Preliminary Assessment and Site Inspection Report for the Clayton Slag Pile

Custer County

State of Idaho
Department of Environmental Quality

January 2014

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

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

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

January 7, 2014

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

Subject: Preliminary Assessment and Site Inspection Report for the Clayton Slag Pile, 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 Clayton Slag Pile 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 the site on September 30, 2013. The site inspection and sampling was conducted on Idaho Department of Lands (IDL) property. Surface water samples were collected from Kinnikinic Creek and the Salmon River. IDL will receive a copy of this PA/SI report.

Based on sample analysis and observations made during the site visit, DEQ did not find any significant evidence indicating potential adverse toxicological effects to human or ecological receptors. As a result of DEQ's research and observations, a No Remedial Action Planned (NRAP) designation is recommended for the Clayton Slag Pile.

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

Sincerely,

Dana Swift

Dana Swift
Mine Waste Project Coordinator

Attachments

cc: Mr. Eric Wilson, IDL

Printed on recycled paper, DEQ January 2014, RM28, CA 610. Costs associated with this publication are available from the State of Idaho Department of Environmental Quality in accordance with Section 60-202, Idaho Code.

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Custer County

January 2014

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

Acknowledgments

DEQ would like to thank the Idaho Department of Lands for planning assistance and access to sampling locations.

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List of Acronyms

amsl	above mean sea level
BLM	United States Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWA	Clean Water Act
DEQ	Idaho Department of Environmental Quality
EPA	United States Environmental Protection Agency
g/L	grams per liter
GIS	geographic information system
HDPE	high-density polyethylene
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IGS	Idaho Geological Survey
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mL	millileter
NAIP	National Agriculture Imagery Program
NRAP	No Remedial Action Planned
NTU	nephelometric turbidity unit
ORP	oxidation reduction potential
PA	preliminary assessment
PPE	probable point of entry
ppm	parts per million
PQL	practical quantitation limit
PWS	public water system
QA/QC	Quality Assurance/Quality Control
SI	site inspection
SVL	SVL Analytical, Inc.
SWA	source water assessment
TDL	target distance limit
TDS	total dissolved solids
TMDL	total maximum daily load
USGS	United States Geological Survey

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1 Introduction

This report presents the preliminary assessment and site inspection (PA/SI) results for the Clayton Slag Pile 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 of the slag pile. 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, past remedial actions related to the site, and current and potential future land uses.
- Section 3, **Sample Collection and Analysis**, describes the sampling locations and analytical results.
- Section 4, **Migration/Exposure Pathways and Targets**, presents observations and potential targets for the ground water pathway, surface water pathway, soil exposures and air pathway.
- Section 5, **Summary and Conclusions**, presents a summary of the PA/SI results and recommendations based on the current conditions at the site.

2 Site Description

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

2.1 Location and Ownership

The slag pile is located on the banks of the Salmon River, downstream from the confluence of Kinnikinic Creek and approximately 200 feet south of the intersection of Highway 75 and Kinnikinic Creek Road in Clayton, Idaho (Figure 1; Township 11 North, Range 17 East, Section 25; Latitude 44.259014°N, Longitude -114.399725°W). DEQ does not warrant the ownership research or location of property boundaries contained in this report. Information regarding ownership was obtained from the Custer County Assessor's webpage (*http://www.greenwoodmap.com/custer/*).

Idaho Department of Lands (IDL) owns the bed and bank of the Salmon River below the ordinary high water mark. The property surrounding the slag pile and outside the city limits of Clayton is owned by the United States Bureau of Land Management (BLM). The site inspection and all sampling for this PA/SI was conducted on IDL property below the ordinary high water mark.

The slag pile is a remnant of operations at the historic Clayton Smelter Site. Construction of the Clayton Smelter began in 1880. The smelter operated intermittently until 1915 and was dismantled and sold as scrap metal during the 1930s. Ore came from several mine sites in the area. These mine sites were primarily worked for iron and lead, but also carried some silver and gold. The closest mine, Clayton Mine site in the Bayhorse mining district, was located about 1.5 miles up Kinnikinic Creek from the Salmon River at Clayton. A number of claims along Kinnikinic Creek were worked in the 1880s and 1890s to supply ore to the smelter; however, more extensive mining began in 1927. The mine and associated on-site mills operated under different owners until 1986 and produced lead, zinc, silver, copper and gold (Mitchell, 2010).

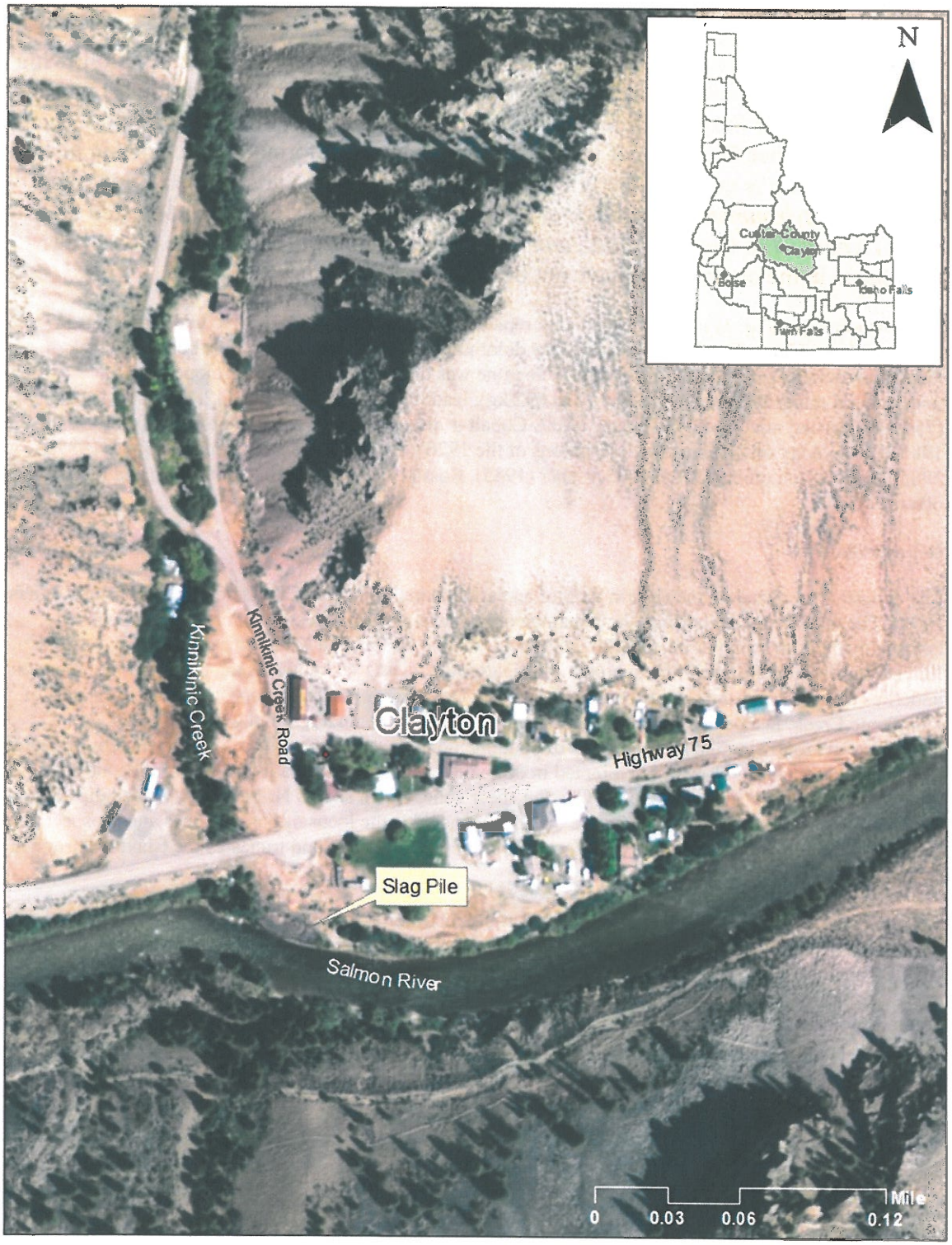

Figure 1. Location of the Clayton Slag Pile in Custer County, Idaho.

2.2 General Geology

A map of the major lithology in the vicinity of the slag pile is shown in Figure 2. The following information identifies the general geology and lithology for this area as it relates to past mining activities; specifically the Clayton Mine site located 1.5 miles north of the slag pile (location shown on Figure 2). Since DEQ cannot improve or expand upon information included in historic reports, this information is quoted directly from the U.S. Geological Survey Open-File Report *Case Study of the Environmental Signature of a Recently Abandoned, Carbonate-Hosted Replacement Deposit: The Clayton Mine, Idaho* (Hammarstrom et al., 2010). The tables and figures referenced in the quote below have not been duplicated in this report.

> The Clayton mine (Fig. 1) is a silver-lead-zinc replacement deposit in the Bayhorse mining district in Custer County, Idaho. The deposit is hosted by dolomite and quartzite within a fault-bounded block of Paleozoic rocks east of the Idaho batholith. The mine was discovered in 1877, developed as an underground mine, and produced silver (218,692 kg), lead (39,358,903 kg), zinc (12,778,700 kg) copper (754, 858 kg) and minor gold (Hillman, 1986). Cobalt is also reported. The mine operated from 1935 to 1986. The geology of the area and descriptions of the 1920's era workings are given by Hobbs (1985a, 1985b), Hobbs and others (1991, 1995, Fisher (1985), Ross (1937, 1963), Hillman (1986), and Mitchell and others (1986).
>
> **Deposit Geology**
>
> The deposit is localized on the eastern limb of an anticline in Ordovician Ella Dolomite (Hobbs and others, 1991). The underground workings show that the ore zone is irregular, in shaley dolomite sandwiched between two Ordovican quartzites (Hillman, 1986). Middle Ordovician Kinnikinic Quartzite overlies the Ella Dolomite and a Lower Ordovician or older feldspathic quartzite, known as the Clayton Mine Quartzite, underlies the mineralized dolomite. Buff-colored Ella Dolomite forms talus slopes along the west side of Kinnikinic Creek, just north of the mine area (Fig. 1). Most of the underground workings trend northwesterly, following the average trend of bedding along the creek. Ore is partly controlled by fractures and bedding planes, but also is disseminated in dolomite host rock. Exploration and development focused on two mineralized shear zones: (1) the Clayton shear zone, which strikes N. 11° – 20° W. and dips 60° – 80° NE, is exposed at the surface for more than 1,000 m and is the locus of gossan zones and prospect pits and (2) a south shear that strikes S. 40° W. and dips 80° SE to vertical and truncates the Clayton shear zone (Hillman, 1986).
>
> The ore minerals are galena, sphalerite, tetrahedrite, chalcopyrite, pyrargyrite, arsenopyrite, cerussite and covellite. Seal and others (1990) showed that Clayton tetrahedrite contains arsenic, as well as silver and zinc. By analogy with similar deposits elsewhere in the Bayhorse mining district, they concluded that the deposit formed at temperatures of about 300 C. Siderite is the principal gangue mineral, along with dolomite, quartz, barite, calcite, fluorite, pyrite, chlorite, goethite, and garnet. The orebody is zones. Galena and sphalerite decrease to the north as siderite and tetrahedite increase; massive sphalerite occurs near the bottom of the ore shoots. The Clayton deposit, like other carbonate replacement deposits in the district, is related to Cretaceous-Tertiary igneous intrusions. Hydrothermal fluids interacted with sedimentary country rocks and deposited metals in fractured carbonate host rocks.

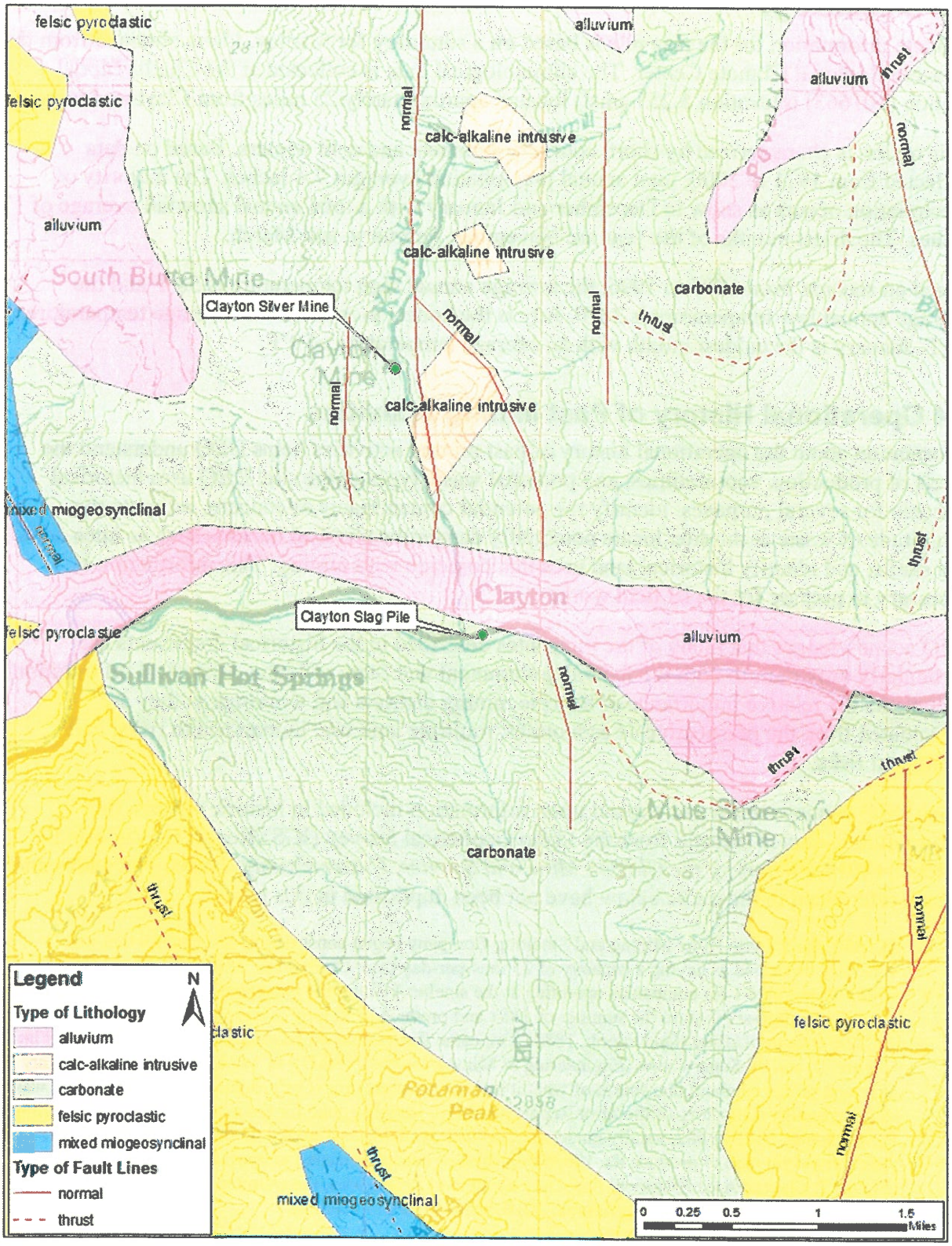

Figure 2. Map of major lithology in the vicinity of the Clayton Slag Pile.

2.3 Climatology

Climate information for the slag pile is based on a summary for Stanley, Idaho obtained from the Western Regional Climate Center. The climatological data is collected at the Challis Model Station (101663) (elevation 5,253 amsl) located approximately 25 miles from Clayton, Idaho.

This region is characterized by short, cool, dry summers and cold winters. Based on data collected from 1971 to 2000, total annual precipitation averages 7.4 inches. The majority of precipitation occurs as snow in December and January with a total annual snowfall average of 17 inches. The driest months of the year are November, February, and March.

Based on records from 1895 to 1996, the average annual high temperature is 58°F and the average annual low temperature is 30°F. July is the hottest month with an average temperature of 85°F. January is the coldest month with an average temperature of 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.

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 (2010) *History of the Clayton Mine and Smelter, Custer County, Idaho*. The tables and figures referenced in the quote below have not been duplicated in this report.

> In 1880, the Salmon River Mining and Smelting Company began construction of a smelter that was variously described as having a capacity of 25 tons-per-day (tpd; Onderdonk, 1885) and 30 tpd (Wells, 1983). (See Table 1 for companies operating at the smelter.) Under the management of C.B. Rustin, the smelter ran sixty-six days in the summer of 1881 and produced 220 tons of base bullion, containing 100,000 ounces of silver (Onderdonk, 1885). Ore came from mines on Kinnikinic Creek, on Poverty Flat (Figure 2), and on Sugar Creek (Engineering & Mining Journal; E&MJ). In 1882, the smelter ran twenty days and produced about one-fourth of what it had the previous year (Onderdonk, 1885). The bullion was of good quality (Directory of the Mint Report; DotMR). Initially, coke for the smelter was imported from Pennsylvania, but by 1882, locally made charcoal was available as a substitute for the coke (Wells 1983). It took forty-eight men to produce the 180,000 bushels of charcoal needed to operate the smelter each year (Figure 7; Clayton Area Historical Association). In the Clayton area, the charcoal was produced by burning trees in covered pits (Michael P. Kalenik, 2010, written communication).
>
> At the beginning of 1884, A.J. Crook & Co. purchased the smelter and a number of mines. This included several mines on Kinnikinic Creek above the smelter, which carried some silver but were worked primarily because they contained abundant iron (Onderdonk, 1885). These included the Overland, North Star, Ella, Climax, Crown, eleven claims of the Rose, Rob Roy, five claims for the Camp Bird, and the Nancy Lee

(Clayton Area Historical Association). Among the mines purchased on Poverty Flat were the Silver Bell, which had produced $30,000 of ore in 1881, and the Redemption, which had produced about 850 tons of ore that contained $90,000 in silver (Onderdonk, 1885). During the summer of 1884 the ore was delivered to the smelter by both teams and pack animals. Two shifts of men were employed, and an average of 50 bars of bullion weighing 100 pounds were turned out each twenty-four hours. The bullion was valued at $600 per ton (DotMR). From June to October, the smelter reduced 1,810 tons of ore which contained 186,841 ounces silver. Another run in November finished off the year (Onderdonk, 1885).

The smelter ran for a short season each summer. Late in 1888, the capacity of the smelter was enlarged to 60 tpd. The variety of ores and the charcoal brought to Clayton from the surrounding area provided a balanced charge for the smelter (Wells, 1983). In 1891, the smelter (now owned by Clayton Mining and Smelting Company) was again doubled in size with the addition of another stack of 60 tpd capacity. Lawrence Green was placed in charge of the operation in 1983 (E&MJ).

The August 27, 1898, issue of E&MJ (v. 66, no. 9, p. 256) described the operation as follows:

> The smelter at the Clayton Mine, near Clayton, was blown in July 25th, and is expected to run 100 days. For several years the company has been making regular runs each year, the balance of the time being occupied in general preparations, development of their mines and stoping some ore. During the winter season about 30 men are employed in the Skylark on Ramshorn Hill, in the Redbird, Poverty Flat and Snake Creek mines. Now while the smelter is in operation there are employed, in the mines 50 men, at the smelter 15, in the charcoal camps 25, and 10 men with 50 horses hauling coal and ore. Besides this, employment is given to many men and teams in taking bullion to the railroad at Blackfoot, a distance of 160 miles, thus giving much life to the district for about three months. This smelter has a remarkable record for an unpretentious concern. Located on the left bank the Salmon River, the machinery is all operated by water from a creek entering the river at that point. The single furnace easily handles about 35 tons of ore per day, which, with the 8 tons of charcoal and 7 tons of limestone, give a total of 50 tons per day going through the furnace. The ores carry enough lead and iron to only require lime for complete fluxing. Mr. Lawrence Greene, superintendent, has been successful in using charcoal and dispensing with the coke formerly hauled to the works at a heavy cost.

The smelter operated into November of 1898. The owners of the company were reported to be connected with the Omaha and Grant Smelting Company (E&MJ).

In 1899, the Clayton smelter ran 106 days and produced 1,315,178 lbs. of bullion. This bullion contained 109,248 oz. of silver, 173.3 oz. of gold, and 1,307,339 lbs. of lead. In 1900, the smelter had the most successful run in its history, producing 1,700,000 lbs. of high-grade lead-silver bullion in 112 days. Since 1894, it had turned out nearly $1,000,000 worth of bullion and made an annual profit of from $25,000 to $50,000. In 1901, the smelter was started on August 17 and turned out 7-8 tons of high-grade lead-silver bullion every day. In a successful run of two months, the smelter produced 1,000,000 lbs. of lead-silver bullion (E&MJ). According to the 1901 Idaho Mine Inspector's Report (IMIR), the year's output was 954,775 lbs. of lead-silver bullion containing 67,806.86 oz. of silver and 21,784 oz. of gold. The amount of lead was not stated. The smelter's summer run in 1902 also produced over a million pounds of bullion (Wells, 1983) containing almost 100,000 oz. of silver and a small amount of gold (IMIR). In August 1902, Lawrence Green resigned as superintendent, and the owners of the smelter gave orders to close it for an indefinite period (E&MJ). A pending sale and consolidation of mining properties was rumored in 1905 (IMIR).

The Idaho Smelting and Mining Company purchased the interests of the Clayton Mining and Smelting Company in 1912. The smelter operated for part of the year (Figures 8, 9, 10, 11, and 12). In 1913 Red Bird Smelting Company took over the property of the Idaho Smelting & Mining Company; both companies were controlled by many of the same men. The Red Bird Smelting Company was incorporated the following year (Table). The smelter ran for three-and-a-half months, and a new 100-tpd smelter was under construction at Clayton. The old smelter operated for a few weeks in 1914, and the new smelter was still incomplete (USGS). The 1914 smelter run produced 2,700 bars of lead bullion carrying good silver values (IMIR). The smelter was idle in 1915 (USGS) and apparently never reopened despite the confusion in

> Wells (1983) between the company owning the smelter and Clayton Mining Company (later Clayton Silver Mines), a corporation concerned only with the mine.
>
> Idaho Mine Development Company leased the property in 1921, but only operated the Red Bird Mine. The Ford Motor Company acquired the mine in 1924 (IMIR). The smelter was part of Ford's property, but Ford was primarily interested in mining lead. During the 1930's, the smelter was sold as scrap metal to the Japanese (Clayton Area Historical Association).

The following information is from the U.S. Geological Survey Open-File Report 02-10 by J.M. Hammarstrom et al. (2010). The tables and figures referenced in the quote below have not been duplicated in this report.

> The mine was last operated by Clayton Silver Mines, Inc. through 1986. The modern mill at the mine site is along Kinnikinic Creek, which drains into the Salmon River at Clayton, about 1.5 miles (2.4 km) downstream from the mine (Fig. 2). The mill produced a lead concentrate by selective flotation that contained 35 to 45 percent lead and 3,400 to 6,800 g/t silver (Hillman, 1986). Mill tailings were placed as terraces along steep slopes within the narrow stream valley, extending to the edge of creek. Prior to the most recent mining activity, a historic smelter, on the north bank of the Salmon River at the town of Clayton, processed ores from a number of mines in the district and dumped slag directly into the river. The smelter operated intermittently from the 1880s to 1902 (Wells, 1983). The U.S. Environmental Protection Agency (EPA) and the U.S. Bureau of Land Management (BLM) have been investigating environmental issues related to the abandoned mine site since the early 1990s (EPA, 2000a). In October, 2001, EPA completed a Time-Critical Removal Action to stabilize mine tailings to prevent erosion into Kinnikinic Creek, to control infiltration of water into tailings and seepage of water from tailings, and to minimize wind erosion (EPA 1999, 2001).
>
> *Slag*
>
> A 30-ton smelter along the Salmon River processed lead-silver ore from the Clayton mine and from other mines in the Bayhorse district until 1902 (West, 1983). The smelter is located at the Clayton town site, 2.4 km from the mine, and a few meters downstream from the confluence of Kinnikinic Creek with the Salmon River (Fig. 9). Geochemical analysis of a composite sample of slag (table 5) shows that the slag contains extremely high concentrations of lead (5.3 wt.%) and relatively high concentrations of some other metals (Zn, Cu, As, Sb, Fe, and Mn).

2.5 Remedial Actions

Several remedial actions have been performed for remnants of past mining activities in the Clayton area; however, no remedial actions have been performed to specifically address the slag pile. EPA performed Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) removal actions at the Clayton Mine Site in 1999 to remove and dispose of hazardous materials left at the site when it was abandoned. EPA also conducted a site stabilization action in 2001 to cover what is now a 16 acre tailings pile. The tailings were found to contain elevated concentrations of arsenic, lead, and other metals. Tailing pile fines were eroding into Kinnikinic Creek, where they could have an adverse impact on aquatic species (including endangered Chinook salmon), and people visiting the site could be exposed to metals in wind blown dust carried off the pile (EPA 2001).

During a 2002 sampling event conducted by the United Stated Geological Survey (USGS), one composite sample was collected from the slag pile that showed high concentrations of lead and relatively high concentrations of other metals (Zn, Cu, As, Sb, Fe and Mn; Hammarstrom et al., 2010). These concentrations generally were much higher than the tailings (by about a factor of

10). EPA reported that there was inadequate information to make conclusions on risks posed by the slag pile near the Salmon River (EPA 1999); therefore, no remedial action was performed.

As part of the Upper Salmon River Subbasin Assessment and Total Maximum Daily Load (TMDL), DEQ evaluated historic data and collected three samples along Kinnikinic Creek in April 2002 to evaluate the effect of the Clayton Mine Site remediation project during base flow conditions. Based on the metals sampling results, previously elevated dissolved zinc and cadmium levels appear to have been reduced to levels below water quality criteria. However, as flow conditions change, so may metals concentrations and DEQ recommended continuing metals sampling to evaluate the loading response and post remediation monitoring as a data gap for Kinnikinic Creek (DEQ 2003). As part of the desktop research for this slag pile, no additional data collected after 2002 has been found.

2.6 Current and Potential Future Land Uses

The population of Clayton was 7 during the 2010 census; a population decrease from 27 in 2000. Current land uses in the area surrounding the slag pile include recreational activities such as fishing, picnicking, hiking, and tourism. These current uses are likely to continue into the future.

Concern for this site was recently raised by IDL due to plans to replace the culvert just west of the slag pile to allow fish passage between Kinnikinic Creek and the Salmon River. DEQ identified this culvert as a fish migration barrier in the *Upper Salmon River Subbasin Assessment and TMDL* (DEQ 2003). Replacement of this culvert will allow anadramous and migratory fish passage from the Salmon River to Kinnikinic Creek. Another potential concern from IDL is winter ice jams on the Salmon River disturbing this slag pile. Given these concerns, a site inspection and sampling to obtain current metals concentrations in surface water near this slag pile was performed.

3 Sample Collection and Analysis

On September 30, 2013, DEQ visited the site and collected surface water samples. All sampling was conducted on IDL property. DEQ did not purposely or knowingly trespass on any private holdings.

Four grab surface water samples (Figure 3) and one field blank were collected near the slag pile:

- Surface water (CS-KC-SW1, Photo 1)—Kinnikinic Creek
- Surface water (CS-SR-SW2 and CS-SR-SW3 duplicate, Photo 2)—Salmon River at the downstream edge of the slag pile (~5 ft downstream)
- Surface water (CS-BK-SW4, Photos 3 and 4)—Background location; Salmon River ~30 feet upstream of the confluence with Kinnikinic Creek
- Field Blank (CS-FB-SW5)—Quality Assurance/Quality Control (QA/QC) sample

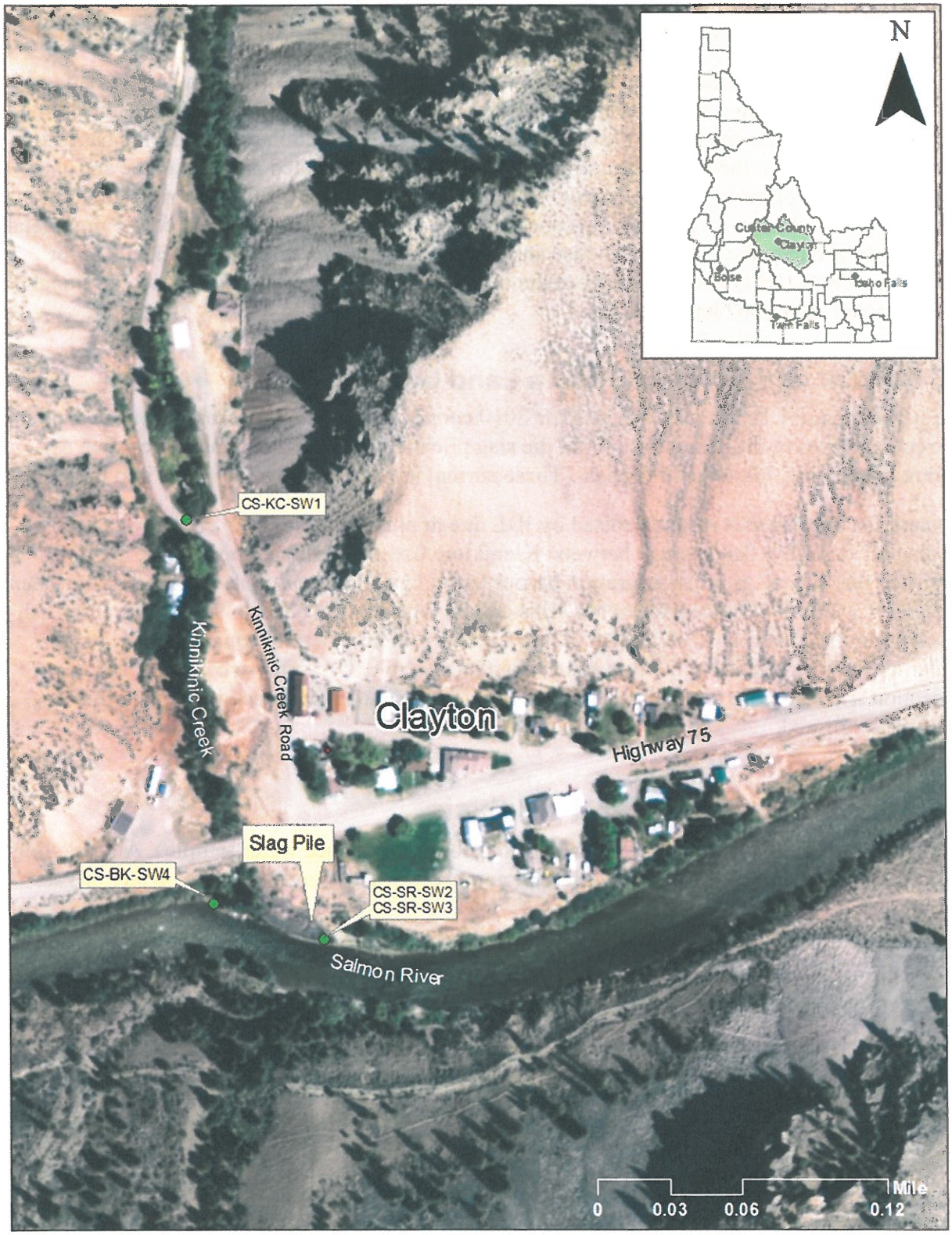

Figure 3. Sample Locations.

Photo 1. Kinnikinic Creek sample location.

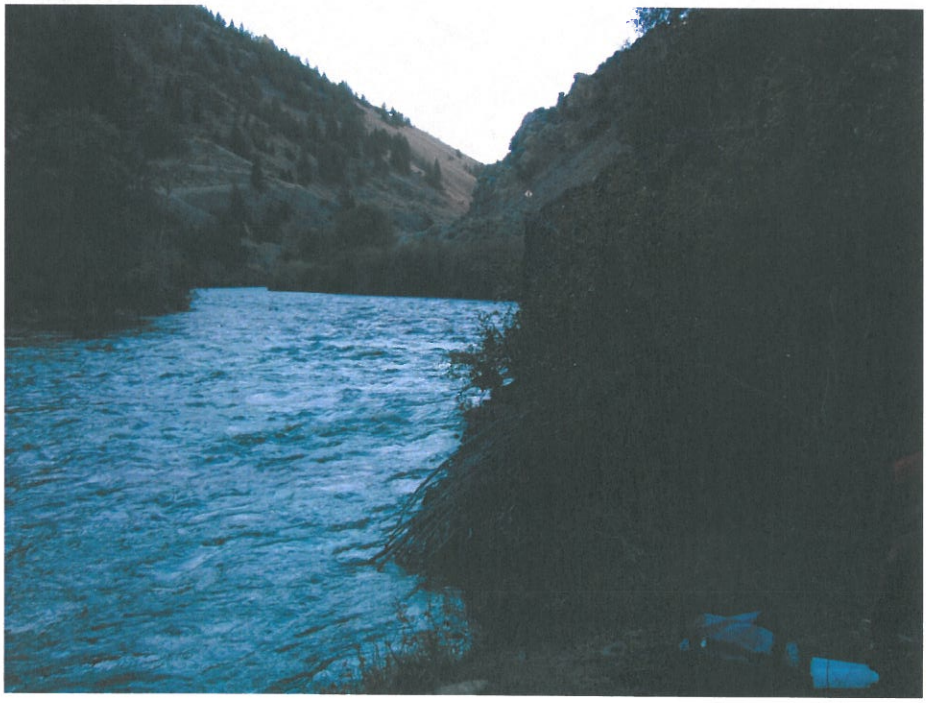

Photo 2. Salmon River sample location at the downstream edge of the slag pile.

Photo 3. Salmon River sample location upstream of the confluence with Kinnikinic Creek.

Photo 4. Kinnikinic Creek flowing into the Salmon River.

Sampling was conducted in accordance with DEQ's Quality Assurance Project Plan for the Preliminary Assessment Program and the Field Sampling Plan for the Clayton Slag Pile (DEQ 2012 and 2013). Modifications to the sampling plan were made in the field based on observed conditions and access to the planned sampling locations. The weather in and surrounding

Clayton was rainy all day on September 29th and the rain continued into the morning of September 30th. Due to this rain event, the Salmon River was very turbid. The sampling plan included three Salmon River sampling locations (upstream, near the center of the slag pile, and downstream); however, the river water was immediately adjacent to the slag pile so there was no access to collect a sample near the center of the pile. Instead, a sample and duplicate were collected immediately downstream of the slag pile where a possible metals release from the pile could be evaluated. Due to the turbidity of the river water, the analyte type was changed from dissolved metals to total metals to capture the possible release of suspended metals into the river. No sediment samples were collected from any of the locations due to high water.

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

Samples collected for evaluating quality assurance/quality control (QA/QC) included one duplicate surface water sample (CS-SR-SW3) and one field blank (CS-FB-SW5). The analytical results of the duplicate sample (CS-SR-SW3) were comparable to the results of the primary sample (CS-SR-SW2). The field blank was collected at the site using distilled water. None of the target analytes were detected in the field blank; all concentrations were below the laboratory practical quantitation limit (PQL).

Table 1. Total recoverable metals analysis from Clayton Slag Pile site. (Concentrations expressed in milligrams per liter [mg/L] unless otherwise noted.)

Analyte/ Parameter	EPA Drinking Water Standard MCL	DEQ Cold Water Biota Standard Acute	DEQ Cold Water Biota Standard Chronic	CS-KC-SW1	CS-SR-SW2	CS-SR-SW3 Duplicate	CS-BK-SW4	CS-FB-SW5 Field Blank
Antimony (Sb)	0.006	—	—	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300
Arsenic (As)	0.010	0.34	0.15	<0.0030	0.0064	0.0064	0.0065	<0.0030
Barium (Ba)	2	—	—	0.0617	0.200	0.203	0.212	<0.0020
Cadmium (Cd)	0.005	0.0010 to 0.0011 (H)	0.00047 to 0.00050 (H)	<0.00020	0.00039	0.00037	0.00042	<0.00020
Calcium (Ca)	—	—	—	15.0	19.2	19.1	19.7	<0.040
Chromium (Cr) (Total)	0.1	—	—	<0.0060	0.0116	0.0121	0.0123	<0.0060
Copper (Cu)	1.0[a]	0.012 to 0.014 (H)	0.0086 to 0.0094 (H)	<0.010[c]	<0.010[c]	<0.010[c]	<0.010[c]	<0.010[c]
Iron (Fe)	0.3[a]	—	—	0.630	14.4	14.9	15.3	<0.060
Lead (Pb)	0.015[b]	0.045 to 0.051 (H)	0.0018 to 0.0020 (H)	0.0171	0.0181	0.0177	0.0172	<0.00300[c]
Magnesium (Mg)	—	—	—	10.4	5.83	6.02	5.53	<0.060
Manganese (Mn)	0.05[a]	—	—	0.0585	1.20	1.20	1.32	<0.0040
Mercury (Hg)	0.002	—	—	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Selenium (Se)	0.05	0.02 (T)	0.005 (T)	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300
Silver (Ag)	0.10[a]	0.0020 to 0.0024 (H)	—	<0.000100	0.000150	0.000151	0.000150	<0.000100
Zinc (Zn)	5[a]	0.089 to 0.097 (H)	0.089 to 0.098 (H)	0.0244	0.0781	0.0819	0.0827	<0.0100
Temperature (°C)	—	—	Cold water aquatic life 22°C or less or a maximum daily average not >19°C Salmonid spawning 13°C or less with a maximum daily average not >9°C	8.43	9.28	--	9.23	--
pH (su)	6.5 – 8.5[a]	—	6.5 – 9.0	8.36	8.14	--	8.12	--
Hardness (as $CaCO_3$)	—	—	—	80.4	71.9	72.4	71.9	--
Oxidation Reduction Potential (mV)	—	—	—	195	212	--	203	--
Conductivity (µs/cm)	—	—	—	0.151	0.093	--	0.09	--
Turbidity (NTU)	b	Not >50 NTU instantaneous	Not >50 NTU instantaneous and no >25 NTU over a 10 day period	31	623	--	659	--
Dissolved Oxygen	—	—	>6 ppm	15.35	15.23	--	13.14	--
Total Dissolved Solids (g/L)	—	—	—	0.098	0.01	--	0.058	--

Note: (T)—Standard in Total, (H)—Hardness dependent for Cd, Cu, Pb, Ag, Zn
Note: Shaded values indicate exceedances of water quality standards. Criteria exceeded are indicated in bold.
[a] Secondary Standard Maximum Contaminant Level (MCL) – non-enforceable guideline.
[b] Action level regulated by treatment technique.
[c] The laboratory practical quantitation limit (PQL) is higher than the calculated chronic cold water biota standards. If the result is below the MCL and acute standard, the result was not shaded as exceeding the standard.
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

4 Migration/Exposure Pathways and Targets

The purpose of this PA/SI is to evaluate if the slag pile is a potential source of metals contamination into the Salmon River and if there are any potentials for release to other pathways and targets. The following sections identify migration and exposure pathways for potential contaminant sources and releases with the associated human and ecological receptors.

4.1 Ground Water Pathways

In areas where historic mines are close to residential areas, contamination of drinking water systems may come from two types of mine sources (ore bodies and waste dumps) 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 slag pile (Figure 4) currently includes 8 public water systems (PWS) and 55 domestic wells. No PWS or domestic wells were sampled as part of this PA/SI.

Source water assessment (SWA) summary reports are available for the four PWS located within a ¼ mile radius of the slag pile: Clayton Merc (PWS#ID7190169), Salmon River Trading Post (PWS#ID7190170), Hideout Steak House (aka R&B Family Café, PWS#ID7190176), and Clayton Corral (PWS#ID7190051). The SWA contains information about the population served by each PWS and susceptibility rankings for potential contaminants. The rankings are high, moderate or low for inorganic, volatile organic, synthetic organic and microbial contaminants based on system construction, potential contaminant inventory/land use, and hydrologic sensitivity (i.e., likelihood that the water supply will become contaminated based on the hydrologic and geologic conditions surrounding the PWS).

Clayton Merc PWS and Salmon River Trading Post PWS are both identified as not serving anyone; however, connections to the PWS are present. Clayton Corral PWS is identified as serving only one person. For all three of these PWS, a final susceptibility ranking of moderate was assigned to all of the contaminant categories, which included a moderate ranking for hydrologic sensitivity. Hideout Steak House PWS was identified as serving only one person and assigned a moderate ranking for hydrologic sensitivity and a final susceptibility ranking of 'auto high' for all of the contaminant categories because detections were present above a drinking water maximum contaminant level. The SWA does not identify the specific contaminants identified in the PWS.

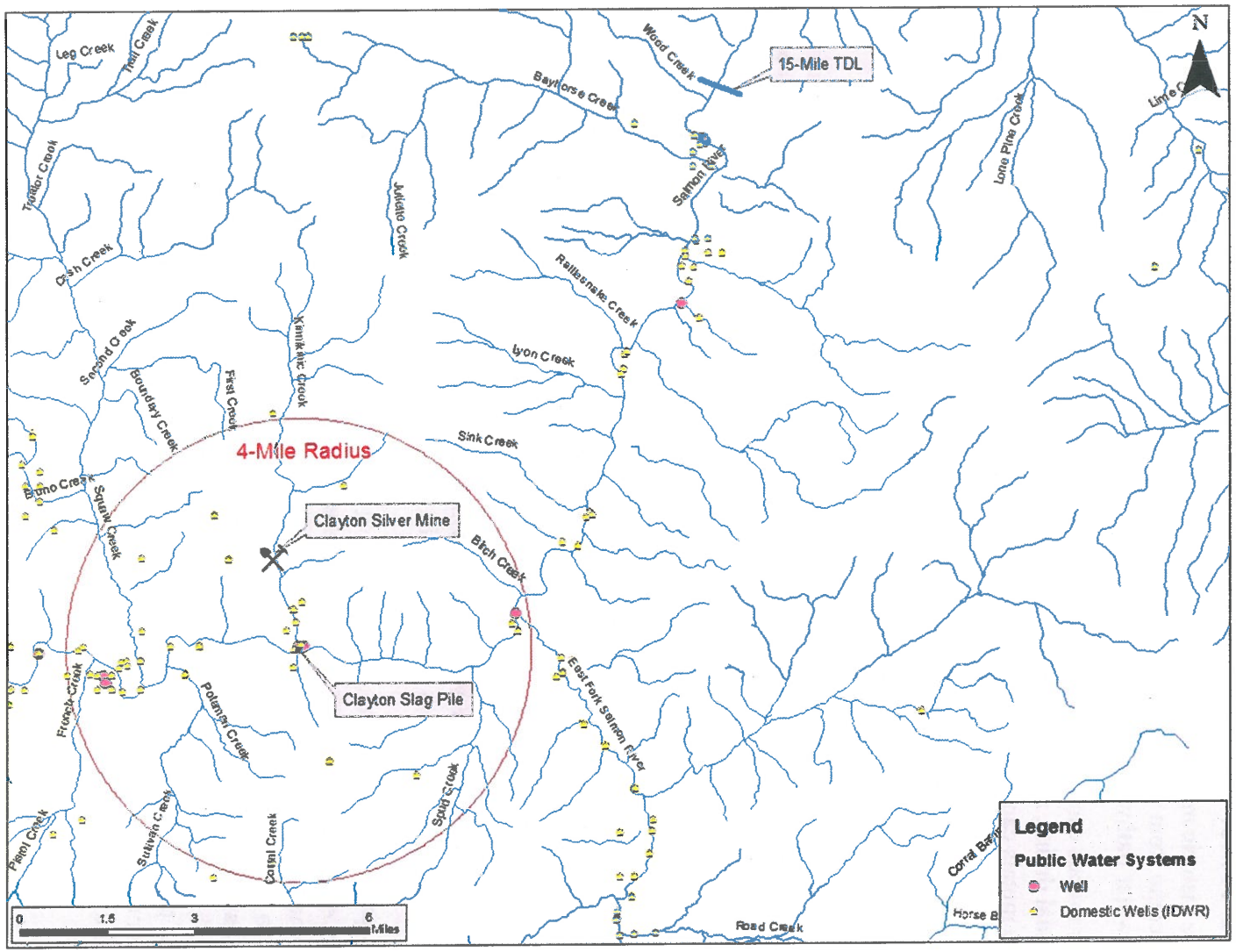

Figure 4. Domestic well and public water system locations.

Domestic well sampling was conducted in the vicinity of the slag pile as part of EPA's integrated assessment of the Clayton Silver Mine in August 1994. DEQ reviewed this information and concluded that "samples collected from residential wells did not indicate metals occurring above levels prescribed in the Safe Drinking Water Act" (DEQ, 1996).

4.2 Surface Water Pathways

The surface water migration pathway target distance limit (TDL) begins at the probable point of entry (PPE) of surface water runoff from a site to a surface water body and extends downstream for 15 miles. Since the slag pile is immediately adjacent to the Salmon River, the 15-mile TDL starts at the slag pile and ends downstream of the Wood Creek confluence (Figure 4). Other surface water features within a 2-mile radius of the slag pile include riverine wetlands along the banks of the Salmon River (Figure 5). Analysis of the surface water pathways and targets for this PA/SI include evaluation of analytical results (Section 4.2.1) and identification of sensitive, rare and threatened plant and animal species (Section 4.2.2), fisheries (Section 4.2.3), and sensitive waterways (Section 4.2.4).

4.2.1 Surface Water Analytical Results

Four surface water grab samples were collected with results presented in Section 3, Table 1. The purpose of sample collection includes:

- Kinnikinic Creek (sample CS-KC-SW1) to evaluate effectiveness of past remedial actions near the Clayton Silver Mine and determine the presence of metals loading to Kinnikinic Creek and the Salmon River.
- Salmon River at the downstream edge of the slag pile (samples CS-SR-SW2 and CS-SR-SW3 duplicate) to evaluate any possible release of metals into the river from the slag pile.
- Salmon River upstream of the confluence with Kinnikinic Creek (sample CS-BK-SW4) as a background location.

Evaluation of field parameters demonstrate that the water at all sampling sites are slightly alkaline (pH = 8.12 to 8.36) and supportive of cold water aquatic life (temperature = 8.43 to 9.28). The high turbidity observed on the Salmon River (623-659 NTU, above the DEQ instantaneous cold water biota standards) was likely influenced by the rain event on the day before and day of sampling. Turbidity on Kinnikinic Creek (31 NTU) was below the standard. Dissolved oxygen data appear suspect and may be artificially high due to instrument error since the results are not comparable to historic measurements in Kinnikinic Creek of 7-8 ppm in 2002 (Hammarstrom et al, 2010).

The low TDS values (0.01-0.098 g/L) support the decision to analyze surface water samples for total metals, instead of dissolved metals, for this sampling event. In addition, USGS sampling results from Kinnikinic Creek in 2002 demonstrated that filtered (dissolved) and unfiltered (total) water analyses are comparable (within an analytical error of $\pm$ 10%) with the exception of Al, Fe, Pb, and Zn where the unfiltered concentrations exceed the filtered (Hammarstrom et al, 2010). This information suggests that analysis of total metals provides a more conservative evaluation.

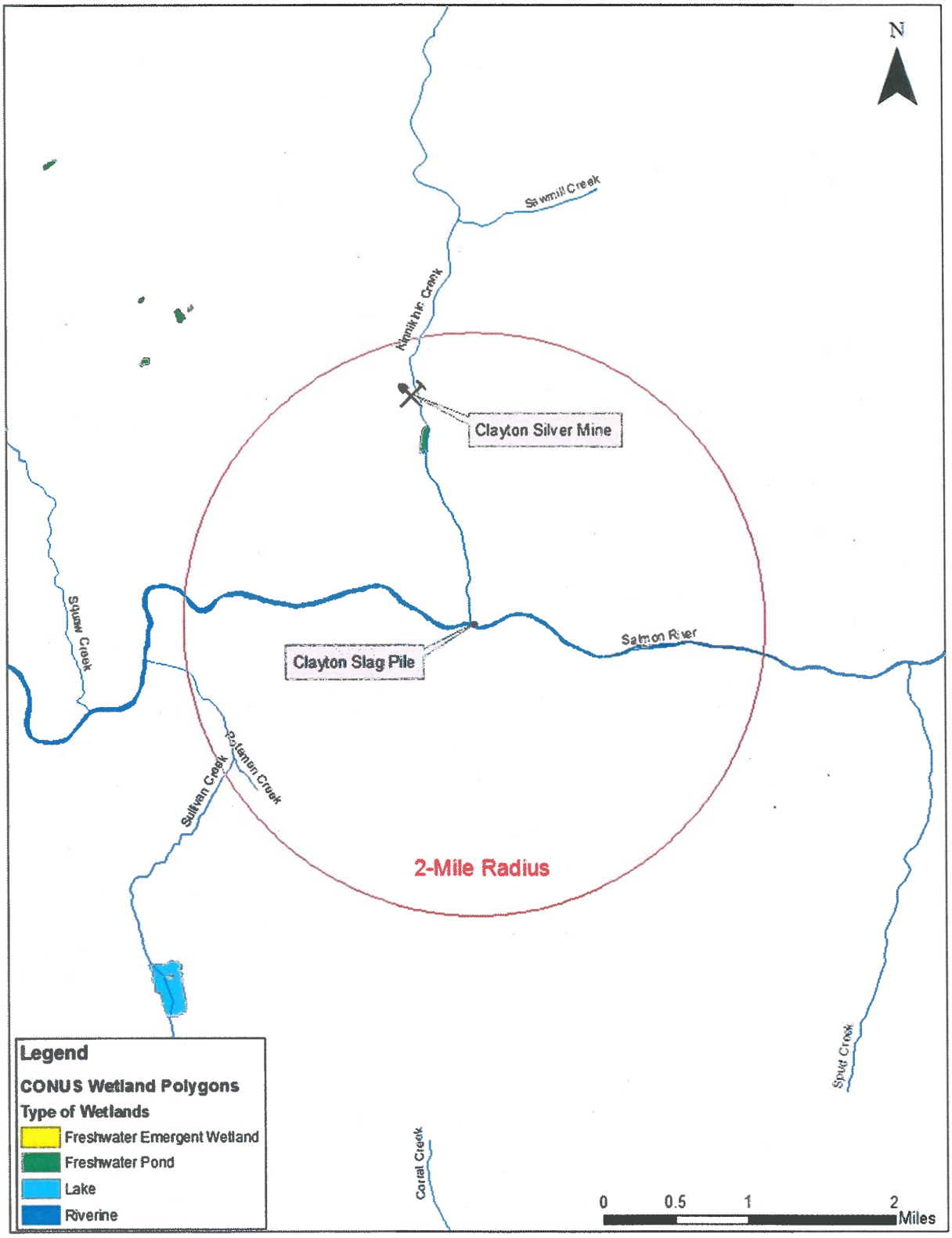

Figure 5. Wetlands.

Overall, metals concentrations from the three sampling locations (Kinnikinic Creek, Salmon River background and Salmon River downstream of the slag pile) are similar. The following comparisons are based on the metals results:

- **Water Quality Standards:** Concentrations of Fe, Pb, and Mn at all three locations exceed the drinking water standards. Cold water biota standards are only available for Pb and the concentrations of Pb at all locations also slightly exceed the chronic standard.

- **Kinnikinic Creek:** Although concentrations of Fe, Pb, and Mn exceed water quality standards in the Kinnikinic Creek sample, the results for Fe (0.630 mg/L) and Mn (0.0585 mg/L) are substantially lower than both the Salmon River background and downstream of the slag pile results for Fe (14.4 to 15.3 mg/L) and Mn (1.20 to 1.32 mg/L). The Kinnikinic Creek Pb result (0.0171 mg/L) is similar to the Salmon River background result (0.0172 mg/L). These results demonstrate that past remedial actions near the Clayton Silver Mine conducted in 2001 continue to be effective at reducing loading to Kinnikinic Creek; thus no loading to the Salmon River above background concentrations was observed in samples collected during this PA/SI sampling event.

- **Background:** None of the results downstream of the slag pile are substantially higher than background except for Pb. Pb downstream of the slag pile is only slightly higher (0.0177 to 0.0181 mg/L) than background (0.0172 mg/L); a difference of 3 to 5% higher. However, the possible remaining source of metals may be larger than the present slag pile adjacent to the Salmon River because previous documents identify that slag was dumped directly into the river (Hammarstrom et al., 2010).

- **Clayton Slag Pile:** Previous geochemical analysis of a composite slag sample showed that the slag contains extremely high concentrations of lead (5.3 wt. %; Hammarstrom et al., 2010). Comparisons of Pb concentrations at the background and downstream of the slag pile locations demonstrate that contributions of Pb from the slag pile are minimal.

4.2.2 Sensitive, Rare, and Threatened Plant and Animal Species

Sensitive species can have large habitat ranges overlapping the area surrounding the slag pile. Due to the size of ranges, these species may not receive significant exposure time or doses to heavy metals. Given the low probability of the slag pile acting as a source of metals release to the environment, significant exposure is unlikely.

For plant species, five rare or sensitive plant species are documented to exist within the 4-mile radius of the slag pile (Figure 6):

- Lemhi Milkvetch (*Astragalus aquilonius*)
- Wavy-leaf Thelypody (*Thelypodium repandum*)
- Challis Crazyweed (*Oxtropis besseyi var. salmonensis*)
- White Eatonella (*Eatonella nivea*)
- Challis Milkvetch (*Astragalus amblytropis*)

For animal species, below is a list of animals with habitat ranges within the 4-mile radius of the slag pile. The nongame animals, with the exception of the lynx located just outside the 4-mile radius, are listed as "species of concern" and have no status. Game animals are regulated by the Idaho Department of Fish and Game (IDFG) (Figure 7).

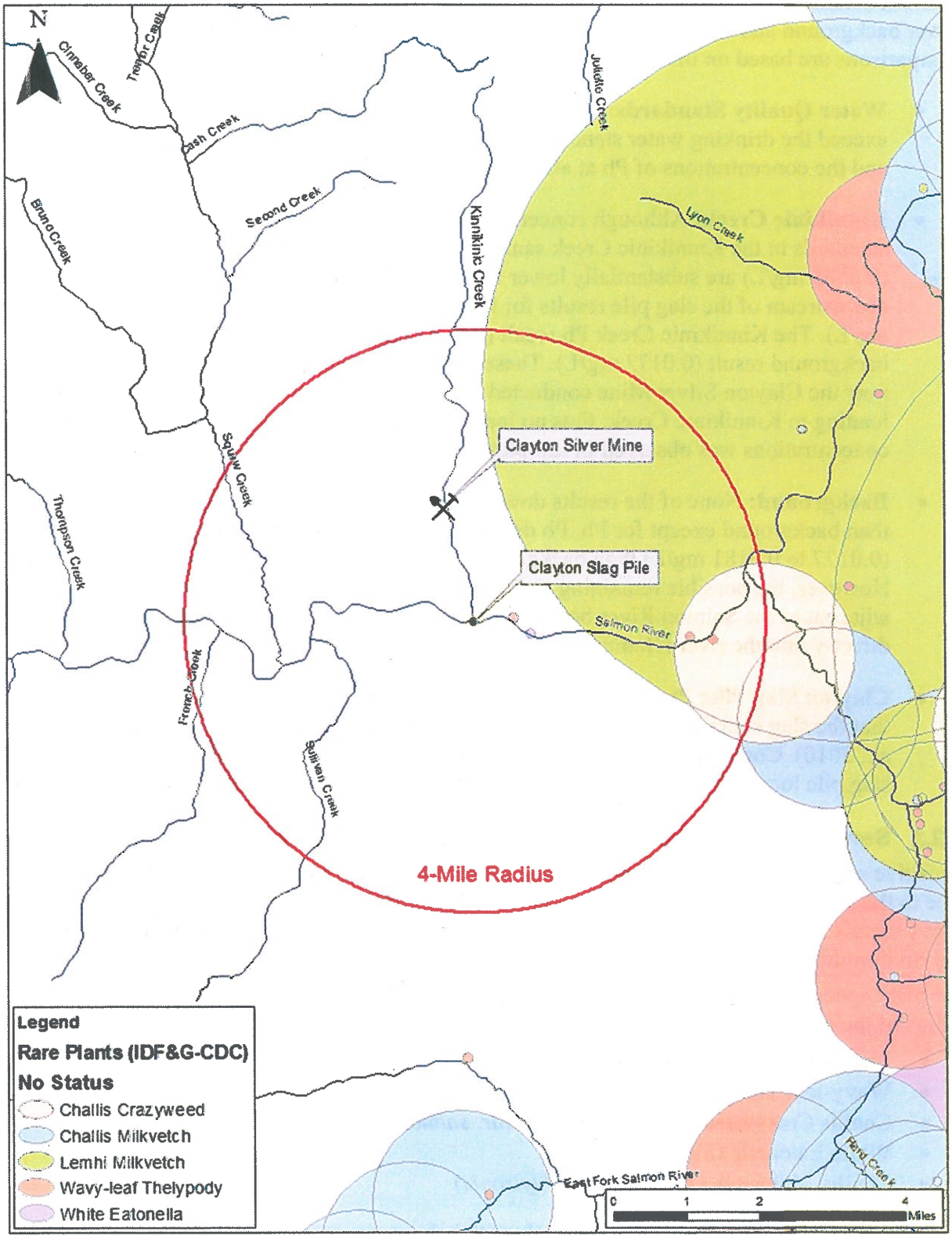

Figure 6. Sensitive plant species in and around the Clayton Slag Pile.

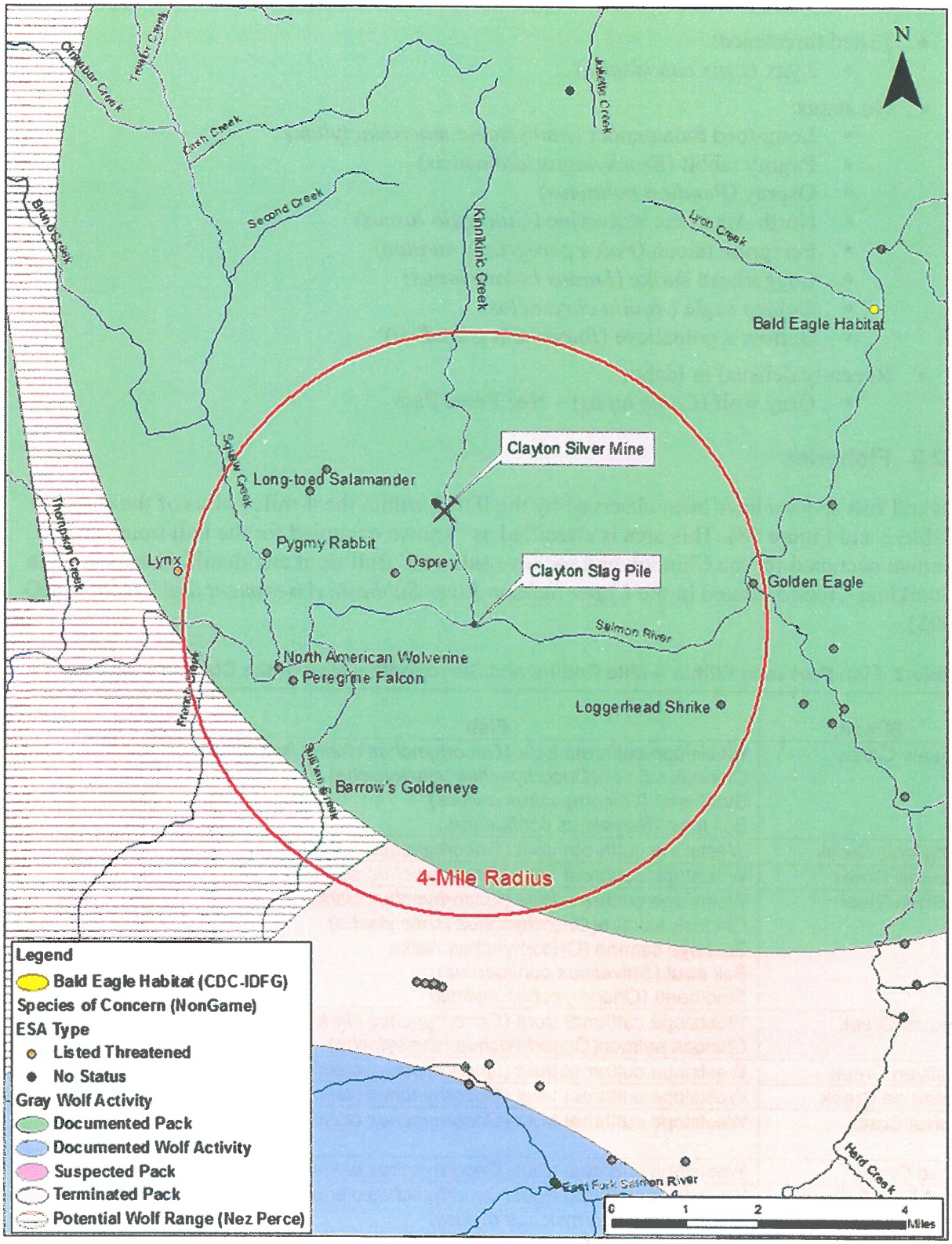

Figure 7. Sensitive animal species in and around the Clayton Slag Pile.

- Listed threatened:
  - Lynx (*Lynx canadensis*)
- No status:
  - Long-toed Salamander (*Ambystoma macrodactylum*)
  - Pygmy rabbit (*Brachylagus idahoensis*)
  - Osprey (*Pandion haliaetus*)
  - North American wolverine (*Gulo gulo luscus*)
  - Peregrine falcon (*Falco peregrinus anatum*)
  - Loggerhead shrike (*Lanius ludovicianus*)
  - Golden eagle (*Aquila chrysaetos*)
  - Barrow's goldeneye (*Bucephala islandica*)
- Recently delisted in Idaho:
  - Gray wolf (*Canis lupus*) – Nez Perce Pack

4.2.3 Fisheries

Several fish species have been observed by the IDFG within the 4-mile radius of the slag pile (Table 2 and Figure 68). This area is classified as "known occupied for the bull trout" and "known occupied for the Chinook and sockeye salmon." Bull trout are identified as present in Kinnikinic Creek as stated in the *Upper Salmon River Subbasin Assessment and TMDL* (DEQ 2003).

Table 2. Fish Presence Within 4-Mile Radius and Surrounding Area of the Clayton Slag Pile.

Stream	Fish	Sensitive Species
Squaw Creek	Westslope cutthroat trout (*Oncorhynchus clarkia lewisi*) Chinook salmon(*Oncorhynchus tshawytscha*) Steelhead (*Oncorhynchus mykiss*) Bull trout (*Salvelinus confluentus*)	No Yes No Yes
Kinnikinic Creek	Westslope cutthroat trout (*Oncorhynchus clarkia lewisi*)	No
Sawmill Creek	Westslope cutthroat trout (*Oncorhynchus clarkia lewisi*)	No
Salmon River	Westslope cutthroat trout (*Oncorhynchus clarkia lewisi*) Chinook salmon(*Oncorhynchus tshawytscha*) Sockeye salmon (Oncorhynchus nerka Bull trout (*Salvelinus confluentus*) Steelhead (*Oncorhynchus mykiss*)	No Yes Yes Yes No
French Creek	Westslope cutthroat trout (*Oncorhynchus clarkia lewisi*) Chinook salmon(*Oncorhynchus tshawytscha*)	No Yes
Sullivan Creek	Westslope cutthroat trout (*Oncorhynchus clarkia lewisi*)	No
Potaman Creek	Westslope cutthroat trout (*Oncorhynchus clarkia lewisi*)	No
Corral Creek	Westslope cutthroat trout (*Oncorhynchus clarkia lewisi*)	No
Spud Creek	Westslope cutthroat trout (*Oncorhynchus clarkia lewisi*)	No
East Fork Salmon River	Westslope cutthroat trout (*Oncorhynchus clarkia lewisi*) Steelhead (*Oncorhynchus mykiss*) Chinook salmon(*Oncorhynchus tshawytscha*) Bull trout (*Salvelinus confluentus*)	No No Yes Yes
First Creek	Westslope cutthroat trout (*Oncorhynchus clarkia lewisi*)	No

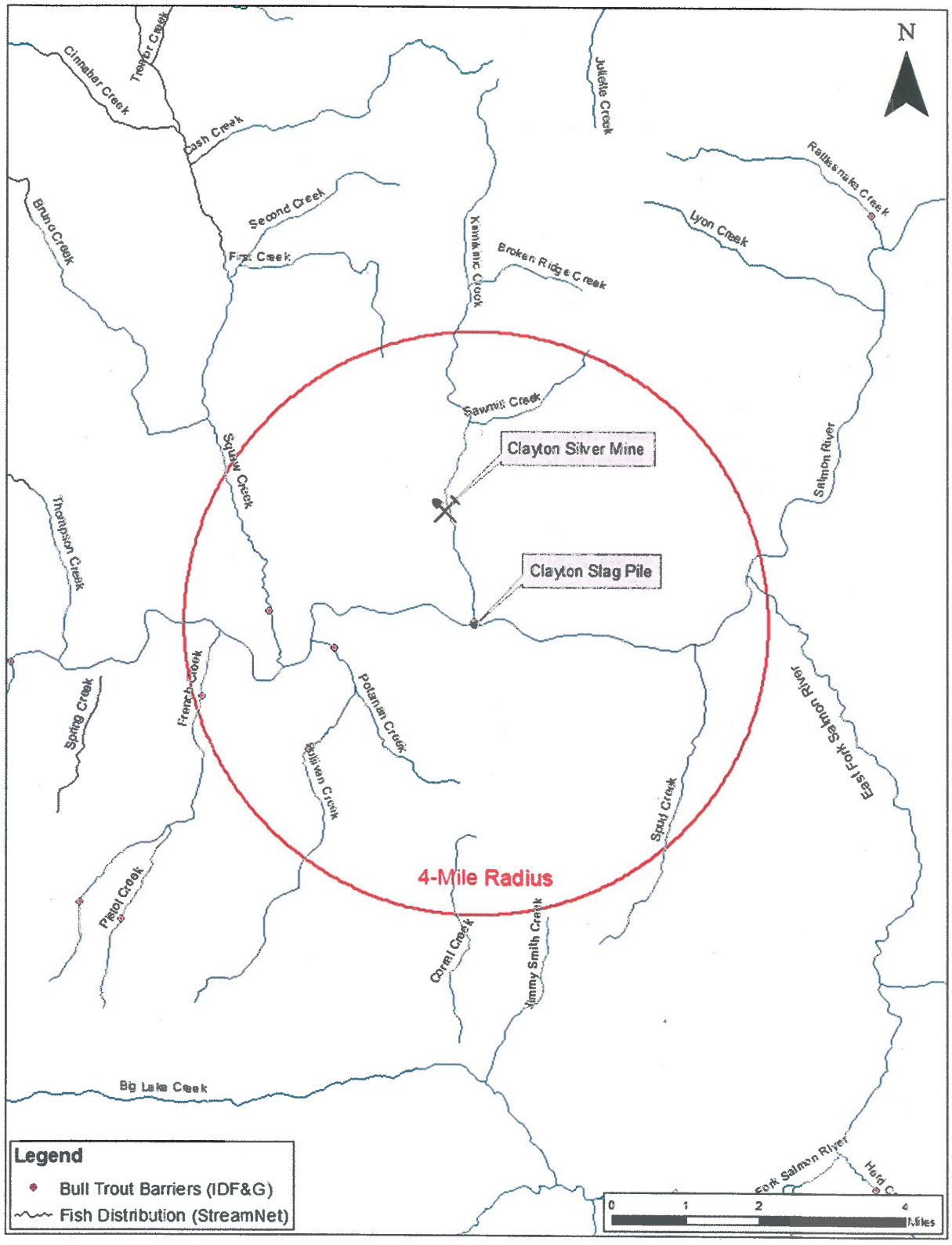

Figure 8. Fisheries within a 4-mile radius and in the vicinity of the Clayton Slag Pile.

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). Figure 9 illustrates the §303(d)-listed streams, based on temperature, in this area. As part of this PA/SI, water quality samples were collected from the Salmon River (ID17060201000252_05, Squaw Creek to East Fork Salmon River) and Kinnikinic Creek (ID17060201SL020_02, Kinnikinic Creek – source to mouth) which are part of the Upper Salmon Subbasin (HUC 17060201). As listed in the Integrated Report, the Salmon River (Squaw Creek to East Fork Salmon River) is fully supporting for cold water aquatic life and primary contact recreation. Kinnikinic Creek is fully supporting for cold water aquatic life, salmonid spawning and secondary contact recreation.

4.3 Soil Exposures and Air Pathways

Soil and air samples were not collected as part of this PA/SI since there are no indications of contaminant releases to these media from the slag pile. Given the inert nature of the slag pile, minimal to no soil exposures or releases to the air pathway are expected; therefore, the soil exposure and air pathways are not complete.

Past sampling of soil and air was conducted as part of the EPA's integrated assessment of the Clayton Silver Mine in August 1994. Results, conclusions and recommendations were addressed by EPA (EPA 1999); however, no potential releases to soil or air specifically from the slag pile were identified.

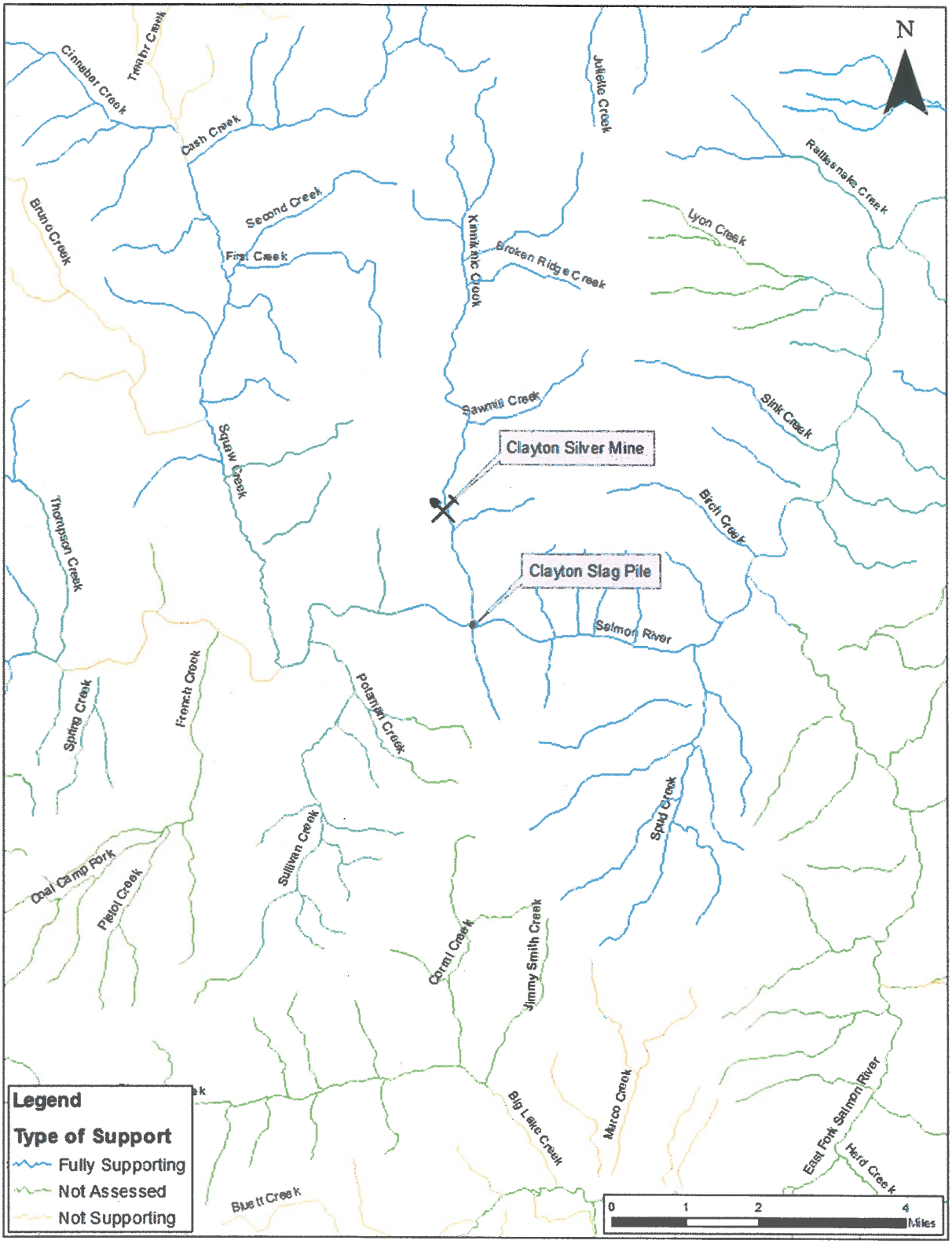

Figure 9. State of Idaho §303(d) map for impaired waters not supporting cold water aquatic life and salmonid spawning due to temperature.

5 Summary and Conclusions

A determination of *No Remedial Action Planned*, or NRAP, is recommended for the slag pile. Based on the current conditions at the site, DEQ did not find any significant evidence indicating potential adverse toxicological effects to human or ecological receptors and no additional work is necessary to manage the potential effects. This determination does not account for risks associated with the physical hazards of the slag pile such as high walls or potential unstable ground.

Sampling was conducted to evaluate the surface water pathway since it was identified as the primary pathway of concern. No samples were collected during this PA/SI to evaluate soil exposure or the ground water or air pathways since no information gathered as part of desktop research indicates possible exposures to these pathways from the slag pile.

The following conclusions are based on the water quality samples collected from Kinnikinic Creek and the Salmon River (background and downstream of the slag pile) during this PA/SI sampling event:

- **Water Quality Standards:** Concentrations of Fe, Pb, and Mn exceed the drinking water standards at all three sample locations. Cold water biota standards are only available for Pb and the concentrations of Pb at all locations also slightly exceed the chronic standard.

- **Kinniknic Creek:** No metals loading from Kinniknic Creek to the Salmon River above background concentrations was observed during this PA/SI; therefore, past remedial actions near the Clayton Silver Mine (conducted in 2001) continue to be effective at reducing loading to Kinnikinic Creek. Fe and Mn concentrations in Kinnikinic Creek are substantially lower than Salmon River background and Pb concentrations are similar to background.

- **Clayton Slag Pile:** Comparisons of Pb concentrations at the background and downstream of the slag pile locations demonstrate that contributions of Pb from the slag pile are minimal. Pb downstream of the slag pile is only slightly higher than background, an observed difference of 3 to 5% higher.

Based on existing conditions and uses, historic information, data observations made during the site visit, sample analysis, potential pathways of contaminants to receptors, and potential exposures to ecological and human receptors, DEQ recommends a NRAP determination for the Clayton Slag Pile since no impacts to human health or the environment directly related to the slag pile were identified.

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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) 784-1258 • FAX: (208) 783-0891

Page 1 of 1

W3JTC081

FOR SVL USE ONLY
SVL JOB #

TEMP on Receipt: 17.8

Table 1. – Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other Field Blank

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

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

Project Name: Clayton Slag Pile

Sampler's Signature: Dana Swift

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

Please take care to distinguish between:
1 and I
2 and Z
5 and S
ø and O
Thanks!

	Sample ID	Collection: Date	Collection: Time	Collected by: (Init.)	Misc.: Matrix Type (From Table 1)	Misc.: No. of Containers	Preservative(s): Unpreserved	HNO_3 Filtered	HNO_3 Unfiltered	HCl	H_2SO_4	NaOH	Other (Specify)	Analyses Required: 200.7 Ba, Cr, Cu, Fe, Mn, Zn, Ni	200.8 As, Cd, Pb, Se, Sb, Ag	Hg by 245.1 CVAA	Hardness 200.7/SM2340B	Rush Instructions (Days)	Comments
1	CS-KC-SW1	9/30/13	4:55	DS	1	1			X					X	X	X	X		
2	CS-SR-SW2	↓	5:05	DS	1	1			X					X	X	X	X		
3	CS-SR-SW3		5:05	DS	1	1			X					X	X	X	X		
4	CS-BK-SW4	↓	5:30	DS	1	1			X					X	X	X	X		
5	CS-FB-SW5	↓	5:40	DS	7	1		X						X	X	X	X		
6																			
7																			
8																			
9																			
10																			

Dana Swift 10/2/13

Relinquished by:	Dana Swift	Date:	10/2/13	Time:	10:30	Received by:	
Relinquished by:		Date:		Time:		Received by:	

Date: 10-3-13 Time: 12:30

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

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: 10/3/13 By: [signature]

SVL Work No: W3J0081

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 Dils
4	Temperature blank or cooler temperature	✓				Temp. 17.8 °C. HNO3 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: Clayton Mine 2013
Work Order: **W3J0081**
Reported: 18-Oct-13 14:05

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Sampled By	Date Received
CS-KC-SW1	W3J0081-01	Surface Water	30-Sep-13 16:55	DS	03-Oct-2013
CS-SR-SW2	W3J0081-02	Surface Water	30-Sep-13 17:05	DS	03-Oct-2013
CS-SR-SW3	W3J0081-03	Surface Water	30-Sep-13 17:05	DS	03-Oct-2013
CS-BK-SW4	W3J0081-04	Surface Water	30-Sep-13 17:30	DS	03-Oct-2013
CS-FB-SW5	W3J0081-05	Field Blank	30-Sep-13 17:40	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.

SVL ANALYTICAL
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: Clayton Mine 2013
Work Order: **W3J0081**
Reported: 18-Oct-13 14:05

Client Sample ID: **CS-KC-SW1**
SVL Sample ID: **W3J0081-01 (Surface Water)**

Sampled: 30-Sep-13 16:55
Received: 03-Oct-13
Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total)										
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W341148	STA	10/09/13 14:20	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	**Barium**	0.0617	mg/L	0.0020	0.0002		W340368	DT	10/18/13 10:09	
EPA 200.7	**Calcium**	15.0	mg/L	0.040	0.008		W340368	DT	10/18/13 10:09	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0008		W340368	DT	10/18/13 10:09	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.003		W340368	DT	10/18/13 10:09	
EPA 200.7	**Iron**	0.630	mg/L	0.060	0.012		W340368	DT	10/18/13 10:09	
EPA 200.7	**Magnesium**	10.4	mg/L	0.060	0.020		W340368	DT	10/18/13 10:09	
EPA 200.7	**Manganese**	0.0585	mg/L	0.0040	0.0005		W340368	DT	10/18/13 10:09	
EPA 200.7	**Zinc**	0.0244	mg/L	0.0100	0.0012		W340368	DT	10/18/13 10:09	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00012	2.5	W341005	KWH	10/16/13 07:15	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0004	2.5	W341005	KWH	10/16/13 07:15	
EPA 200.8	Cadmium	< 0.00020	mg/L	0.00020	0.00004	2.5	W341005	KWH	10/16/13 07:15	
EPA 200.8	**Lead**	0.0171	mg/L	0.00300	0.00006	2.5	W341005	KWH	10/16/13 07:15	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00032	2.5	W341005	KWH	10/16/13 07:15	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000015	2.5	W341005	KWH	10/16/13 07:15	
SM 2340B	**Hardness (as CaCO3)**	80.4	mg/L	0.347	0.099		N/A		10/18/13 10:09	

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: Clayton Mine 2013
Work Order: **W3J0081**
Reported: 18-Oct-13 14:05

Client Sample ID: **CS-SR-SW2**
SVL Sample ID: **W3J0081-02 (Surface Water)**

Sampled: 30-Sep-13 17:05
Received: 03-Oct-13
Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total)										
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W341148	STA	10/09/13 14:21	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	**Barium**	0.200	mg/L	0.0020	0.0002		W340368	DT	10/18/13 10:20	
EPA 200.7	**Calcium**	19.2	mg/L	0.040	0.008		W340368	DT	10/18/13 10:20	
EPA 200.7	**Chromium**	0.0116	mg/L	0.0060	0.0008		W340368	DT	10/18/13 10:20	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.003		W340368	DT	10/18/13 10:20	
EPA 200.7	**Iron**	14.4	mg/L	0.060	0.012		W340368	DT	10/18/13 10:20	
EPA 200.7	**Magnesium**	5.83	mg/L	0.060	0.020		W340368	DT	10/18/13 10:20	
EPA 200.7	**Manganese**	1.20	mg/L	0.0040	0.0005		W340368	DT	10/18/13 10:20	
EPA 200.7	**Zinc**	0.0781	mg/L	0.0100	0.0012		W340368	DT	10/18/13 10:20	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00012	2.5	W341005	KWH	10/16/13 07:37	
EPA 200.8	**Arsenic**	0.0064	mg/L	0.0030	0.0004	2.5	W341005	KWH	10/16/13 07:37	
EPA 200.8	**Cadmium**	0.00039	mg/L	0.00020	0.00004	2.5	W341005	KWH	10/16/13 07:37	
EPA 200.8	**Lead**	0.0181	mg/L	0.00300	0.00006	2.5	W341005	KWH	10/16/13 07:37	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00032	2.5	W341005	KWH	10/16/13 07:37	
EPA 200.8	**Silver**	0.000150	mg/L	0.000100	0.000015	2.5	W341005	KWH	10/16/13 07:37	
SM 2340B	**Hardness (as CaCO3)**	71.9	mg/L	0.347	0.099		N/A		10/18/13 10:20	

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: Clayton Mine 2013
Work Order: **W3J0081**
Reported: 18-Oct-13 14:05

Client Sample ID: **CS-SR-SW3**
SVL Sample ID: **W3J0081-03 (Surface Water)**

Sampled: 30-Sep-13 17:05
Received: 03-Oct-13
Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total)										
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W341153	STA	10/09/13 15:23	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	**Barium**	0.203	mg/L	0.0020	0.0002		W340368	DT	10/18/13 10:23	
EPA 200.7	**Calcium**	19.1	mg/L	0.040	0.008		W340368	DT	10/18/13 10:23	
EPA 200.7	**Chromium**	0.0121	mg/L	0.0060	0.0008		W340368	DT	10/18/13 10:23	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.003		W340368	DT	10/18/13 10:23	
EPA 200.7	**Iron**	14.9	mg/L	0.060	0.012		W340368	DT	10/18/13 10:23	
EPA 200.7	**Magnesium**	6.02	mg/L	0.060	0.020		W340368	DT	10/18/13 10:23	
EPA 200.7	**Manganese**	1.20	mg/L	0.0040	0.0005		W340368	DT	10/18/13 10:23	
EPA 200.7	**Zinc**	0.0819	mg/L	0.0100	0.0012		W340368	DT	10/18/13 10:23	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00012	2.5	W341005	KWH	10/16/13 07:41	
EPA 200.8	**Arsenic**	0.0064	mg/L	0.0030	0.0004	2.5	W341005	KWH	10/16/13 07:41	
EPA 200.8	**Cadmium**	0.00037	mg/L	0.00020	0.00004	2.5	W341005	KWH	10/16/13 07:41	
EPA 200.8	**Lead**	0.0177	mg/L	0.00300	0.00006	2.5	W341005	KWH	10/16/13 07:41	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00032	2.5	W341005	KWH	10/16/13 07:41	
EPA 200.8	**Silver**	0.000151	mg/L	0.000100	0.000015	2.5	W341005	KWH	10/16/13 07:41	
SM 2340B	**Hardness (as CaCO3)**	72.4	mg/L	0.347	0.099		N/A		10/18/13 10:23	

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: Clayton Mine 2013
Work Order: **W3J0081**
Reported: 18-Oct-13 14:05

Client Sample ID: **CS-BK-SW4**
SVL Sample ID: **W3J0081-04 (Surface Water)**

Sampled: 30-Sep-13 17:30
Received: 03-Oct-13
Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Total)										
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W341153	STA	10/09/13 15:29	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	**Barium**	0.212	mg/L	0.0020	0.0002		W340368	DT	10/18/13 10:26	
EPA 200.7	**Calcium**	19.7	mg/L	0.040	0.008		W340368	DT	10/18/13 10:26	
EPA 200.7	**Chromium**	0.0123	mg/L	0.0060	0.0008		W340368	DT	10/18/13 10:26	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.003		W340368	DT	10/18/13 10:26	
EPA 200.7	**Iron**	15.3	mg/L	0.060	0.012		W340368	DT	10/18/13 10:26	
EPA 200.7	**Magnesium**	5.53	mg/L	0.060	0.020		W340368	DT	10/18/13 10:26	
EPA 200.7	**Manganese**	1.32	mg/L	0.0040	0.0005		W340368	DT	10/18/13 10:26	
EPA 200.7	**Zinc**	0.0827	mg/L	0.0100	0.0012		W340368	DT	10/18/13 10:26	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00012	2.5	W341005	KWH	10/16/13 07:46	
EPA 200.8	**Arsenic**	0.0065	mg/L	0.0030	0.0004	2.5	W341005	KWH	10/16/13 07:46	
EPA 200.8	**Cadmium**	0.00042	mg/L	0.00020	0.00004	2.5	W341005	KWH	10/16/13 07:46	
EPA 200.8	**Lead**	0.0172	mg/L	0.00300	0.00006	2.5	W341005	KWH	10/16/13 07:46	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00032	2.5	W341005	KWH	10/16/13 07:46	
EPA 200.8	**Silver**	0.000150	mg/L	0.000100	0.000015	2.5	W341005	KWH	10/16/13 07:46	
SM 2340B	**Hardness (as CaCO3)**	71.9	mg/L	0.347	0.099		N/A		10/18/13 10:26	

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

John Kern
Laboratory Director

SVL ANALYTICAL
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: Clayton Mine 2013
Work Order: **W3J0081**
Reported: 18-Oct-13 14:05

Client Sample ID: **CS-FB-SW5**
SVL Sample ID: **W3J0081-05 (Field Blank)**

Sample Report Page 1 of 1

Sampled: 30-Sep-13 17:40
Received: 03-Oct-13
Sampled By: DS

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Metals (Dissolved)										
EPA 200.7	Barium	< 0.0020	mg/L	0.0020	0.0005		W340371	DT	10/18/13 11:42	
EPA 200.7	Calcium	< 0.040	mg/L	0.040	0.015		W340371	DT	10/18/13 11:42	
EPA 200.7	Chromium	< 0.0060	mg/L	0.0060	0.0015		W340371	DT	10/18/13 11:42	
EPA 200.7	Copper	< 0.010	mg/L	0.010	0.006		W340371	DT	10/18/13 11:42	
EPA 200.7	Iron	< 0.060	mg/L	0.060	0.023		W340371	DT	10/18/13 11:42	
EPA 200.7	Magnesium	< 0.060	mg/L	0.060	0.039		W340371	DT	10/18/13 11:42	
EPA 200.7	Manganese	< 0.0040	mg/L	0.0040	0.0010		W340371	DT	10/18/13 11:42	
EPA 200.7	Zinc	< 0.0100	mg/L	0.0100	0.0023		W340371	DT	10/18/13 11:42	
EPA 200.8	Antimony	< 0.00300	mg/L	0.00300	0.00010		W341022	KWH	10/15/13 09:34	
EPA 200.8	Arsenic	< 0.0030	mg/L	0.0030	0.0003		W341022	KWH	10/15/13 09:34	
EPA 200.8	Cadmium	< 0.00020	mg/L	0.00020	0.00003		W341022	KWH	10/15/13 09:34	
EPA 200.8	Lead	< 0.00300	mg/L	0.00300	0.000048		W341022	KWH	10/15/13 09:34	
EPA 200.8	Selenium	< 0.00300	mg/L	0.00300	0.00026		W341022	KWH	10/15/13 09:34	
EPA 200.8	Silver	< 0.000100	mg/L	0.000100	0.000012		W341022	KWH	10/15/13 09:34	
EPA 245.1	Mercury	< 0.00020	mg/L	0.00020	0.000045		W341149	STA	10/09/13 14:31	

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: Clayton Mine 2013
Work Order: **W3J0081**
Reported: 18-Oct-13 14:05

Quality Control - BLANK Data

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
Metals (Total)								
EPA 245.1	Mercury	mg/L	<0.00020	0.000045	0.00020	W341148	09-Oct-13	
EPA 245.1	Mercury	mg/L	<0.00020	0.000045	0.00020	W341153	09-Oct-13	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)								
EPA 200.7	Barium	mg/L	<0.0020	0.0002	0.0020	W340368	18-Oct-13	
EPA 200.7	Calcium	mg/L	<0.040	0.008	0.040	W340368	18-Oct-13	
EPA 200.7	Chromium	mg/L	<0.0060	0.0008	0.0060	W340368	18-Oct-13	
EPA 200.7	Copper	mg/L	<0.010	0.003	0.010	W340368	18-Oct-13	
EPA 200.7	Iron	mg/L	<0.060	0.012	0.060	W340368	18-Oct-13	
EPA 200.7	Magnesium	mg/L	<0.060	0.020	0.060	W340368	18-Oct-13	
EPA 200.7	Manganese	mg/L	<0.0040	0.0005	0.0040	W340368	18-Oct-13	
EPA 200.7	Zinc	mg/L	<0.0100	0.0012	0.0100	W340368	18-Oct-13	
EPA 200.8	Antimony	mg/L	<0.00300	0.00012	0.00300	W341005	16-Oct-13	
EPA 200.8	Arsenic	mg/L	<0.0030	0.0004	0.0030	W341005	16-Oct-13	
EPA 200.8	Cadmium	mg/L	<0.00020	0.00004	0.00020	W341005	16-Oct-13	
EPA 200.8	Lead	mg/L	<0.00300	0.00006	0.00300	W341005	16-Oct-13	
EPA 200.8	Selenium	mg/L	<0.00300	0.00032	0.00300	W341005	16-Oct-13	
EPA 200.8	Silver	mg/L	<0.000100	0.000015	0.000100	W341005	16-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	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	W341149	09-Oct-13	

Quality Control - LABORATORY CONTROL SAMPLE Data

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Metals (Total)									
EPA 245.1	Mercury	mg/L	0.00479	0.00500	95.8	85 - 115	W341148	09-Oct-13	
EPA 245.1	Mercury	mg/L	0.00470	0.00500	94.0	85 - 115	W341153	09-Oct-13	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)									
EPA 200.7	Barium	mg/L	1.00	1.00	100	85 - 115	W340368	18-Oct-13	
EPA 200.7	Calcium	mg/L	19.7	20.0	98.6	85 - 115	W340368	18-Oct-13	
EPA 200.7	Chromium	mg/L	1.00	1.00	100	85 - 115	W340368	18-Oct-13	
EPA 200.7	Copper	mg/L	0.994	1.00	99.4	85 - 115	W340368	18-Oct-13	
EPA 200.7	Iron	mg/L	10.5	10.0	105	85 - 115	W340368	18-Oct-13	
EPA 200.7	Magnesium	mg/L	21.2	20.0	106	85 - 115	W340368	18-Oct-13	
EPA 200.7	Manganese	mg/L	0.994	1.00	99.4	85 - 115	W340368	18-Oct-13	
EPA 200.7	Zinc	mg/L	0.987	1.00	98.7	85 - 115	W340368	18-Oct-13	
EPA 200.8	Antimony	mg/L	0.0262	0.0250	105	85 - 115	W341005	16-Oct-13	
EPA 200.8	Arsenic	mg/L	0.0251	0.0250	100	85 - 115	W341005	16-Oct-13	

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: Clayton Mine 2013
Work Order: **W3J0081**
Reported: 18-Oct-13 14:05

Quality Control - LABORATORY CONTROL SAMPLE Data (Continued)

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Metals (Total Recoverable--reportable as Total per 40 CFR 136) (Continued)									
EPA 200.8	Cadmium	mg/L	0.0260	0.0250	104	85 - 115	W341005	16-Oct-13	
EPA 200.8	Lead	mg/L	0.0265	0.0250	106	85 - 115	W341005	16-Oct-13	
EPA 200.8	Selenium	mg/L	0.0238	0.0250	95.2	85 - 115	W341005	16-Oct-13	
EPA 200.8	Silver	mg/L	0.0268	0.0250	107	85 - 115	W341005	16-Oct-13	
Metals (Dissolved)									
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	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	0.00467	0.00500	93.4	85 - 115	W341149	09-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
Metals (Total)										
EPA 245.1	Mercury	mg/L	0.00094	<0.00020	0.00100	93.9	70 - 130	W341148	09-Oct-13	
EPA 245.1	Mercury	mg/L	0.00096	<0.00020	0.00100	95.9	70 - 130	W341148	09-Oct-13	
EPA 245.1	Mercury	mg/L	0.00098	<0.00020	0.00100	98.0	70 - 130	W341153	09-Oct-13	
EPA 245.1	Mercury	mg/L	0.00096	<0.00020	0.00100	95.9	70 - 130	W341153	09-Oct-13	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	Barium	mg/L	1.04	0.0617	1.00	97.7	70 - 130	W340368	18-Oct-13	
EPA 200.7	Barium	mg/L	0.964	0.0101	1.00	95.4	70 - 130	W340368	18-Oct-13	
EPA 200.7	Calcium	mg/L	34.8	15.0	20.0	98.8	70 - 130	W340368	18-Oct-13	
EPA 200.7	Calcium	mg/L	515	503	20.0	R > 4S	70 - 130	W340368	18-Oct-13	D2,M3
EPA 200.7	Chromium	mg/L	0.984	<0.0060	1.00	98.3	70 - 130	W340368	18-Oct-13	
EPA 200.7	Chromium	mg/L	0.958	<0.0060	1.00	95.5	70 - 130	W340368	18-Oct-13	
EPA 200.7	Copper	mg/L	0.974	<0.010	1.00	97.4	70 - 130	W340368	18-Oct-13	
EPA 200.7	Copper	mg/L	6.80	5.77	1.00	102	70 - 130	W340368	18-Oct-13	
EPA 200.7	Iron	mg/L	11.4	0.630	10.0	107	70 - 130	W340368	18-Oct-13	
EPA 200.7	Iron	mg/L	10.2	0.160	10.0	101	70 - 130	W340368	18-Oct-13	
EPA 200.7	Magnesium	mg/L	30.5	10.4	20.0	100	70 - 130	W340368	18-Oct-13	
EPA 200.7	Magnesium	mg/L	90.7	66.3	20.0	122	70 - 130	W340368	18-Oct-13	M3
EPA 200.7	Manganese	mg/L	1.03	0.0585	1.00	97.3	70 - 130	W340368	18-Oct-13	
EPA 200.7	Manganese	mg/L	11.3	10.5	1.00	76.7	70 - 130	W340368	18-Oct-13	
EPA 200.7	Zinc	mg/L	0.978	0.0244	1.00	95.4	70 - 130	W340368	18-Oct-13	
EPA 200.7	Zinc	mg/L	8.86	8.22	1.00	R > 4S	70 - 130	W340368	18-Oct-13	M2
EPA 200.8	Antimony	mg/L	0.0246	<0.00300	0.0250	97.0	70 - 130	W341005	16-Oct-13	
EPA 200.8	Arsenic	mg/L	0.0261	<0.0030	0.0250	96.5	70 - 130	W341005	16-Oct-13	
EPA 200.8	Cadmium	mg/L	0.0246	<0.00020	0.0250	98.0	70 - 130	W341005	16-Oct-13	
EPA 200.8	Lead	mg/L	0.0426	0.0171	0.0250	102	70 - 130	W341005	16-Oct-13	
EPA 200.8	Selenium	mg/L	0.0234	<0.00300	0.0250	93.4	70 - 130	W341005	16-Oct-13	

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: Clayton Mine 2013
Work Order: **W3J0081**
Reported: 18-Oct-13 14:05

Quality Control - MATRIX SPIKE Data (Continued)

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Metals (Total Recoverable--reportable as Total per 40 CFR 136) (Continued)										
EPA 200.8	Silver	mg/L	0.0254	<0.000100	0.0250	101	70 - 130	W341005	16-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	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	0.00096	<0.00020	0.00100	95.9	70 - 130	W341149	09-Oct-13	
EPA 245.1	Mercury	mg/L	0.00096	<0.00020	0.00100	95.9	70 - 130	W341149	09-Oct-13	

Quality Control - MATRIX SPIKE DUPLICATE Data

Method	Analyte	Units	MSD Result	Spike Result	Spike Level	RPD	RPD Limit	Batch ID	Analyzed	Notes
Metals (Total)										
EPA 245.1	Mercury	mg/L	0.00096	0.00094	0.00100	2.1	20	W341148	09-Oct-13	
EPA 245.1	Mercury	mg/L	0.00097	0.00098	0.00100	1.0	20	W341153	09-Oct-13	
Metals (Total Recoverable--reportable as Total per 40 CFR 136)										
EPA 200.7	Barium	mg/L	1.04	1.04	1.00	0.0	20	W340368	18-Oct-13	
EPA 200.7	Calcium	mg/L	35.1	34.8	20.0	0.8	20	W340368	18-Oct-13	
EPA 200.7	Chromium	mg/L	0.982	0.984	1.00	0.2	20	W340368	18-Oct-13	
EPA 200.7	Copper	mg/L	0.974	0.974	1.00	0.0	20	W340368	18-Oct-13	
EPA 200.7	Iron	mg/L	11.3	11.4	10.0	0.7	20	W340368	18-Oct-13	
EPA 200.7	Magnesium	mg/L	30.8	30.5	20.0	0.9	20	W340368	18-Oct-13	
EPA 200.7	Manganese	mg/L	1.03	1.03	1.00	0.1	20	W340368	18-Oct-13	
EPA 200.7	Zinc	mg/L	0.974	0.978	1.00	0.4	20	W340368	18-Oct-13	
EPA 200.8	Antimony	mg/L	0.0247	0.0246	0.0250	0.6	20	W341005	16-Oct-13	
EPA 200.8	Arsenic	mg/L	0.0262	0.0261	0.0250	0.4	20	W341005	16-Oct-13	
EPA 200.8	Cadmium	mg/L	0.0249	0.0246	0.0250	1.3	20	W341005	16-Oct-13	
EPA 200.8	Lead	mg/L	0.0431	0.0426	0.0250	1.2	20	W341005	16-Oct-13	
EPA 200.8	Selenium	mg/L	0.0233	0.0234	0.0250	0.3	20	W341005	16-Oct-13	
EPA 200.8	Silver	mg/L	0.0256	0.0254	0.0250	0.6	20	W341005	16-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	

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

Project Name: Clayton Mine 2013
Work Order: **W3J0081**
Reported: 18-Oct-13 14:05

Quality Control - MATRIX SPIKE DUPLICATE Data (Continued)

Method	Analyte	Units	MSD Result	Spike Result	Spike Level	RPD	RPD Limit	Batch ID	Analyzed	Notes
Metals (Dissolved) (Continued)										
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	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	0.00096	0.00096	0.00100	0.0	20	W341149	09-Oct-13	

Notes and Definitions

D2	Sample required dilution due to high concentration of target analyte.
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