QUARTZBURG
PRELIMINARY ASSESSMENT REPORT
BOISE COUNTY, IDAHO

STATE OF IDAHO

DEPARTMENT OF ENVIRONMENTAL QUALITY

September 2004

Submitted to:
U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, WA 98101

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LIST OF ACRONYMS

Acronym	Definition
Amsl	above mean sea level
ATV	All Terrain Vehicle
BLM	United States Bureau of Land Management
DEQ	Department of Environmental Quality
EPA	United States Environmental Protection Agency
Gpm	gallons per minute
PPE	Probable Point of Entry
TDL	Target Distance Limit
TMDL	Total Maximum Daily Load

1. INTRODUCTION

The Idaho Department of Environmental Quality (DEQ) was contracted by Region 10 of the United States Environmental Protection Agency (EPA) to provide technical support for completion of a preliminary assessment (PA) of Quartzburg located near Placerville, Idaho in Boise County. DEQ completed PA activities in accordance with the goals listed below.

The specific goals for the Quartzburg PA, identified by DEQ, are to:

- Determine the potential threat to public health or the environment posed by the site.
- Determine the potential for a release of hazardous constituents into the environment.
- Determine the potential for placement of the site on the National Priorities List.

Completion of the PA included reviewing existing site information, collecting receptor information within the site's range of influence, determining regional characteristics, and conducting a site visit. This document includes a discussion of site background information (Section 2), a discussion of migration/exposure pathways and potential targets (Section 3), a summary and conclusions (Section 4), and a list of pertinent references. Photographic documentation is included as Appendix A and sample lab results are included in Appendix B.

2. SITE BACKGROUND

2.1. SITE LOCATION

Site Name:	Quartzburg
CERCLIS ID No.:	NA
Location:	Boise County, Idaho
Latitude:	43.9586 N
Longitude:	-115.985 W
Legal Description:	Section 09, Township 7N, Range 4E, Boise Meridian
Congressional District:	Idaho
Site Owner:	John Parrish 2327 Mt. View Drive Boise, ID 83706
Site Contact:	John Parrish 2327 Mt. View Drive Boise, ID 83706

2.2.SITE DESCRIPTION/OWNERSHIP HISTORY

The Gold Hill and Iowa Mines exist on patented and un-patented land within the mountainous Boise Basin Mining District approximately 11 miles northwest of Idaho City in Boise County, Idaho. The Gold Hill mine is situated along Granite Creek, a tributary to Grimes Creek, just below the town of Quartzburg (Figure 2-1). The Gold Hill and Iowa Mines lie between an elevation of approximately 4600 to 4700 feet amsl. The mine is accessed via the Boise-Lowman Highway No. 21 by driving through Idaho City and Placerville. A locked gate on the road prevents public access to the mine site.

The Boise Basin includes approximately 300 square miles and is located in the south-central part of Boise County, about 20 miles northeast of Boise. The Boise Basin is drained by Mores and Grimes Creeks, which are tributaries of the Boise River. The Boise Basin was well known for its rich placer deposits, discovered in 1862, but is less well known for its lode deposits, which have contributed more than $10,000,000, principally in gold. The area is underlain by the granitic rock of the Idaho batholith, of Mesozoic age, which is cut locally by porphyritic dikes (Ross, 1934).

The Gold Hill Mine is one of the oldest and largest producing gold mines in Idaho. The Gold Hill lode deposit was discovered in 1863 and was worked almost continuously until 1938 (Anderson, 1947). By 1868, at least 10 stamp mills were treating the free-milling ores in the Boise Basin District, including a mill at the Gold Hill Mine. Increased activity at the Gold Hill Mine in the late 1920's did much to revive interest in lode mining throughout the Boise Basin. However, mining in the area received a serious blow in 1931 when a forest fire swept along the porphyry belt through Quartzburg and Grimes Pass, destroying numerous surface plants, including the plant of the Gold Hill Mine. In 1935, the Gold Hill plant and mill was re-built. In 1938, operations at the Gold Hill Mine were suspended and the plant was dismantled. Production of the Gold Hill Mine up to 1929 totaled $7,500,000 and by 1938, exceeded $8,000,000.

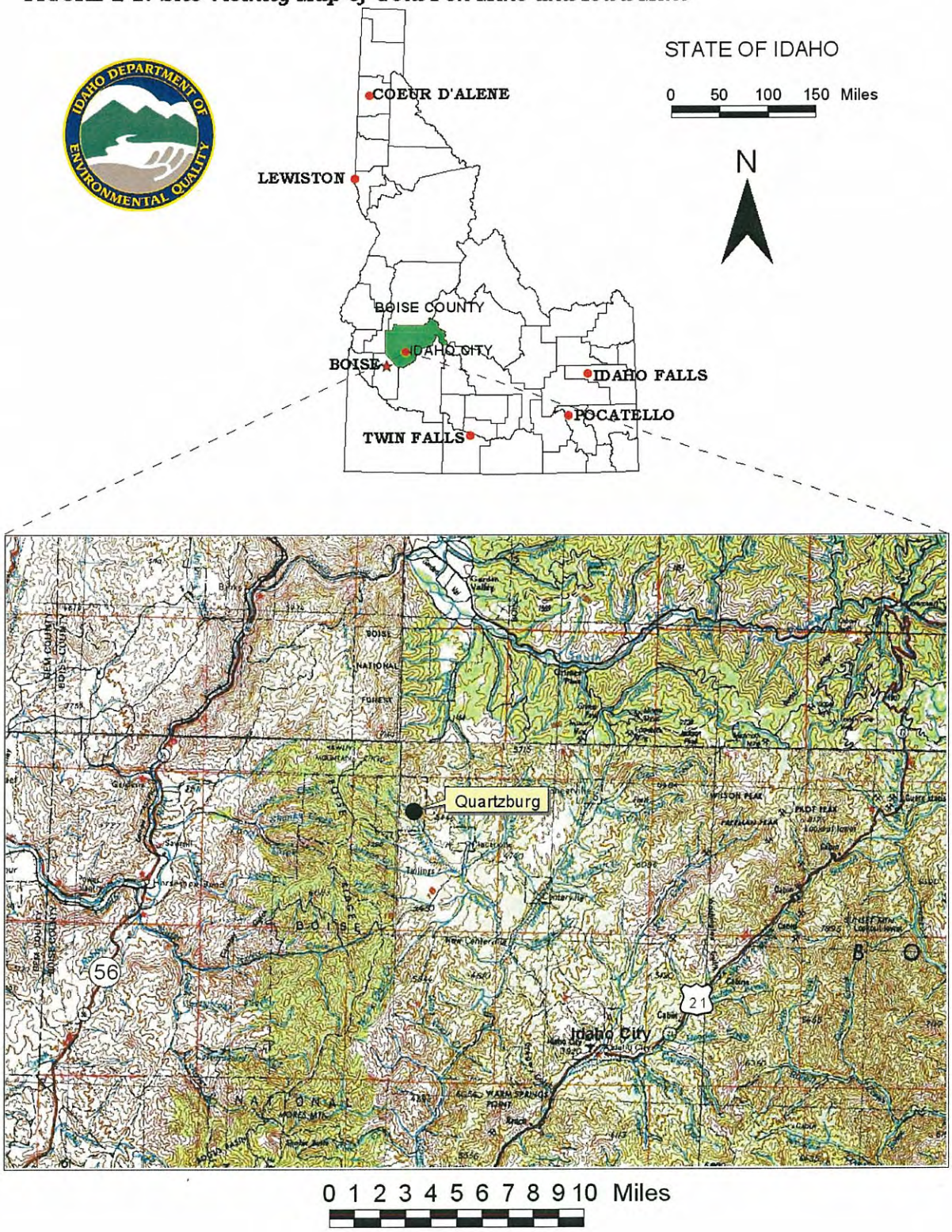
In 1931, Talache Mines Inc. acquired the title to the Gold Hill Mine from the Gold Hill and Iowa Mines Company. The property includes 19 patented and 28 un-patented claims. A large mill was located near the northern portion of the Gold Hill mine site. (Figure 2-2). The most recent mill was a 100-ton electrically driven fine-grinding amalgamation mill; however, this mill was dismantled in 1938. An extensive pumping system was used up until 1938 to keep the mines free from water and flooding.

The Gold Hill Mine was developed principally through a 1,246-foot, 3-compartment vertical shaft with nine intermediate levels, totaling more than 40,000 feet of workings. Other mining activity in the immediate area include the older Gold Hill shaft (which extended to a depth of 400 feet below creek level) and workings of unknown extent on the Iowa, Last Chance, Sunday and Confederate, and Pioneer lodes. The Iowa lode existed approximately one-quarter mile northeast of the Gold Hill and was abandoned prior to 1900. Much work was done on the Sunday Lode, located in Confederate Gulch a

short distance west of Gold Hill, prior to 1906 but operations were suspended when work could not continue without draining the extensive Gold Hill and Iowa workings.

FIGURE 2-1

FIGURE 2-1. Site Vicinity Map of Gold Fok Mine and Iowa Mine



2.3 SITE OPERATIONS AND WASTE CHARACTERISTICS

The distribution of the lodes within the Boise Basin along the porphyry belt indicate that the fractures that guided the ore-forming solutions had resulted from recurrent adjustments along major zones of crustal weakness that had earlier facilitated the intrusion of the porphyritic dikes. The lode deposits are related to early Tertiary and to early Miocene magmas (Anderson, 1947). Quartz veins within the Boise Basin consist of three types: as prominent outcrops not adjacent to porphyry zones, as quartz veins associated with acidic dikes (usually distinguished by the absence of pegmatite and the presence of pyrite), and as fissure veins related to regional shearing and subsidence which occurred during the Miocene period (Ballard, 1924). The ore deposits of the Boise Basin generally occur in veins of the third type of quartz veins.

The Gold Hill Mine is located within a porphyry belt containing numerous dikes, including dikes of rhyolite porphory and dacite and quartz monzonite porphyry and lamprophyre. In general, the dikes have slightly divergent trends to the east and northeast. The subsurface geology of the Gold Hill Mine is fairly complicated, as the mine appears to be the site of extensive shearing and fissuring during the general period of dike intrusion as well as during the time of ore deposition. Most of the lode appeared to consist of recurrent quartz lenses of variable thickness. In the early days of mining, numerous stringers of rich ore were found to extend from the fissure for short distances into the hanging wall. Anderson (1947) reports that the lode had a developed length of about 3,500 feet in the main part of the mine and a maximum thickness of about 6 feet. Small crystals of pyrite with sparse amounts of calcite have been disseminated through the altered rock of the Gold Hill lode. Much of the gold appeared to be intimately mixed with the bismuth minerals within coarse-grained quartz.

Anderson (1947) reports that although much of the ore had no visible free gold, the gold appears in the native state, as about 95% was recovered by fine grinding and amalgamation. Geological maps of the Gold Hill mine show the locations of at least three areas known to contain sulfides throughout the Gold Hill and Pioneer shafts. Most of the ore and waste rock containing pyrite was probably mined during the 1930's, after the oxide deposits that were easily amenable to traditional methods of stamp milling and amalgamation had been mined first.

Square-set stoping was the method of mining primarily used at the Gold Hill Mine. Backfilling was necessary in the stopes. Ballard (1924) reports that the mined material was hand sorted, passed over a bar grizzly, with the oversize going to a Blake crusher. The crushed ore was passed to rolls, then to a 4 by 5-foot ball mill, and finally to an 8-foot Hardinge mill with an amalgamator. The feed was passed over amalgamating plates, then to Overstrom and Wilfley tables. The concentrates were re-ground in cyanide

FIGURE 2-2

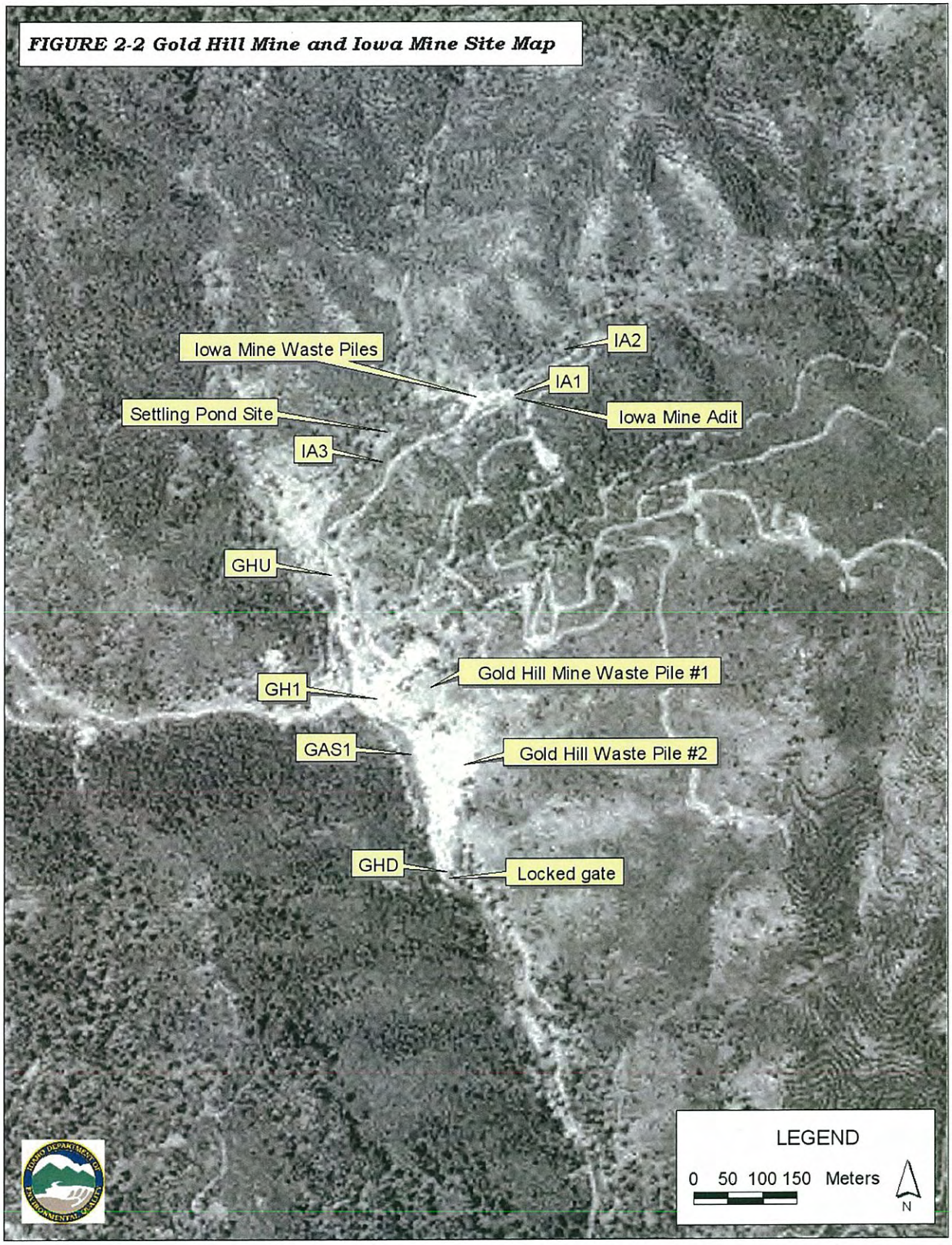


FIGURE 2-2 Gold Hill Mine and Iowa Mine Site Map
Iowa Mine Waste Piles
IA2
IA1
Iowa Mine Adit
Settling Pond Site
IA3
GHU
Gold Hill Mine Waste Pile #1
GH1
GAS1
Gold Hill Waste Pile #2
GHD
Locked gate
LEGEND
0 50 100 150 Meters
N

solution in a 4 by 22-foot tube mill and agitated and settled in two Pachuca tanks. Zinc shavings were used to precipitate the gold and silver. Cyanide treatment at the Gold Hill mine and mill proved to be more profitable than shipping the concentrates to Salt Lake City smelters.

2.4 DEQ ACTIONS

DEQ conducted a site visit on July 20, 2004, which included a visual inspection of the Quartzburg mines and collection of one (1) soil sample and six (6) surface water samples (Appendix B). During DEQ's July 20 visit, the mine waste piles within the Quartzburg drainage ranged from very small, such as the Iowa Mine waste dump, to very large, such as those existing near the Gold Hill Mine (Pictures 3,4,10-13,16, and 18).

From the lower end of Quartzburg, two large waste piles associated with the Gold Hill Mine can be seen protruding from the hillside (Pictures 3,4,10-13). In addition to the waste piles, evidence of the mine operations can be seen through a foundations of a pre-existing structures and various debris lying around the site (Pictures 1,2,5,8, and 9).

Two significant waste piles were inspected at the Gold Hill Mine during the DEQ site visit. The waste piles were arbitrarily named Waste Pile #1 and Waste Pile #2. Waste Pile #1 is located on the northern section of the mine property. This waste pile was approximately 350 feet long, 150 feet wide and 200 feet high. Additional waste debris that had slumped off of the pile was seen surrounding the bottom of the toe of the pile. The pile exists from an old access road on the northeastern hillslope down to the current road, which runs along Quartz Creek. The toe of the waste pile is located approximately 50 feet to the east of the main roadway.

Waste Pile #1 has very little vegetation growing on it, and the few trees that are growing on the pile do not appear healthy (Pictures 4, 10 and 11). The material forming this waste pile had a reddish brown color and was uniform is grain size and distribution (Pictures 4, 10, and 11).

Water sample GH1 was collected at the toe of Waste Pile #1, as ground water seeped from the waste pile. No standing water was visible anywhere else on the waste pile or within the vicinity of the pile. No soil samples were collected directly on this waste pile.

Waste Pile #2 is located due south of the Waste Pile #1 on the same west facing hillslope. The size of this pile is similar to that of the first, approximately 300 long, 250 feet high, and 200 feet wide (Pictures 3, 12, and 13). Numerous roads have been cross-cut through this waste pile and remnants of an old hoist still remain at the peak of the waste pile. No surface water flowed on or across this pile. Very little vegetation was seen growing on this pile (Pictures 3, 12, and 13). The size and color of the material forming this waste pile were similar to that described for Waste Pile #1.

A soil sample (GHS1) was also collected at the Gold Hill site, at the toe of waste pile #2, in a marshy area created from ground water seeping out from under the waste pile.

The Iowa Mine, significantly smaller in comparison to the Gold Hill Mine was also inspected during the DEQ site visit. Waste dumps were inspected and measured that consisted of fine grained waste rock consolidated into numerous piles along the roadway (Pictures 16 and 18). Very little vegetation was growing on the waste piles that were approximately 200 feet long, 50 feet wide and 30 feet high. No soil samples were collected from these waste piles.

Ground water was observed seeping from the abandoned adit of the Iowa Mine (Pictures 14 and 15). Water sample IA1 was collected at this point (Figure 2-2). The ground water discharged along the access road where it flowed to the west towards Granite Creek. In between the discharge point and Granite Creek, a marshy wetland that resembled a previous tailing pond collected water before it continued to flow into Granite Creek. Water samples were collected upgradient from the spring (Sample #IA2) and downgradient of the retention pond (Sample #IA3).

A water sample was collected downgradient of all of the mining activity in Granite Creek (Sample #GHD) to investigate the overall impacts of all of the mining activity at Quartzburg. Figure 2-2 shows sampling locations for all samples collected during the site visit and Appendix B summarizes the analytical results.

Human activity is present around Quartzburg. The Idaho City area is a popular ATV riding area due to the amount of public land and number of trails. Although some of the access points are gated, ATVs have driven around them, and many of the roads have ruts created by vehicles with short axles, such as 4-wheelers.

Many animals utilize the area that can potentially be consumed by humans. The Quartzburg area is fantastic Mule Deer and elk habitat with the open south-facing slopes and timbered north-facing slopes. Many hoof prints of both animals were witnessed at all locations visited during the site visit, and deer and elk where seen at the site. Although none were witnessed during the site visit, it is expected that game birds, including grouse (blue, forest, sage, and ruffed) inhabit the area, as well as the occasional chukars, Hungarian Partridge, and California Quail.

3. MIGRATION/EXPOSURE PATHWAYS AND TARGETS

The following sections describe migration/exposure pathways and potential targets within the site's range of influence (Figures 3-1, 3-2 and 3-3).

3.1 GROUND WATER MIGRATION PATHWAY

Ground water flow is expected to be limited to preferential pathways of faults and brecciated zones within the country rock and come to the surface in the form of springs. In the Blue Gulch drainage, no springs were witnessed. One adit, the Iowa Adit, had water exuding from it. This water drained into a marshy area that resembled a tailing pond (Picture 17). Ground water was also seen seeping from underneath waste pile #1 at the Gold Hill mine. This was surfaced and flowed across the access road into Granite Creek. Another marshy area was seen in between the toes of the two waste piles at the Gold Hill mine, but no obvious discharge point was determined.

Contributions to the aquifer in close proximity to the Quartzburg mines will predominantly be as a direct result of precipitation or surface water. Granite Creek is an influent stream. As the region is semi-arid, it receives only limited annual precipitation, mostly in the winter months. Annual precipitation for Idaho City, Idaho, located approximately 15 miles to the southeast, is 24 inches, with a maximum 24-hour rainfall event of 3.8 inches (WRCC, 2002).

Dry-season rainfall occurs almost exclusively in relatively short bursts, usually related to thunderstorm activity. It is expected that except for flash flood-type events, almost all dry-season rainfall events would be completely absorbed by the soils and plants, without much, if any, contributions to the ground water. However, because the waste rock piles have limited soil percentages, and many exist in or adjacent to draws, a higher percentage of rainfall would be expected to drain into the stream.

According to Idaho Department of Water Resources July 2002 records, 81 private drinking water wells are reported to be located within a 4-mile radius of the site. No public drinking water systems are located within a 4-mile radius of the site (Figure 3-1).

No irrigation wells were identified within a 4-mile radius of the site, and the site is not located within a wellhead protection area (DEQ, 2003).

3.2 AIR MIGRATION PATHWAY

The nearest permanent residence to Quartzburg is approximately .5 miles south of the site, however hunters/campers could potentially frequent the area during the summer/fall months.

The mining sites are comprised of unconsolidated tailing piles varying in degrees of compaction. The waste rock is primarily confined to dumps. The fine-grained waste within some of the waste piles could be subject to wind dispersal within the immediate area; however, no significant dispersion is expected.

Natural aerial dispersal from the dumps is expected to be a very rare occurrence, however dust from ATVs and the occasional ground-moving activities, are a definite possibility for airborne potential contaminants.

No reclamation or other activities to establish plant growth have occurred, however natural plant succession is beginning to take place in some of the affected areas.

3.3 SOIL EXPOSURE PATHWAY

Access to the mine site is restricted by a posted, locked gate across the main access road. General public can not drive around the gate, unless they have a key to locks on the gate. The land behind the gated road can not be accessed by other non-gated roads. Some signage indicating that private land is present and other signage warning of potential mining activity exists, but only in select locations. All of the private land surrounding the mine is posted with trespass information in accordance with IDAPA 36-1603. The mines are relatively close (1 mile) to a public corridor (Granite Creek Road).

Potential receptors include local residents, hunters, cattlemen, trail riders (motorized and non-motorized), campers, and rarely, tourists. Cattle activity surrounding and within the mine site is minimal. Residents and outdoor enthusiasts remain the highest percentage of potential receptors, as they reside nearby or use surrounding land for recreational activities.

The land within the Quartzburg area is primarily private, with minor amounts of federal and state land surrounding the area. The parcels of land that occupy the mines and waste dumps are leased or owned by private parties.

There are no schools, day-care facilities, or private residences within 200 feet of the site, however, BLM or Forest Service workers may occasionally be within 200 feet of the site.

Soil sample GAS1 contained arsenic at concentrations of 129 mg/kg, lead at concentrations of 197 mg/kg, chromium at concentrations of 5.71 mg/kg, mercury at concentrations of 0.660 mg/kg, and selenium at concentrations of 1.5 mg/kg (Appendix B). No reclamation or other activities to establish plant growth have occurred.

Soil exposure at Quartzburg is expected to be low for all receptors.

3.4 SURFACE WATER MIGRATION PATHWAY

The Quartzburg mining area drains westward towards the south flowing Granite Creek. A potential Probable Point of Entry (PPE) exists at the waste piles located at the Gold

Hill Mine site and at the Iowa Adit. Overland flow across or in the vicinity of the waste piles would flow directly into Granite Creek.

Water is discharging from the former Iowa Adit at a rate of approximately .5 gpm. Water from Waste Dump #1 at the Gold Hill Mine is barely a trickle, and returns to the soil within about 20 feet of coming to the surface. During high flow season, it appears this discharge flows across the road into Granite Creek. The water from in between the two waste dumps at the Gold Hill mine is a minor seep, too small to locate the exact discharge point.

Commercial or subsistence fishing does not occur within the 15-mile downstream distance, but sport fishing does. As camping occurs in many places along Granite Creek, it is expected that fishing occurs, at least occasionally. Redband trout are present within Granite Creek (IDFG, 2000), and rainbow trout, whitefish, and brown trout may also be present.

No plant species in the area were listed as a species of concern (F&G, 2002) within a 4-mile radius of Quartzburg (Figure 3-1).

The use of surface water for watering of livestock and wildlife is expected. Crop irrigation is not considered a significant use locally, however, in the lower reaches of Granite Creek, water may be diverted to fields.

Primary targets for surface water include residents and outdoor enthusiasts along Granite Creek. It is expected that Granite Creek's water is not utilized for domestic activities such as bathing, cooking, and drinking. Secondary targets include livestock, wildlife and fish. No sensitive environments were noted during the site visit, however some potential wetland areas may exist along Granite Creek.

Surface water sample results (Appendix B) from waters collected in the Quartzburg area indicate that elevated metal concentrations do not currently exist in this drainage.

4.0 SUMMARY AND CONCLUSIONS

The mines in the Quartzburg area were operated in the late 1800's and early 1900's, mining primarily gold. Approximately $10 million was extracted from the mines of Quartzburg, which entailed approximately 40,000 feet of tunneling.

Most structures relating to mining activity have fallen or been burned or covered. Waste rock piles, abandoned machinery, a few standing structures, some decommissioned structures, and the remains of a few collapsed adits can be seen in the area. No adits remain open and majority of the existing structures were properly restricted with locking gates and warning signs (Picture 19). A soil sample taken from the toe of a fine-grained tailings pile did not contain elevated concentrations of any contaminants. The water samples collected throughout the drainage also show no significant signs of overall water quality degradation. However, one water sample, GH1, had slightly elevated metal

concentrations (Appendix B). Based on limited sampling data, air, soil, and water pathways do not represent a significant threat to primary targets or secondary targets.

FIGURE 3-1

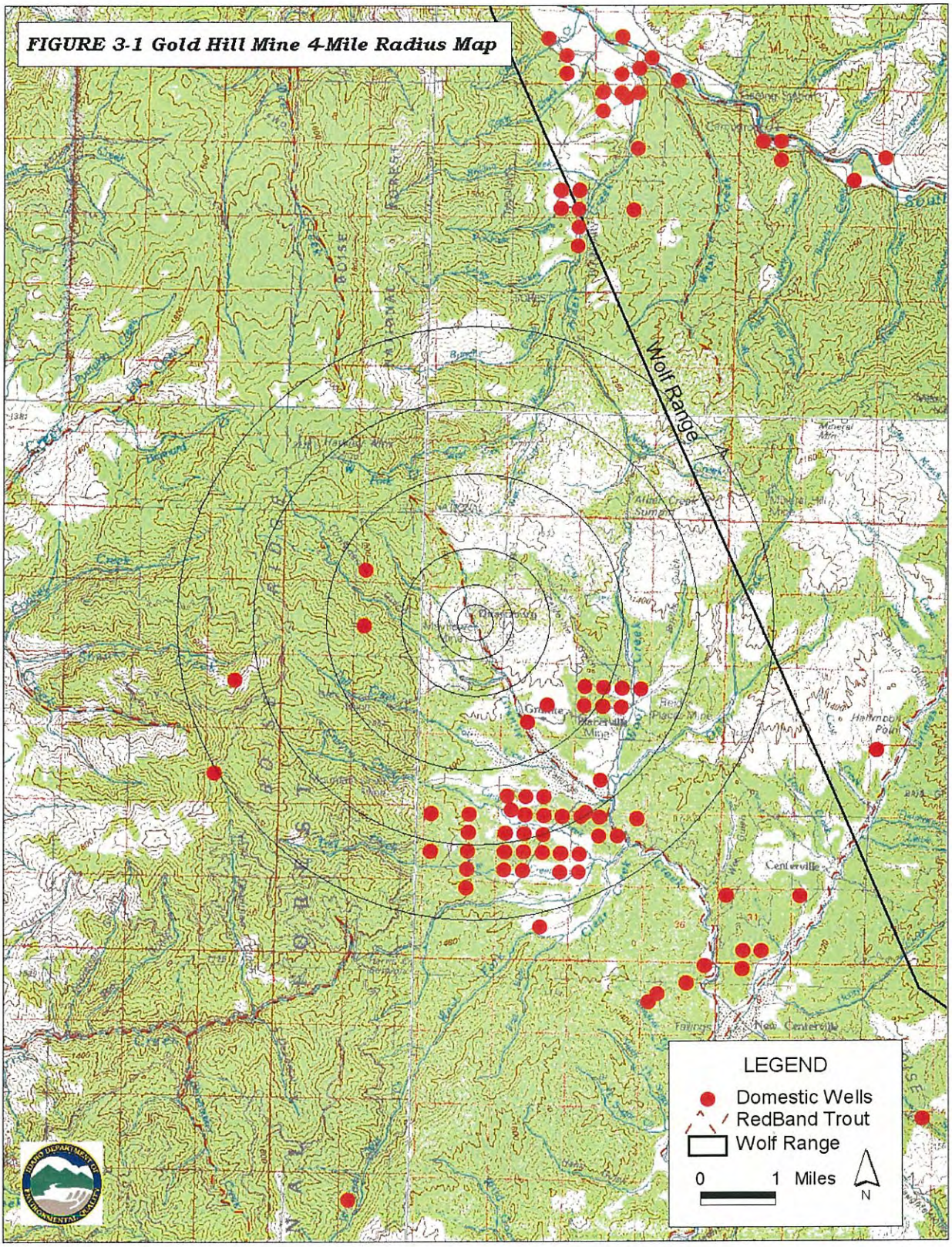


FIGURE 3-1 Gold Hill Mine 4-Mile Radius Map
Wolf Range
LEGEND
Domestic Wells
RedBand Trout
Wolf Range
0
1 Miles
N

FIGURE 3-2

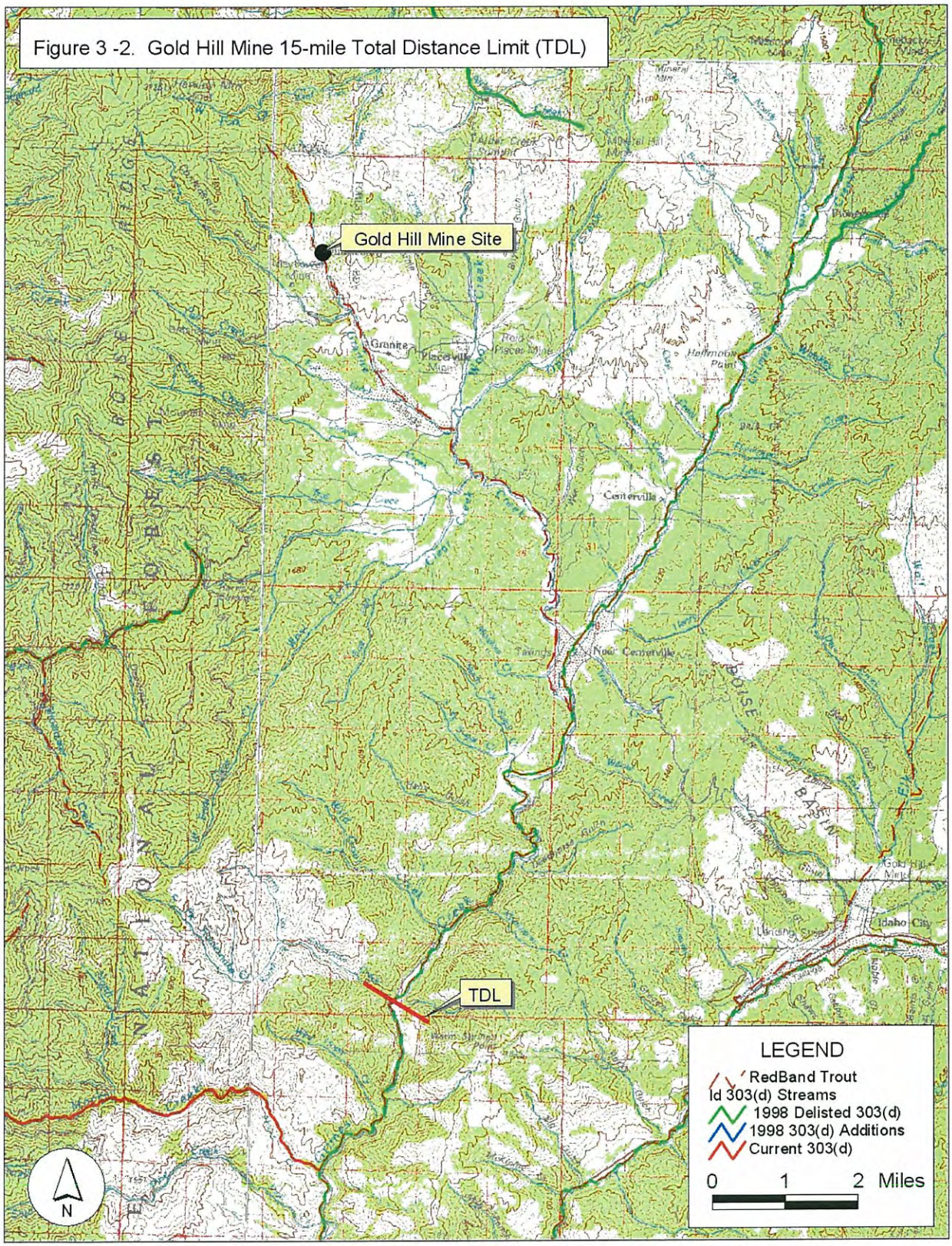


Figure 3 -2. Gold Hill Mine 15-mile Total Distance Limit (TDL)
Gold Hill Mine Site
TDL
Granite
Placerville
Centerville
New Centerville
Idaho City
BOISE BASIN
BOISE RIDGE
N
LEGEND
RedBand Trout
Id 303(d) Streams
1998 Delisted 303(d)
1998 303(d) Additions
Current 303(d)
0 1 2 Miles

FIGURE 3-3

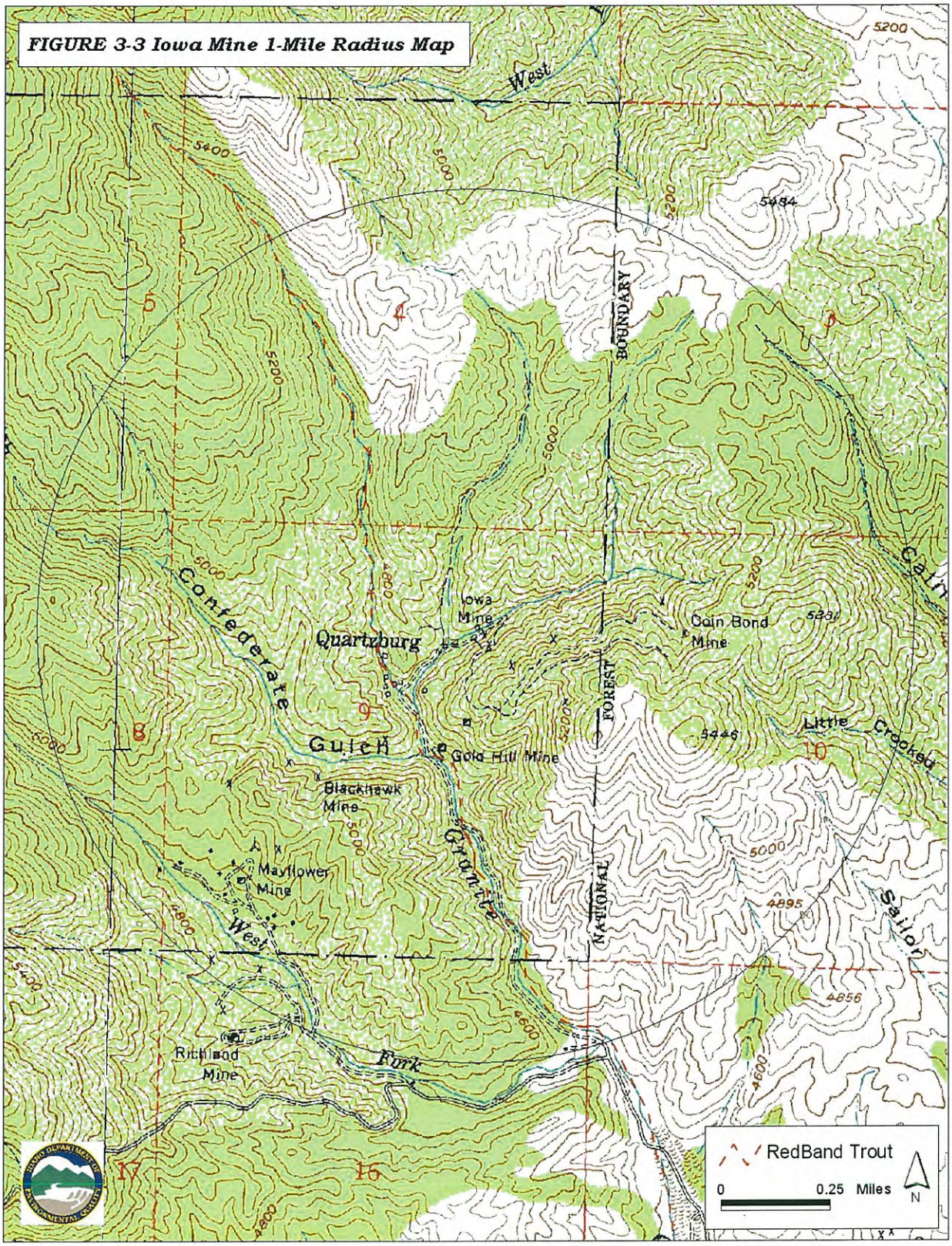


FIGURE 3-3 Iowa Mine 1-Mile Radius Map
West
BOUNDARY
FOREST
NATIONAL
Confederate
Gulch
Quartzburg
Iowa
Mine
Coin Bond
Mine
Gold Hill Mine
Blackhawk
Mine
Mayflower
Mine
Richland
Mine
Granite
West
Fork
Little
Sailor
RedBand Trout
0
0.25 Miles
N

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APPENDIX A

SITE PHOTOGRAPHS

BLUE GULCH

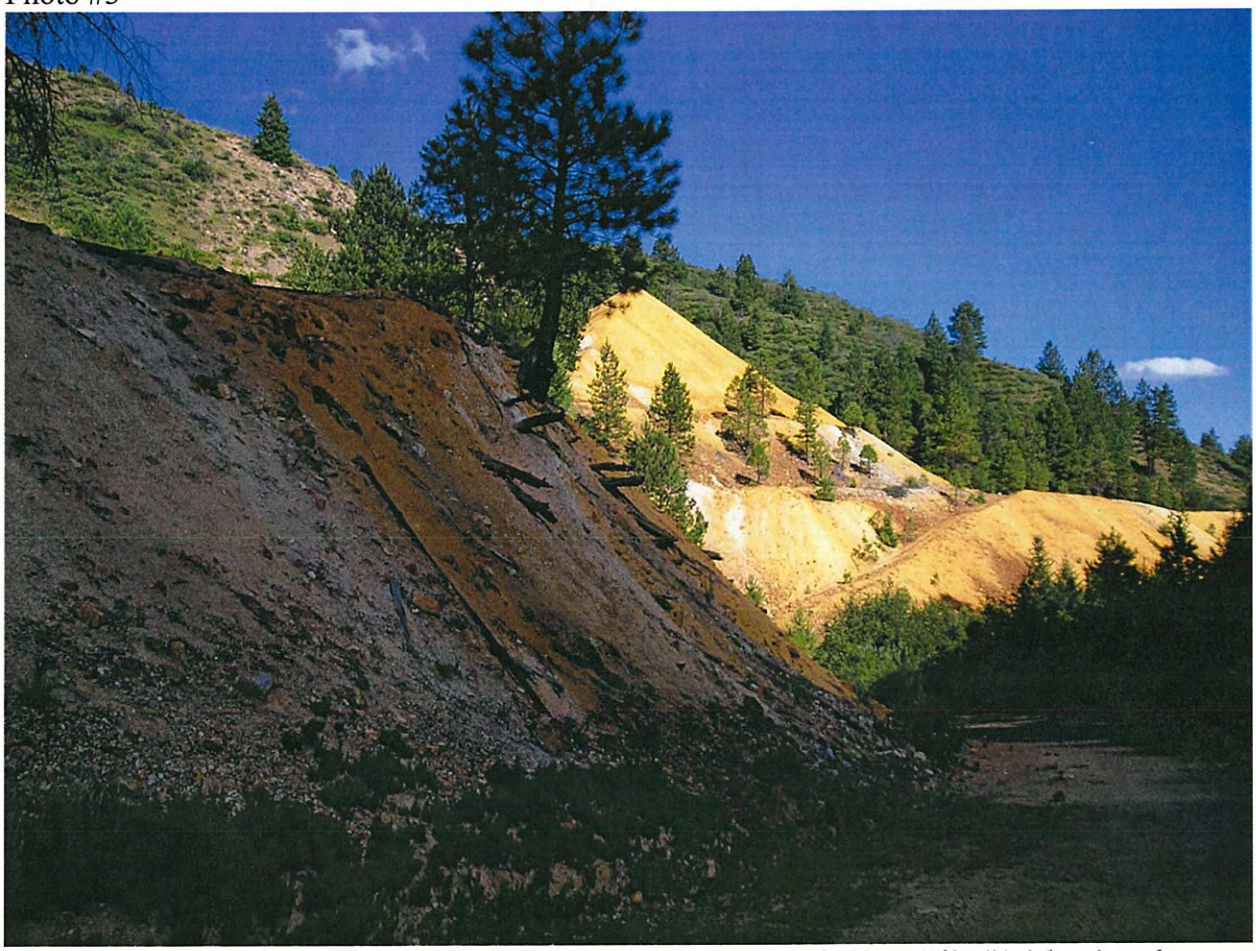
Photo 1

Abandoned machinery observed during the Quartzburg site visit. This machinery was located in between the Gold Hill Mine and the Iowa Mine along the main access road.

Photo 2

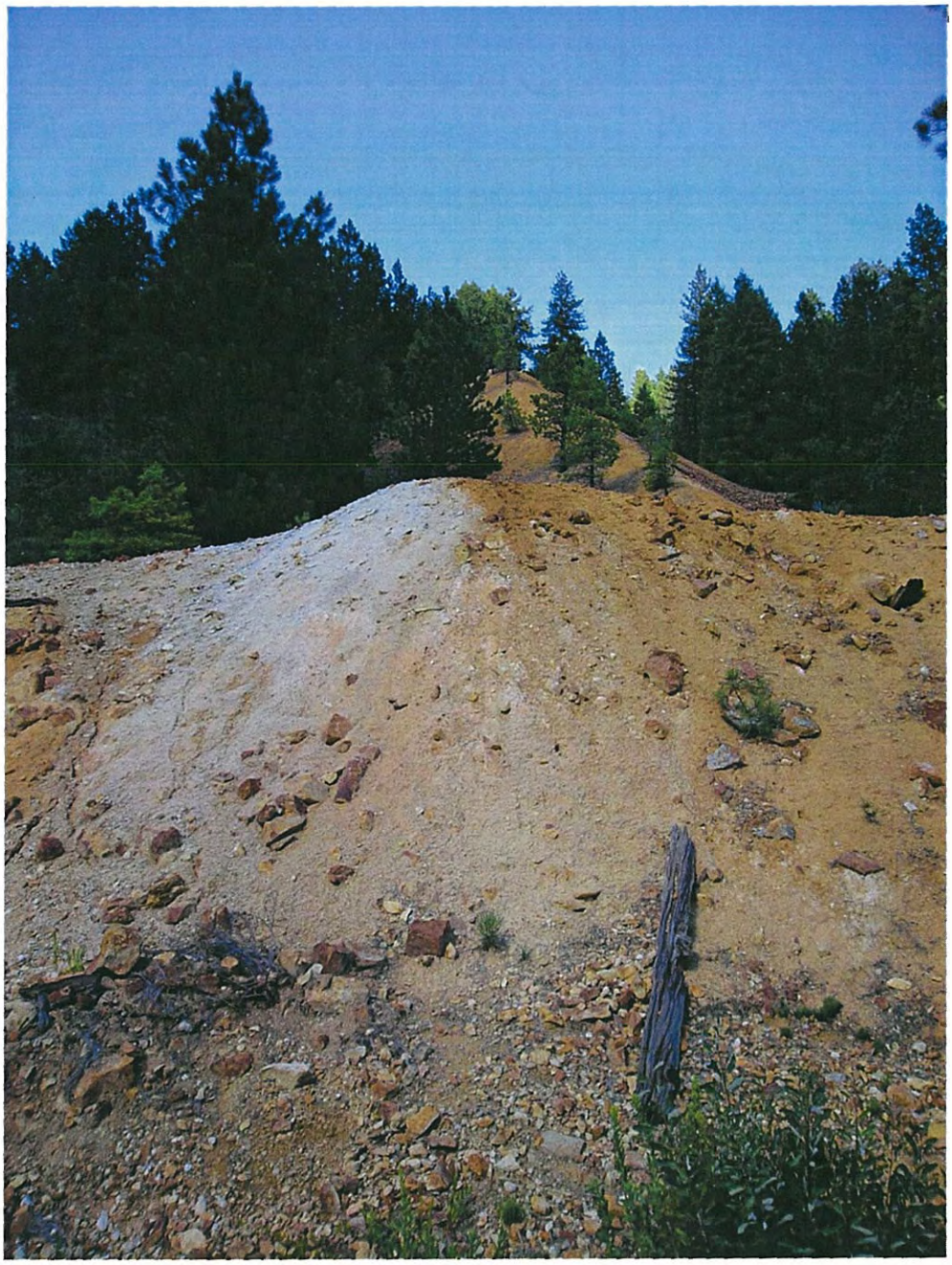
Scrap metal found at the bottom of the Gold Hill Mine. Appears to be the remnants of an old steamer.

Photo #3



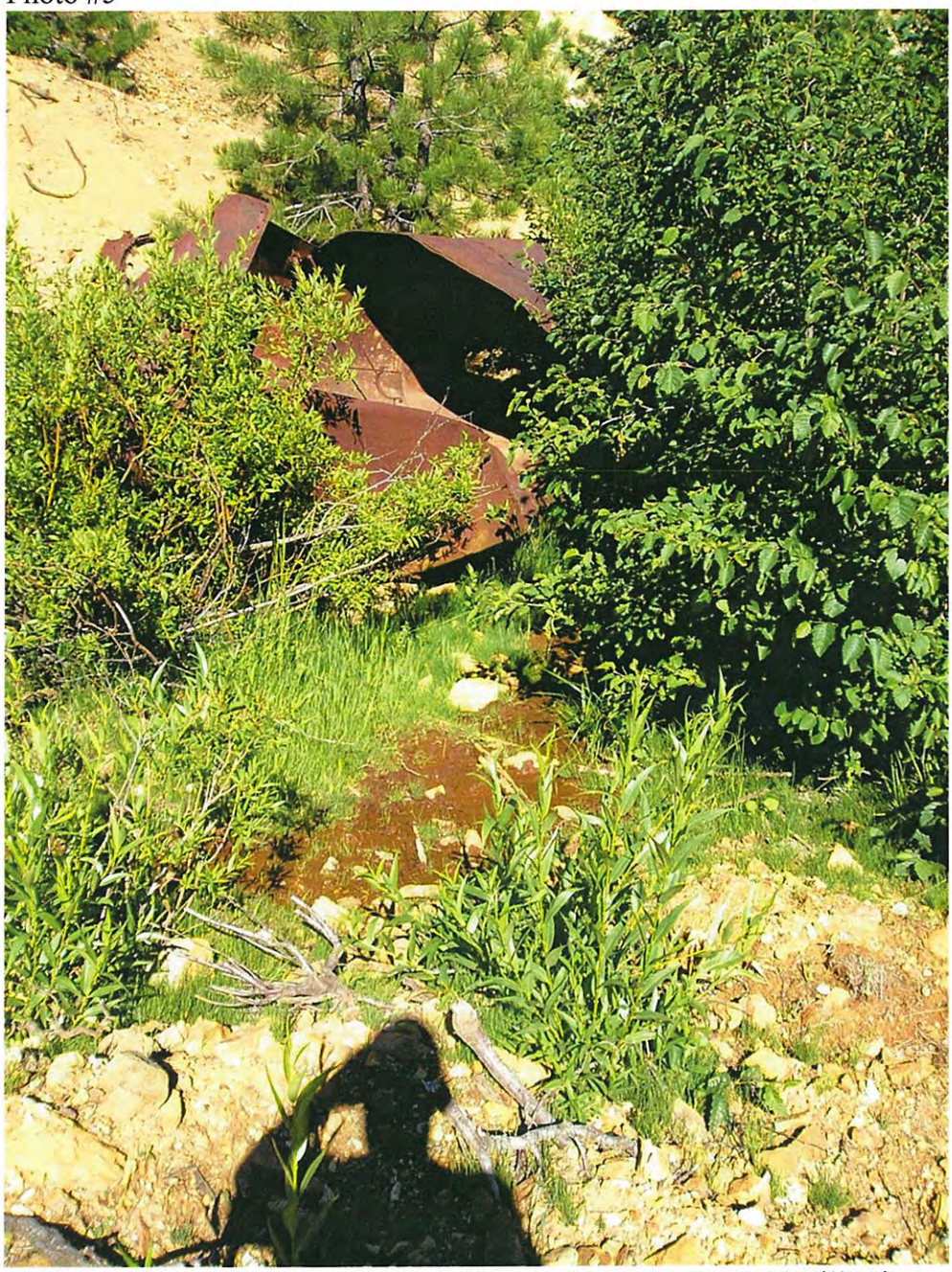
View looking southeast of Waste Pile #2 (distant) and the toe of Waste Pile #1 (close) at the Gold Hill Mine.

Photo #4



View looking up Waste Pile #1 at the Gold Hill Mine. Various bricks, wood debris, and metal scraps can be seen in the toe of the waste pile.

Photo #5



Ground water seeping from the toe of Waste Pile #1 at the Gold Hill Mine.

Photo #6

Water sample (GH1) location. The toe of Waste Pile #1 of the Gold Hill Mine can be seen in the upper left corner of this photograph.

Photo #7

Another view of the ground water seepage coming from the toe of Waste Pile #1 at the Gold Hill Mine.

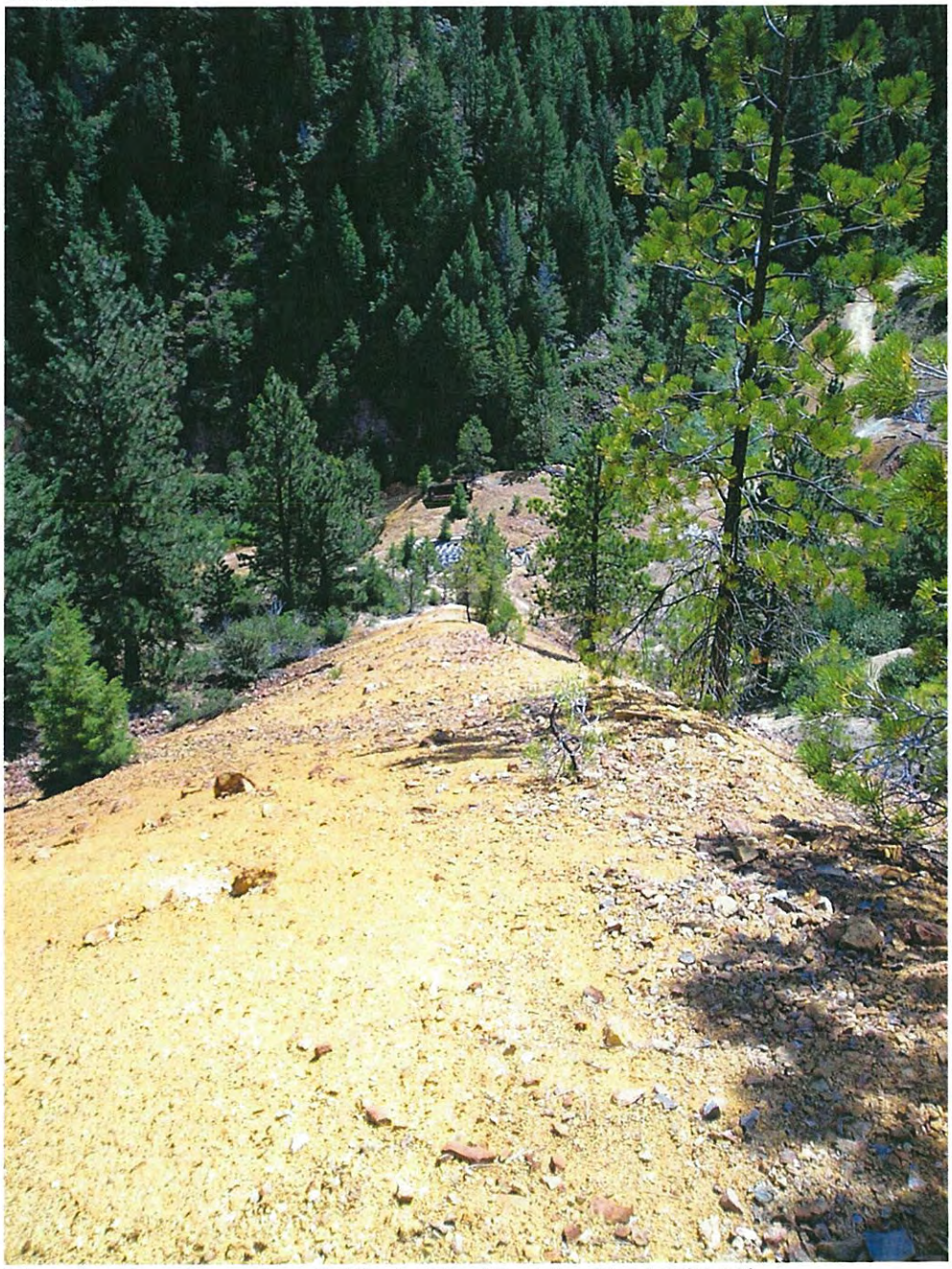
Photo #8

Remnants of an existing structure at the Gold Hill Mine. Waste Pile #1 borders this structure to the left of the photograph.

Photo #9

Another view of the foundation remnants of the structure at the Gold Hill Mine. The toe of Waste Pile #1 can be seen in the bottom left corner of this photograph.

Photo #10

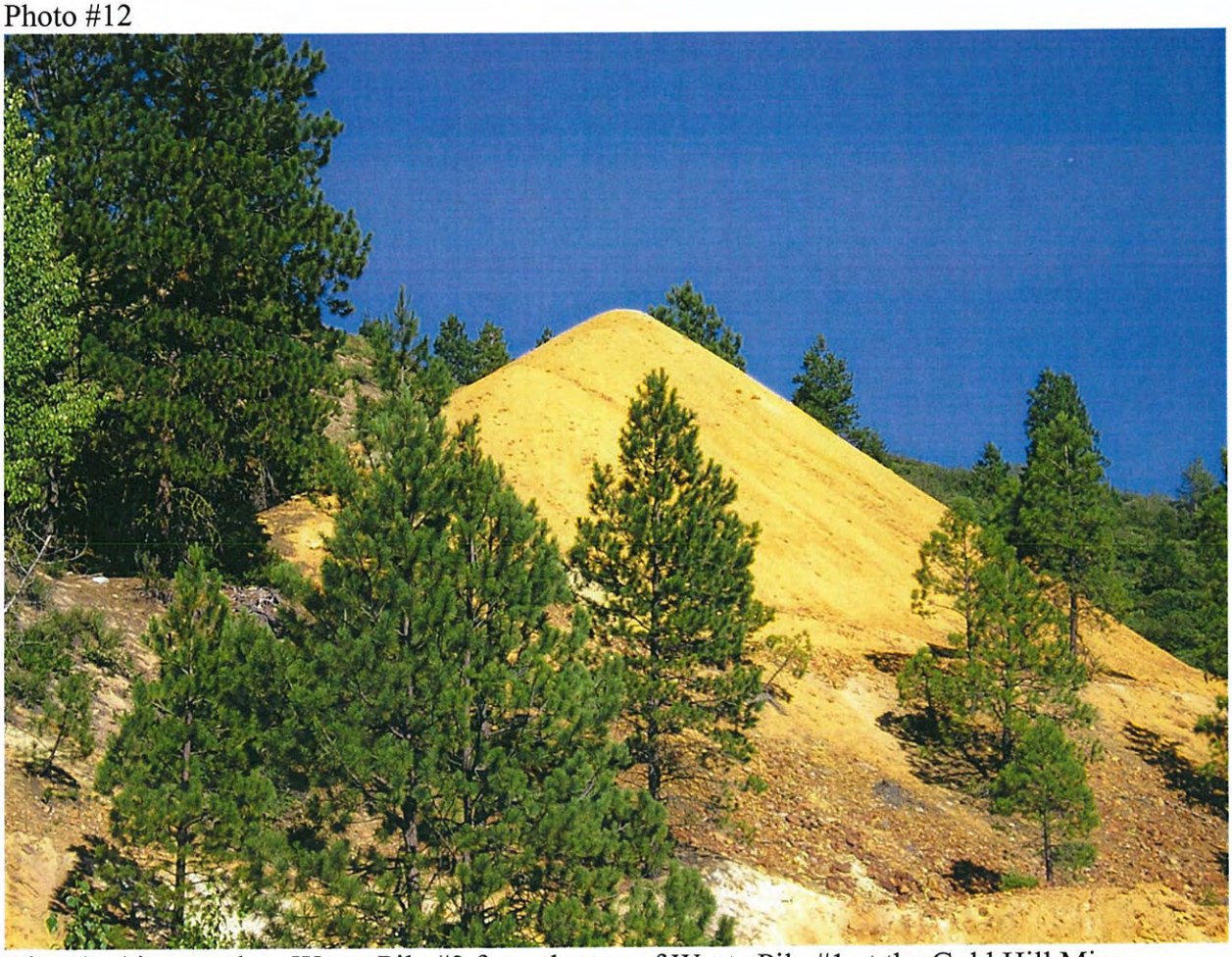


View looking down (west) Waste Pile #1 at the Gold Hill Mine.

Photo #11

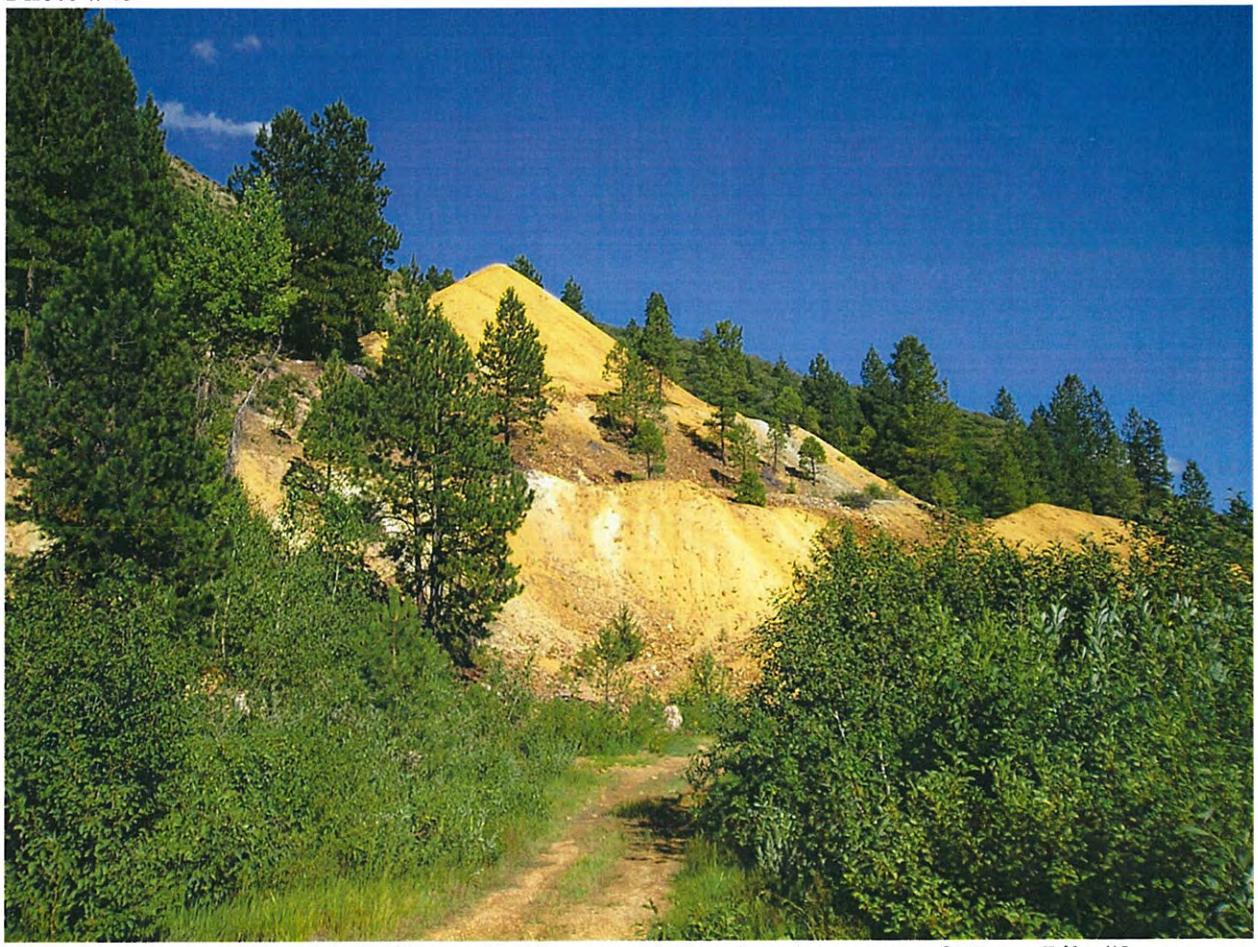
View looking north at Waste Pile #1 from the top of Waste Pile #2 at the Gold Hill Mine.

Photo #12



View looking south at Waste Pile #2 from the top of Waste Pile #1 at the Gold Hill Mine.

Photo #13



View looking southwest from the main access road showing the extent of Waste Pile #2.

Photo #14

Sampling location for sample IA1. This ground water is seeping from the buried adit for the Iowa Mine.

Photo #15

Another view of sampling location for sample IA1 from the Iowa adit.

Photo #16

Iowa Mine waste dump. View looking west from the toe of the waste dump.

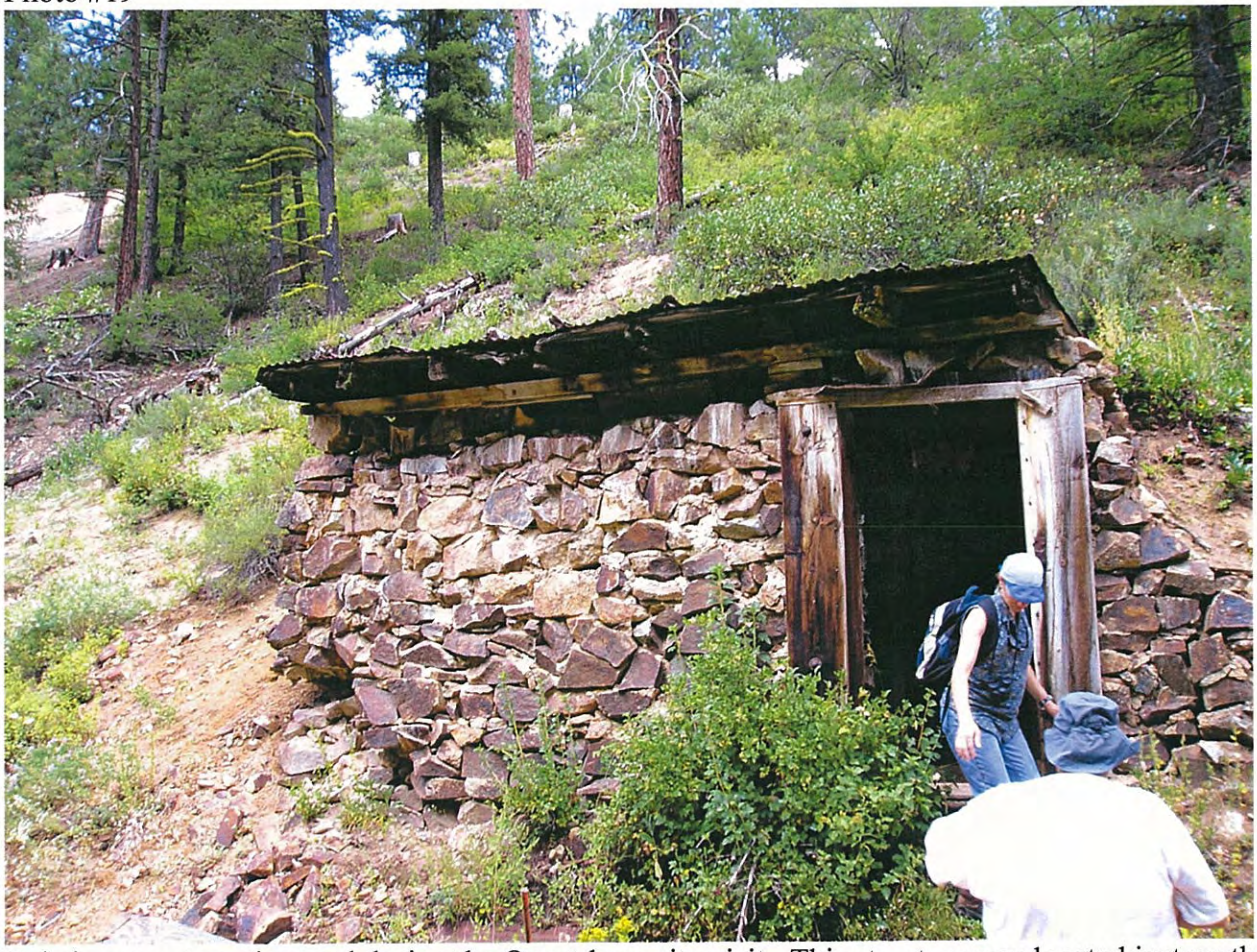
Photo #17

View looking east to a marshy area just east of the Iowa waste dump. Standing water was present in an old man-made pond.

Photo #18

View looking north on the Iowa Waste dump. Several of these piles of waste rock created the present waste dump.

Photo #19



Existing structure observed during the Quartzburg site visit. This structure was located just north of the two mines visited during the inspection.

APPENDIX B

ANALYTICAL RESULTS

Table 1
Soil and Surface Water Sample Data for Quartzburg, Boise County, Idaho

Analyte	Surface Water Sample IA1 (mg/L)	Surface Water Sample IA2 (mg/L)	Surface Water Sample IA3 (mg/L)	Surface Water Sample GH1 (mg/L)	Surface Water Sample GHU (mg/L)	Surface Water Sample GHD (mg/L)	Soil Sample GAS1 (mg/kg)	Soil Sample GAS1 TCLP (mg/kg)
Arsenic	0.014	<0.010	<0.010	0.841	<0.010	<0.010	129	0.026
Barium	0.0310	0.0359	0.0611	0.535	0.0907	0.0758	116	0.302
Cadmium	<0.002	<0.002	<0.002	0.0087	<0.002	<0.002	4.10	0.0324
Chromium	<0.006	<0.006	<0.006	0.0927	<0.006	<0.006	5.71	<0.006
Copper	NA	NA	NA	NA	NA	NA	29.2	NA
Lead	<0.005	<0.005	<0.005	4.02	<0.005	<0.005	197	0.0642
Mercury	<0.0002	<0.0002	<0.0002	0.0109	<0.0002	<0.0002	0.660	<0.0002
Selenium	<0.01	<0.01	<0.01	0.011	<0.01	<0.01	1.5	0.015
Silver	<0.005	<0.005	<0.005	0.0686	<0.005	<0.005	3.87	<0.005
Zinc	NA	NA	NA	NA	NA	NA	802	NA

NA = not analyzed