10/15/13 09:32	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W340335	STA	10/08/13 13:33	

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

John Kern  
Laboratory Director





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

Project Name: Livingston Mine 2013

Work Order: W3J0080

Reported: 18-Oct-13 14:02

**Quality Control - BLANK Data**

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
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**Metals (Total) by EPA 6000/7000 Methods**

EPA 6010B	Antimony	mg/kg	<2.0	0.8	2.0	W342062	16-Oct-13	
EPA 6010B	Arsenic	mg/kg	<2.5	0.8	2.5	W342062	16-Oct-13	
EPA 6010B	Barium	mg/kg	<0.200	0.050	0.200	W342062	16-Oct-13	
EPA 6010B	Cadmium	mg/kg	<0.20	0.04	0.20	W342062	16-Oct-13	
EPA 6010B	Chromium	mg/kg	<0.60	0.06	0.60	W342062	16-Oct-13	
EPA 6010B	Copper	mg/kg	<1.00	0.35	1.00	W342062	16-Oct-13	
EPA 6010B	Iron	mg/kg	<6.0	2.0	6.0	W342062	16-Oct-13	
EPA 6010B	Lead	mg/kg	<0.75	0.47	0.75	W342062	16-Oct-13	
EPA 6010B	Manganese	mg/kg	<0.40	0.10	0.40	W342062	16-Oct-13	
EPA 6010B	Nickel	mg/kg	<1.00	0.31	1.00	W342062	16-Oct-13	
EPA 6010B	Selenium	mg/kg	<4.0	0.9	4.0	W342062	16-Oct-13	
EPA 6010B	Silver	mg/kg	<0.50	0.08	0.50	W342062	16-Oct-13	
EPA 6010B	Zinc	mg/kg	<1.00	0.41	1.00	W342062	16-Oct-13	
EPA 7471A	Mercury	mg/kg	<0.033	0.004	0.033	W341121	10-Oct-13	

**Metals (Dissolved)**

EPA 200.7	Barium	mg/L	<0.0020	0.0005	0.0020	W340371	18-Oct-13	
EPA 200.7	Calcium	mg/L	<0.040	0.015	0.040	W340371	18-Oct-13	
EPA 200.7	Chromium	mg/L	<0.0060	0.0015	0.0060	W340371	18-Oct-13	
EPA 200.7	Copper	mg/L	<0.010	0.006	0.010	W340371	18-Oct-13	
EPA 200.7	Iron	mg/L	<0.060	0.023	0.060	W340371	18-Oct-13	
EPA 200.7	Magnesium	mg/L	<0.060	0.039	0.060	W340371	18-Oct-13	
EPA 200.7	Manganese	mg/L	<0.0040	0.0010	0.0040	W340371	18-Oct-13	
EPA 200.7	Nickel	mg/L	<0.010	0.003	0.010	W340371	18-Oct-13	
EPA 200.7	Zinc	mg/L	<0.0100	0.0023	0.0100	W340371	18-Oct-13	
EPA 200.8	Antimony	mg/L	<0.00300	0.00010	0.00300	W341022	15-Oct-13	
EPA 200.8	Arsenic	mg/L	<0.0030	0.0003	0.0030	W341022	15-Oct-13	
EPA 200.8	Cadmium	mg/L	<0.00020	0.00003	0.00020	W341022	15-Oct-13	
EPA 200.8	Lead	mg/L	<0.00300	0.000048	0.00300	W341022	15-Oct-13	
EPA 200.8	Selenium	mg/L	<0.00300	0.00026	0.00300	W341022	15-Oct-13	
EPA 200.8	Silver	mg/L	<0.000100	0.000012	0.000100	W341022	15-Oct-13	
EPA 245.1	Mercury	mg/L	<0.00020	0.000045	0.00020	W340335	08-Oct-13	

**Quality Control - LABORATORY CONTROL SAMPLE Data**

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
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**Metals (Total) by EPA 6000/7000 Methods**

EPA 6010B	Antimony	mg/kg	90.4	100	90.4	80 - 120	W342062	16-Oct-13	
EPA 6010B	Arsenic	mg/kg	90.8	100	90.8	80 - 120	W342062	16-Oct-13	
EPA 6010B	Barium	mg/kg	89.8	100	89.8	80 - 120	W342062	16-Oct-13	
EPA 6010B	Cadmium	mg/kg	91.7	100	91.7	80 - 120	W342062	16-Oct-13	
EPA 6010B	Chromium	mg/kg	96.5	100	96.5	80 - 120	W342062	16-Oct-13	
EPA 6010B	Copper	mg/kg	99.5	100	99.5	80 - 120	W342062	16-Oct-13	
EPA 6010B	Iron	mg/kg	958	1000	95.8	80 - 120	W342062	16-Oct-13	
EPA 6010B	Lead	mg/kg	91.4	100	91.4	80 - 120	W342062	16-Oct-13	
EPA 6010B	Manganese	mg/kg	97.9	100	97.9	80 - 120	W342062	16-Oct-13	
EPA 6010B	Nickel	mg/kg	86.0	100	86.0	80 - 120	W342062	16-Oct-13	
EPA 6010B	Selenium	mg/kg	87.5	100	87.5	80 - 120	W342062	16-Oct-13	
EPA 6010B	Silver	mg/kg	4.77	5.00	95.3	80 - 120	W342062	16-Oct-13	
EPA 6010B	Zinc	mg/kg	88.6	100	88.6	80 - 120	W342062	16-Oct-13	
EPA 7471A	Mercury	mg/kg	0.855	0.833	103	80 - 120	W341121	10-Oct-13	

SVL holds the following certifications:

AZ:0538, CA:2080, FL(NELAC):E87993, ID:ID00019 &amp; ID00965 (Microbiology), NV:ID000192007A, WA:C573

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Boise, ID 83706

Project Name: Livingston Mine 2013

Work Order: W3J0080

Reported: 18-Oct-13 14:02

## Quality Control - LABORATORY CONTROL SAMPLE Data

(Continued)

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
<b>Metals (Dissolved)</b>									
EPA 200.7	Barium	mg/L	0.946	1.00	94.6	85 - 115	W340371	18-Oct-13	
EPA 200.7	Calcium	mg/L	19.1	20.0	95.3	85 - 115	W340371	18-Oct-13	
EPA 200.7	Chromium	mg/L	0.942	1.00	94.2	85 - 115	W340371	18-Oct-13	
EPA 200.7	Copper	mg/L	0.947	1.00	94.7	85 - 115	W340371	18-Oct-13	
EPA 200.7	Iron	mg/L	9.89	10.0	98.9	85 - 115	W340371	18-Oct-13	
EPA 200.7	Magnesium	mg/L	20.0	20.0	100	85 - 115	W340371	18-Oct-13	
EPA 200.7	Manganese	mg/L	0.962	1.00	96.2	85 - 115	W340371	18-Oct-13	
EPA 200.7	Nickel	mg/L	0.936	1.00	93.6	85 - 115	W340371	18-Oct-13	
EPA 200.7	Zinc	mg/L	0.960	1.00	96.0	85 - 115	W340371	18-Oct-13	
EPA 200.8	Antimony	mg/L	0.0231	0.0250	92.3	85 - 115	W341022	15-Oct-13	
EPA 200.8	Arsenic	mg/L	0.0257	0.0250	103	85 - 115	W341022	15-Oct-13	
EPA 200.8	Cadmium	mg/L	0.0254	0.0250	102	85 - 115	W341022	15-Oct-13	
EPA 200.8	Lead	mg/L	0.0251	0.0250	101	85 - 115	W341022	15-Oct-13	
EPA 200.8	Selenium	mg/L	0.0246	0.0250	98.3	85 - 115	W341022	15-Oct-13	
EPA 200.8	Silver	mg/L	0.0253	0.0250	101	85 - 115	W341022	15-Oct-13	
EPA 245.1	Mercury	mg/L	0.00485	0.00500	97.0	85 - 115	W340335	08-Oct-13	

## Quality Control - MATRIX SPIKE Data

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	mg/kg	47.0	3.4	100	43.6	75 - 125	W342062	16-Oct-13	M2
EPA 6010B	Arsenic	mg/kg	411	348	100	62.8	75 - 125	W342062	16-Oct-13	M2
EPA 6010B	Barium	mg/kg	196	105	100	91.0	75 - 125	W342062	16-Oct-13	
EPA 6010B	Cadmium	mg/kg	90.3	12.8	100	77.6	75 - 125	W342062	16-Oct-13	
EPA 6010B	Chromium	mg/kg	150	67.8	100	81.9	75 - 125	W342062	16-Oct-13	
EPA 6010B	Copper	mg/kg	692	633	100	R > 4S	75 - 125	W342062	16-Oct-13	M3
EPA 6010B	Iron	mg/kg	70700	72700	1000	R > 4S	75 - 125	W342062	16-Oct-13	M3
EPA 6010B	Lead	mg/kg	267	194	100	73.0	75 - 125	W342062	16-Oct-13	M2
EPA 6010B	Manganese	mg/kg	649	556	100	93.0	75 - 125	W342062	16-Oct-13	M3
EPA 6010B	Nickel	mg/kg	135	54.1	100	80.5	75 - 125	W342062	16-Oct-13	
EPA 6010B	Selenium	mg/kg	94.8	13.9	100	80.9	75 - 125	W342062	16-Oct-13	
EPA 6010B	Silver	mg/kg	10.9	6.92	5.00	79.4	75 - 125	W342062	16-Oct-13	
EPA 6010B	Zinc	mg/kg	705	668	100	R > 4S	75 - 125	W342062	16-Oct-13	M3
EPA 7471A	Mercury	mg/kg	0.187	<0.033	0.167	93.0	75 - 125	W341121	10-Oct-13	

## Metals (Dissolved)

EPA 200.7	Barium	mg/L	1.00	0.0208	1.00	98.3	70 - 130	W340371	18-Oct-13	
EPA 200.7	Barium	mg/L	0.945	<0.0020	1.00	94.5	70 - 130	W340371	18-Oct-13	
EPA 200.7	Calcium	mg/L	87.8	68.5	20.0	96.8	70 - 130	W340371	18-Oct-13	
EPA 200.7	Calcium	mg/L	317	298	20.0	95.1	70 - 130	W340371	18-Oct-13	M3
EPA 200.7	Chromium	mg/L	0.979	<0.0060	1.00	97.9	70 - 130	W340371	18-Oct-13	
EPA 200.7	Chromium	mg/L	0.947	<0.0060	1.00	94.4	70 - 130	W340371	18-Oct-13	
EPA 200.7	Copper	mg/L	0.964	<0.010	1.00	96.4	70 - 130	W340371	18-Oct-13	
EPA 200.7	Copper	mg/L	0.989	<0.010	1.00	98.9	70 - 130	W340371	18-Oct-13	
EPA 200.7	Iron	mg/L	10.0	<0.060	10.0	100	70 - 130	W340371	18-Oct-13	
EPA 200.7	Iron	mg/L	9.79	<0.060	10.0	97.9	70 - 130	W340371	18-Oct-13	
EPA 200.7	Magnesium	mg/L	21.9	1.66	20.0	101	70 - 130	W340371	18-Oct-13	
EPA 200.7	Magnesium	mg/L	101	81.4	20.0	96.8	70 - 130	W340371	18-Oct-13	M3
EPA 200.7	Manganese	mg/L	0.996	<0.0040	1.00	99.6	70 - 130	W340371	18-Oct-13	
EPA 200.7	Manganese	mg/L	0.961	<0.0040	1.00	96.1	70 - 130	W340371	18-Oct-13	
EPA 200.7	Nickel	mg/L	0.963	<0.010	1.00	96.3	70 - 130	W340371	18-Oct-13	
EPA 200.7	Nickel	mg/L	0.950	<0.010	1.00	95.0	70 - 130	W340371	18-Oct-13	

SVL holds the following certifications:

AZ:0538, CA:2080, FL(NELAC):E87993, ID:ID00019 &amp; ID00965 (Microbiology), NV:ID000192007A, WA:C573

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Boise, ID 83706

Project Name: Livingston Mine 2013

Work Order: W3J0080

Reported: 18-Oct-13 14:02

**Quality Control - MATRIX SPIKE Data (Continued)**

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
<b>Metals (Dissolved) (Continued)</b>										
EPA 200.7	Zinc	mg/L	1.00	<0.0100	1.00	99.7	70 - 130	W340371	18-Oct-13	
EPA 200.7	Zinc	mg/L	0.924	<0.0100	1.00	92.4	70 - 130	W340371	18-Oct-13	
EPA 200.8	Antimony	mg/L	0.0244	<0.00300	0.0250	97.0	70 - 130	W341022	15-Oct-13	
EPA 200.8	Arsenic	mg/L	0.0299	<0.0030	0.0250	116	70 - 130	W341022	15-Oct-13	
EPA 200.8	Cadmium	mg/L	0.0273	0.00072	0.0250	106	70 - 130	W341022	15-Oct-13	
EPA 200.8	Lead	mg/L	0.0246	<0.00300	0.0250	98.5	70 - 130	W341022	15-Oct-13	
EPA 200.8	Selenium	mg/L	0.0363	0.00539	0.0250	124	70 - 130	W341022	15-Oct-13	
EPA 200.8	Silver	mg/L	0.0252	<0.000100	0.0250	101	70 - 130	W341022	15-Oct-13	
EPA 245.1	Mercury	mg/L	0.00102	<0.00020	0.00100	102	70 - 130	W340335	08-Oct-13	
EPA 245.1	Mercury	mg/L	0.00100	<0.00020	0.00100	100	70 - 130	W340335	08-Oct-13	

**Quality Control - MATRIX SPIKE DUPLICATE Data**

Method	Analyte	Units	MSD Result	Spike Result	Spike Level	RPD	RPD Limit	Batch ID	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	mg/kg	46.1	47.0	100	2.1	20	W342062	16-Oct-13	M2
EPA 6010B	Arsenic	mg/kg	415	411	100	1.0	20	W342062	16-Oct-13	M2
EPA 6010B	Barium	mg/kg	209	196	100	6.2	20	W342062	16-Oct-13	
EPA 6010B	Cadmium	mg/kg	95.7	90.3	100	5.8	20	W342062	16-Oct-13	
EPA 6010B	Chromium	mg/kg	156	150	100	4.1	20	W342062	16-Oct-13	
EPA 6010B	Copper	mg/kg	709	692	100	2.5	20	W342062	16-Oct-13	M3
EPA 6010B	Iron	mg/kg	71500	70700	1000	1.2	20	W342062	16-Oct-13	M3
EPA 6010B	Lead	mg/kg	268	267	100	0.5	20	W342062	16-Oct-13	M2
EPA 6010B	Manganese	mg/kg	660	649	100	1.7	20	W342062	16-Oct-13	M3
EPA 6010B	Nickel	mg/kg	137	135	100	1.8	20	W342062	16-Oct-13	
EPA 6010B	Selenium	mg/kg	96.5	94.8	100	1.8	20	W342062	16-Oct-13	
EPA 6010B	Silver	mg/kg	11.3	10.9	5.00	3.8	20	W342062	16-Oct-13	
EPA 6010B	Zinc	mg/kg	725	705	100	2.8	20	W342062	16-Oct-13	M3
EPA 7471A	Mercury	mg/kg	0.180	0.187	0.167	3.6	20	W341121	10-Oct-13	

**Metals (Dissolved)**

EPA 200.7	Barium	mg/L	0.996	1.00	1.00	0.8	20	W340371	18-Oct-13	
EPA 200.7	Calcium	mg/L	87.3	87.8	20.0	0.6	20	W340371	18-Oct-13	
EPA 200.7	Chromium	mg/L	0.975	0.979	1.00	0.5	20	W340371	18-Oct-13	
EPA 200.7	Copper	mg/L	0.963	0.964	1.00	0.2	20	W340371	18-Oct-13	
EPA 200.7	Iron	mg/L	10.0	10.0	10.0	0.0	20	W340371	18-Oct-13	
EPA 200.7	Magnesium	mg/L	22.0	21.9	20.0	0.3	20	W340371	18-Oct-13	
EPA 200.7	Manganese	mg/L	0.995	0.996	1.00	0.1	20	W340371	18-Oct-13	
EPA 200.7	Nickel	mg/L	0.957	0.963	1.00	0.7	20	W340371	18-Oct-13	
EPA 200.7	Zinc	mg/L	0.996	1.00	1.00	0.5	20	W340371	18-Oct-13	
EPA 200.8	Antimony	mg/L	0.0243	0.0244	0.0250	0.4	20	W341022	15-Oct-13	
EPA 200.8	Arsenic	mg/L	0.0298	0.0299	0.0250	0.1	20	W341022	15-Oct-13	
EPA 200.8	Cadmium	mg/L	0.0271	0.0273	0.0250	0.6	20	W341022	15-Oct-13	
EPA 200.8	Lead	mg/L	0.0249	0.0246	0.0250	1.2	20	W341022	15-Oct-13	
EPA 200.8	Selenium	mg/L	0.0348	0.0363	0.0250	4.5	20	W341022	15-Oct-13	
EPA 200.8	Silver	mg/L	0.0248	0.0252	0.0250	1.5	20	W341022	15-Oct-13	
EPA 245.1	Mercury	mg/L	0.00101	0.00102	0.00100	1.0	20	W340335	08-Oct-13	

SVL holds the following certifications:

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Work order Report Page 12 of 13



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**Project Name: Livingston Mine 2013**Work Order: **W3J0080**

Reported: 18-Oct-13 14:02

**Quality Control - POST DIGESTION SPIKE Data**

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Antimony	mg/kg	20.4	3.4	20.0	84.8	75 - 125	W342062	16-Oct-13	
EPA 6010B	Arsenic	mg/kg	377	348	25.0	115	75 - 125	W342062	16-Oct-13	
EPA 6010B	Lead	mg/kg	205	194	7.50	147	75 - 125	W342062	16-Oct-13	M3

**Notes and Definitions**

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