# Golden Age Mine

## (Aka Golden Age Junior Mine, Golden Age, Jr. Mine, and Theron, Charlotte, Theron Fraction, Francis, Harper, Florence Patented Mining Claims)

# Preliminary Assessment Report

Boise County
State of Idaho


## Idaho Department of

## Environmental Quality


October 2008

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

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

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

C.L. "Butch" Otter, Governor
Toni Hardesty, Director

October 27, 2008

Mrs. Ruth Cunningham
4743 Coopers Hawk Bay
Holladay, UT 84117

RE: Site Assessment of the Golden Age Mine (aka Golden Age Junior), Located on Private Land, Owned by Ruth Cunningham of Holladay, Utah.

Dear Mrs. Cunningham:

The Idaho Department of Environmental Quality (IDEQ) has completed a review of historical mining data and geological information of the above referenced mining claims. Subsequent to that review, IDEQ conducted site visits of the Golden Age Mine. During these site visits, mining facilities were mapped and sampled to complete a Preliminary Assessment (PA).

PAs are conducted according to the Federal Comprehensive Environmental Response, Compensation and Liabilities Act (CERCLA). The reasons to complete a PA include:

1) To identify those sites which are not CERCLIS caliber because they do not pose a threat to public health or the environment (No Remedial Action Planned (NRAP);

2) To determine if there is a need for removal actions or other programmatic management of sites;

3) To determine if a Site Investigation, which is a more detailed site characterization, is needed; and/or

4) To gather data to facilitate later evaluation of the release through the Hazard Ranking System (HRS)

IDEQ also completed PAs under contract with the U.S. Environmental Protection Agency in order to identify risks to human health and the environment, and make recommendations to land owners regarding how risks might be managed, if necessary.

IDEQ has determined that No Remedial Actions should be Planned (NRAP) at this time. However, soils analysis indicates that the heavy metals of concern (highest result) for the Golden Age Mine are: arsenic (220 mg/kg), and lead (2,870 mg/kg); which far exceeds both the IDTLs and EPA Region Six's Human Health Screening levels. These levels, although used for comparison even at remote locations, are more applicable in locations where these types of

contaminants are determined to be readily available to receptors; where exposures might produce an acute or chronic toxicological effect in a population. In the case of the Golden Age Mine, these numbers suggest that additional site assessment should be undertaken if the tailings areas or the former assay site were to be developed for "unrestrictive uses" such as residential. Furthermore, risk management tools should be employed prior to any such developments.

IDEQ collected a sample from a spring, located near the camp. This spring supplies drinking water for the camp's caretaker and other cabins. Based upon water quality analysis, concentration of arsenic, cadmium and lead in the spring water **exceeds** IDEQ's Drinking Water Standard. Additionally, the IDEQ Ground Water Standard for arsenic, cadmium, lead and zinc is also **exceeded.** Therefore, IDEQ recommends that other sources for drinking water are utilized for the caretaker and visitors.

Attached is the Preliminary Assessment Report of the property and mine facilities. The report contains a brief mine history, limited geologic information, maps and additional discussion of observations made at the property. There are also photos of the mine openings and waste dumps, remnant structures and miscellaneous equipment as well as and a brief checklist.

IDEQ very much appreciates your cooperation and approval for our access, and looks forward to addressing any questions you may have regarding our findings. Please call me if you have any comments, questions, or if I may be of any other assistance. We very much appreciate any feedback you can give us relative to our services.

Sincerely,

Bruce A. Schuld
Mine Waste Projects Coordinator
Waste Management and Remediation Division

BAS:tg \golden age pa cover letter.doc

Attachments

cc: Ken Marcie – U.S. Environmental Protection Agency
Russ Hicks - U.S. Forest Service, Idaho City Ranger Dist.
Steve Moore – U.S. Bureau of Land Management
file

## Section 1 Introduction

The Idaho Department of Environmental Quality (IDEQ) was contracted by Region 10 of the United States Environmental Protection Agency (EPA) to provide technical support for the completion of preliminary assessments at various mines within the Grimes Pass District in Boise County, Idaho.

This document presents the results of the Preliminary Assessment (PA) of the Golden Age Mine, also known as the Golden Age Junior. The Idaho Department of Environmental Quality (IDEQ) was contracted by Region 10 of the United States Environmental Protection Agency (EPA) to provide technical support for completion of PAs at various mines within the Grimes Pass Mining District in Boise County, Idaho.

IDEQ often receives complaints or information about sites that may be contaminated with hazardous waste. These sites can include abandoned mines, rural airfields that have served as bases for aerial spraying, old landfills, illegal dumps, and abandoned industrial facilities that have known or suspected releases.

In February 2002, IDEQ initiated a Preliminary Assessment Program to evaluate and prioritize assessment of such 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. Priority was also given to mining districts where groups or clusters of sites could be assessed on a watershed basis.

For additional information about the Preliminary Assessment Program, see the following:

http://www.deq.idaho.gov/waste/prog_issues/mining/pa_program.cfm

Access to assess the Golden Age Mine was provided by Ms. Ruth Cunningham, the owner of record, in April of 2007.

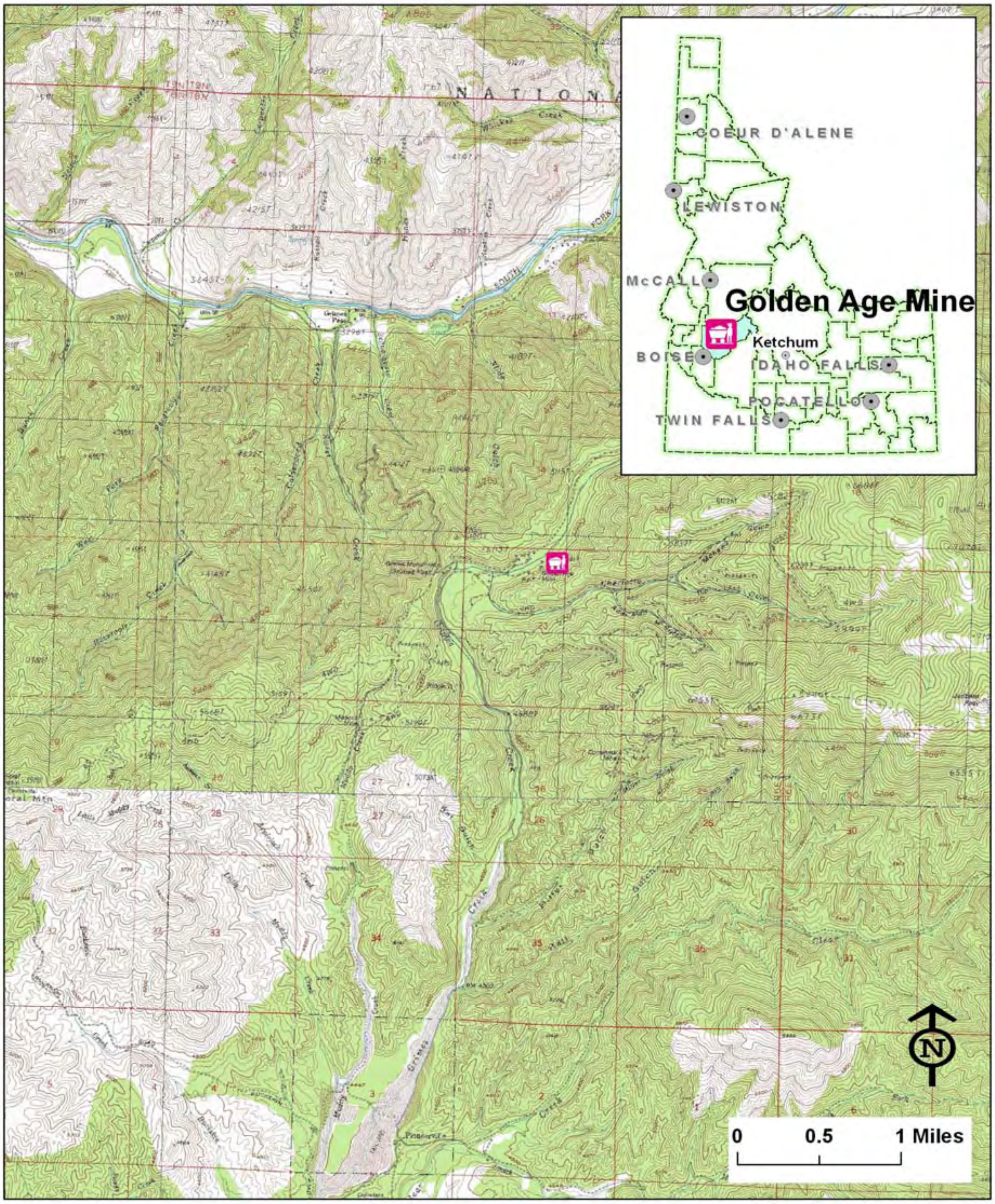

COEUR D'ALENE
LEWISTON
McCALL
Golden Age Mine
Ketchum
BOISE
IDAHO FALLS
POCATELLO
TWIN FALLS
N
0
0.5
1 Miles

**Figure 1.**

## Section 2 Ownership

IDEQ does not warrant the ownership research or location of property boundaries contained in this report. The information regarding ownership and property boundaries was obtained from the Boise County Tax Assessor's Office in Idaho City, Idaho.

Within the following ownership descriptions the **"Partial Determination"** is meant to convey a very brief summary of IDEQ's assessment of individual claims and parcels relative to human health and ecological risk factors associated with toxicological responses to mine wastes. A determination of No Remedial Action Planned or "**NRAP**" means that based on current conditions at the site IDEQ did not find any significant evidence that would indicate the potential of adverse effects to human or ecological receptors on the parcel of land. This determination says nothing about risks associated with physical hazards such as open adits, open shafts, high walls, or unstable ground. "**Partial Determination"** of "**calculate HRS**" indicates that IDEQ has determined that there is sufficient evidence to warrant calculation of a Hazard Ranking Score (HRS) by EPA's contractors. It also indicates that IDEQ has made significant conclusions and recommendations that additional site assessment and/or remedial actions are necessary to prevent adverse affects to human or ecological receptors. These conclusions and recommendations are contained in the final section of this report.

| **Owner** | **Claim** | **Parcel Number** | **Partial Determination** |
|---|---|---|---|
| James Cunningham (Deceased) | Theron | RP08N05E120048A | |
| Ruth Cunningham | Charlotte | RP08N05E130048A | |
| 4743 Coopers Hawk Bay | Theron Fraction | RP08N05E230650A | |
| Holladay, UT 84117 | Francis | RP08N05E221850A | |
| | Harper | | |
| | Florence | | |

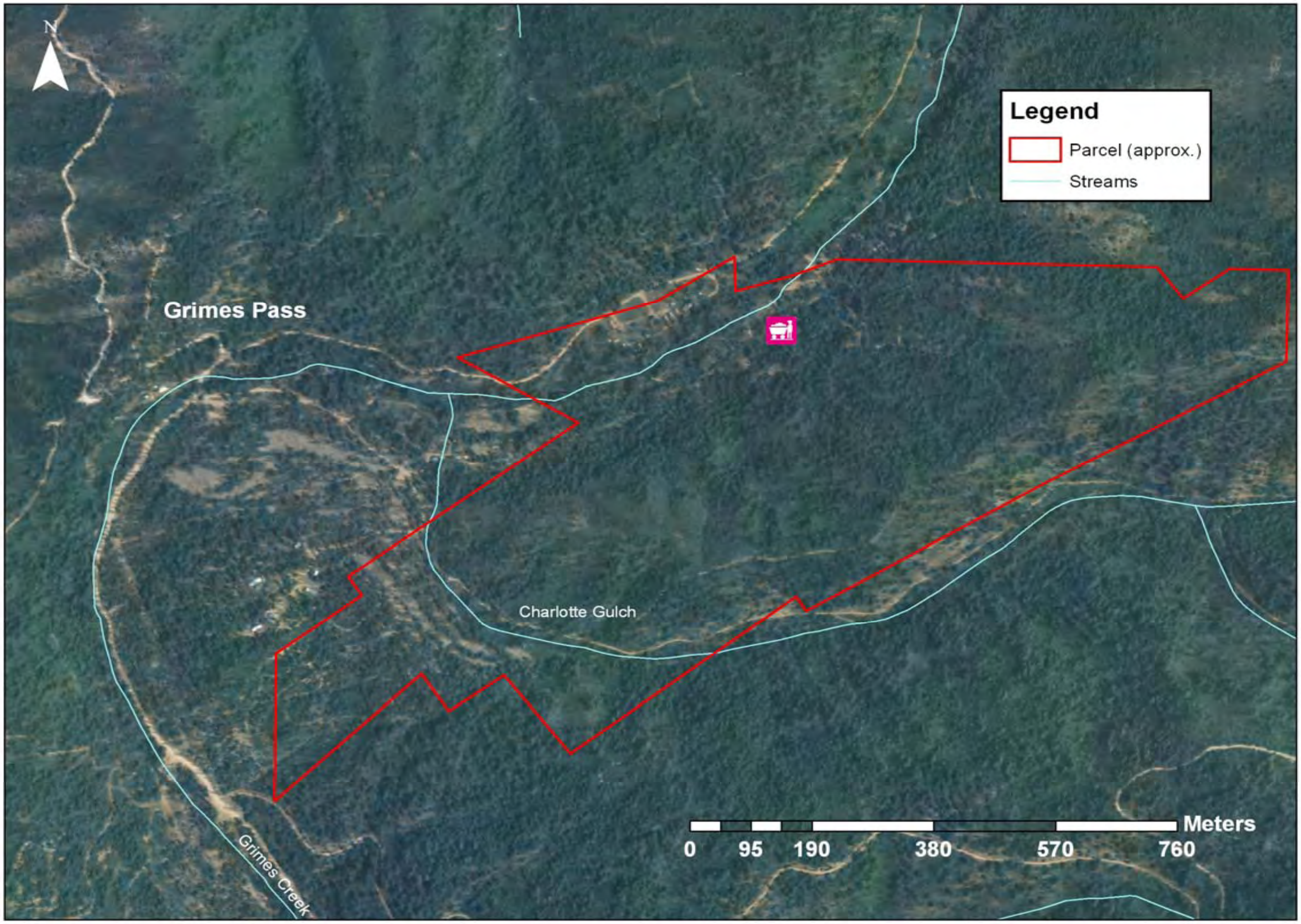



**Figure** 2**.** Golden Age Mine area

# Section 3 Overview

Numerous patented claims are associated with the Golden Age Mine, including mill, lode and placer patents. According to Anderson (1947), the Golden Age "group" consisted of eight patented and 18 unpatented claims as well as "a small area held by placer location". The mine lies near the northeastern end of the group of patents. An ore-processing mill was located at the mine.

The Golden Age Mine is located in upper Grimes Creek, a tributary to the Mores Creek sub-drainage, approximately 0.5 miles east of Grimes Pass and 13 miles north of Idaho City, Idaho, in Section 23 of Township 8 North, Range 5 East of the Boise Meridian, at Latitude 43º 01' 15"N, and Longitude 115º 49' 49"W (see Figure 1).

The Golden Age can be accessed from Idaho City, Idaho by heading northwest on the Centerville Road for a distance of approximately 6.5 miles, then northeast (right) onto Grimes Creek Road and continuing for approximately 11 miles. At this junction, NFD 382 Road continues toward Grimes Pass (left), while the road to the Golden Age forks to the right. The Golden Age is reached after traveling to the east for an additional 0.44 miles. The workings lie along the hillside, on the south side of Grimes Creek (see Figure 2).

There is no precipitation data available for the Golden Age Mine. Consequently, the information provided in this section is based on a climate summary for the Centerville Arbaugh Ran site (station # 101636), which was obtained from the Western Regional Climate Center (WRCC, 2007).

The Centerville station is located approximately 8 miles south-southwest from the mine at an elevation of 4,440 feet amsl. Based upon records from 1949 to 2007, the mean annual precipitation is 27.75 inches; the mean annual snowfall is 119 inches; and the 100-year, 24-hour event is 2.28 inches. Based upon records from 1998 to 2007, the lowest temperature recorded for this period was – 23º F in 2002 while the highest was 101º F in 2001.

Each site for which this data is used is subject to more localized meteorological conditions that result from difference in elevation, orientation of slopes in watershed, vegetation and other factors. The area around the Golden Age Mine is characterized by cool dry summers and cold winters. The majority of precipitation occurs as snow, occurring mostly in December and January. The driest months are July, August and September.

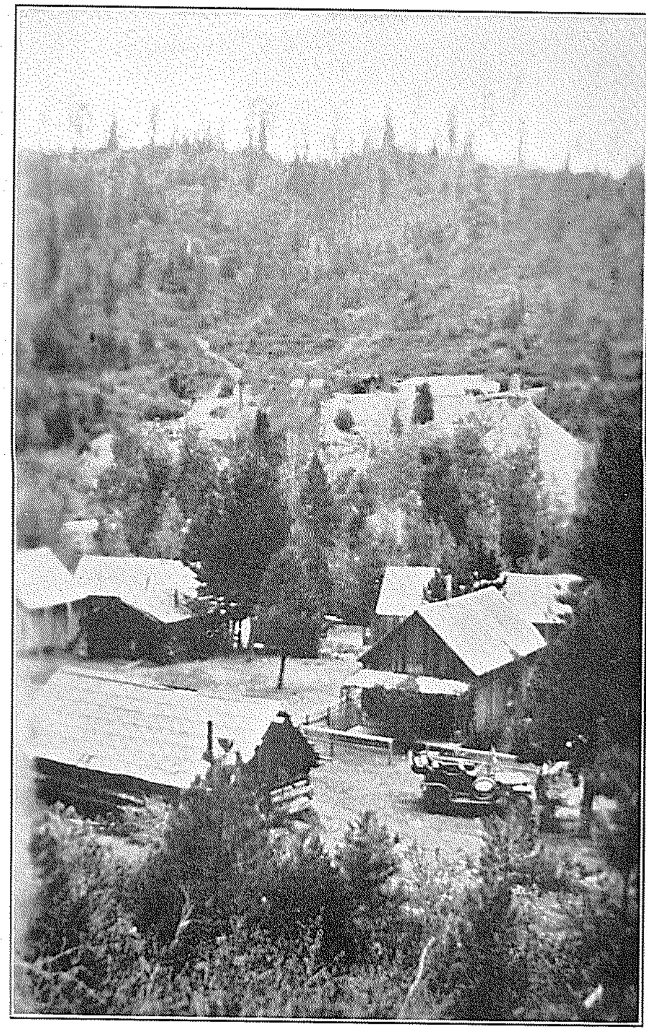
Dry-season rainfall occurs almost in relatively short episodes, usually as thunderstorm activity. It is expected that except for rare flash flood-type events, almost all dry-season rainfall events would be completely absorbed by the soils and plants, without much, if any, contribution to the ground water.

## Section 4 Historical Perspective

Jones (1916), Ballard (1924) and Anderson (1947) discussed the ownership, mine development, mineralization and structural relationships encountered at the mine and throughout the mining district. Excerpts from these authors are presented below.

> *The Golden Age Mining Co. controls 21 claims, of which 8 are patented and application has been made for patent for 8 others. These claims lie on both sides of Grimes Creek and extend northeastward 1 mile from a point near Grimes Pass. The mine is near the northeast end of the group, on the south side of Grimes Creek, at an altitude of 5,000 feet. The ore body was discovered in 1896, but the production dates intermittently from April, 1909. The mine was closed in July, 1912, but work was resumed in August, 1914, and since then about 15 men have been continuously employed. The total production is reported to be approximately $200,000, principally in gold. The development is directed chiefly from the mill tunnel level, on which the crosscuts and drifts aggregate about 2,000 feet. A winze 100 feet deep below the tunnel level has 500 feet of drifts. An old shaft probably not more than 200 feet deep connects with the mill tunnel*.
>
> (Jones, 1916, p.105)

> *The Golden Age deposit was discovered about 1895 and was worked intermittently until 1920; a 250-foot two-compartment shaft was completed in 1921 and subsequent development work has been carried on through it beneath the old workings. The upper workings, consisting of about 2,000 feet of crosscuts and drifts, were mainly in the oxidized zone. The ore was free-milling and the principal recovery was made by amalgamation. The total production by this process was approximately $200,000, principally in gold. When the sulphides-pyrite, galena, and sphalerite, with some chalcopyrite and tetrahedrite-were first encountered, cyanidation of concentrates was attempted on a small scale. This method of treatment was soon abandoned and the property was closed down until re-opened by the present management*.
>
> (Ballard, 1924, pp. 75-76)



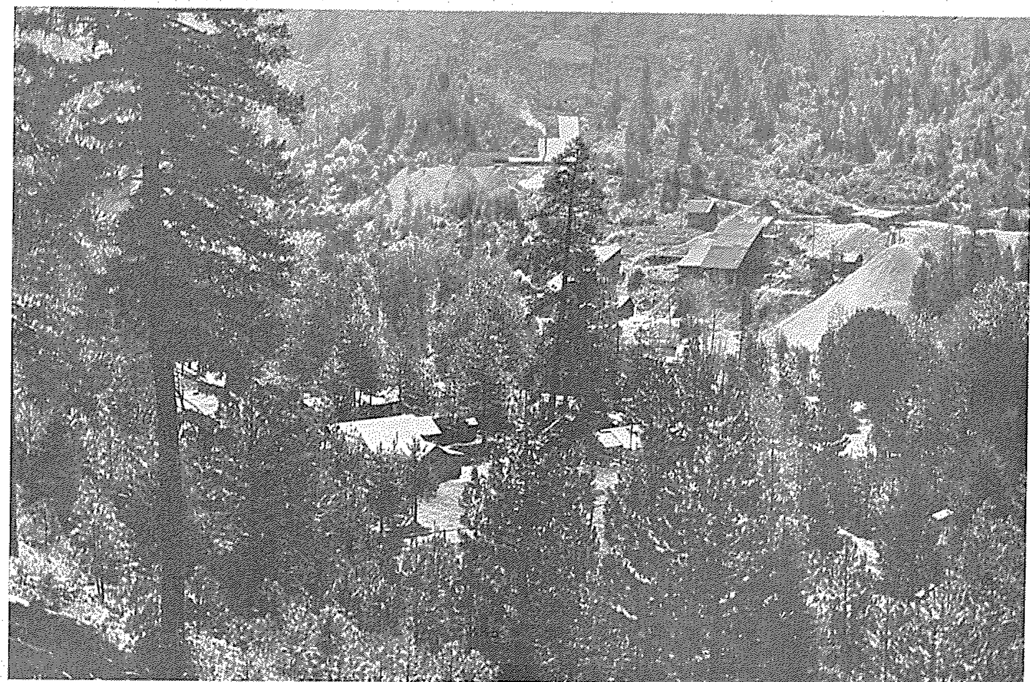
GOLDEN AGE MINE, NEAR GRIMES PASS

Golden Age mine (circa 1912), from R.N. Bell (1913).
Camp cottages in foreground. View to the east.

The 1920 edition of the Mines Handbook included the following millings report:

> *Company mining ore and milling concentrate 1919. 15-stamp mill. 300-ton mill contemplated. An old tailings dump of 3,000 tons, also 1,000 tons of concentrate are being reconcentrated.*
>
> *(Weed, 1920, p. 649)*

IDAHO BUREAU OF MINES AND GEOLOGY BULLETIN 9, PLATE XIII.



GOLDEN AGE SURFACE PLANT, GRIMES CREEK BASIN, LOOKING EAST.

Golden Age Mine and Mill (circa 1924); tunnel entrance at upper right, shaft upper center.

In 1931, the area known as the "Boise Basin" was subjected to a devastating forest fire which threatened or destroyed numerous mining and community structures. The mining town of Quartzburg was razed as the fire swept northeast towards Grimes Pass and beyond. The Golden Age was similarly impacted by the firestorm, as the surface plant was entirely destroyed. However, camp cottages near the mine were saved from the conflagration. Many of these cottages remain intact, today.

> *The mine was located in 1896, but active exploration did not get under way until 1909. Work then continued intermittently until 1925. The mine was first worked by the Golden Age Mining Co., but since April 1915 has been worked by the Golden Age Junior Mining Co. The first work was carried on from a 200-foot shaft, but later an 1800-foot tunnel was driven from Grimes Creek, giving an additional depth of 65 feet. Still later a 100-foot winze was sunk below the tunnel level and 500 feet of drifting was done from the bottom. In 1921 a new 250-foot two-compartment shaft was sunk a short distance below the older shaft and the development carried on through it. This shaft reached a depth of 160 feet below the old winze level, or about 425 feet below the outcrop of the lode measured on*

> *the dip. Mining was continued through the shaft for 2 years, then underground work was suspended while a fine-grinding 100-ton flotation concentrator was installed. Earlier milling had first been carried on in a 15-stamp amalgamator equipped with Wifley tables. When the oxidized ore had been mined a cyanide plant was added. The new concentrator was not completed until 1924, but mining operations were not resumed and the mine remained inactive through 1938. The underground development comprises 6,500 feet of workings. During the 1931 forest fire the entire surface plant, except the camp cottages along Grimes Creek, were destroyed. Production records are not available, but prior to 1915 the recovery by amalgamation had exceeded $200,000.*
>
> (Anderson, 1947, p. 290)

## Current Site Conditions

IDEQ conducted site visits on July 10th and 17th of 2007. According to Ms. Cunningham, owner of the Golden Age Mine, timber harvesting operations have been conducted on several of the patented claims, but mining apparently ceased following the 1931 fire. Evidence of recreational placer mining was observed, however. Portions of the site were heavily covered by brush. When possible, IDEQ located the workings and structure ruins via GPS coordinates. Figure 3 illustrates the workings and sample locations.

*View to E. Small gold sluice in Grimes Creek below small beaver dam near west end of the site.*

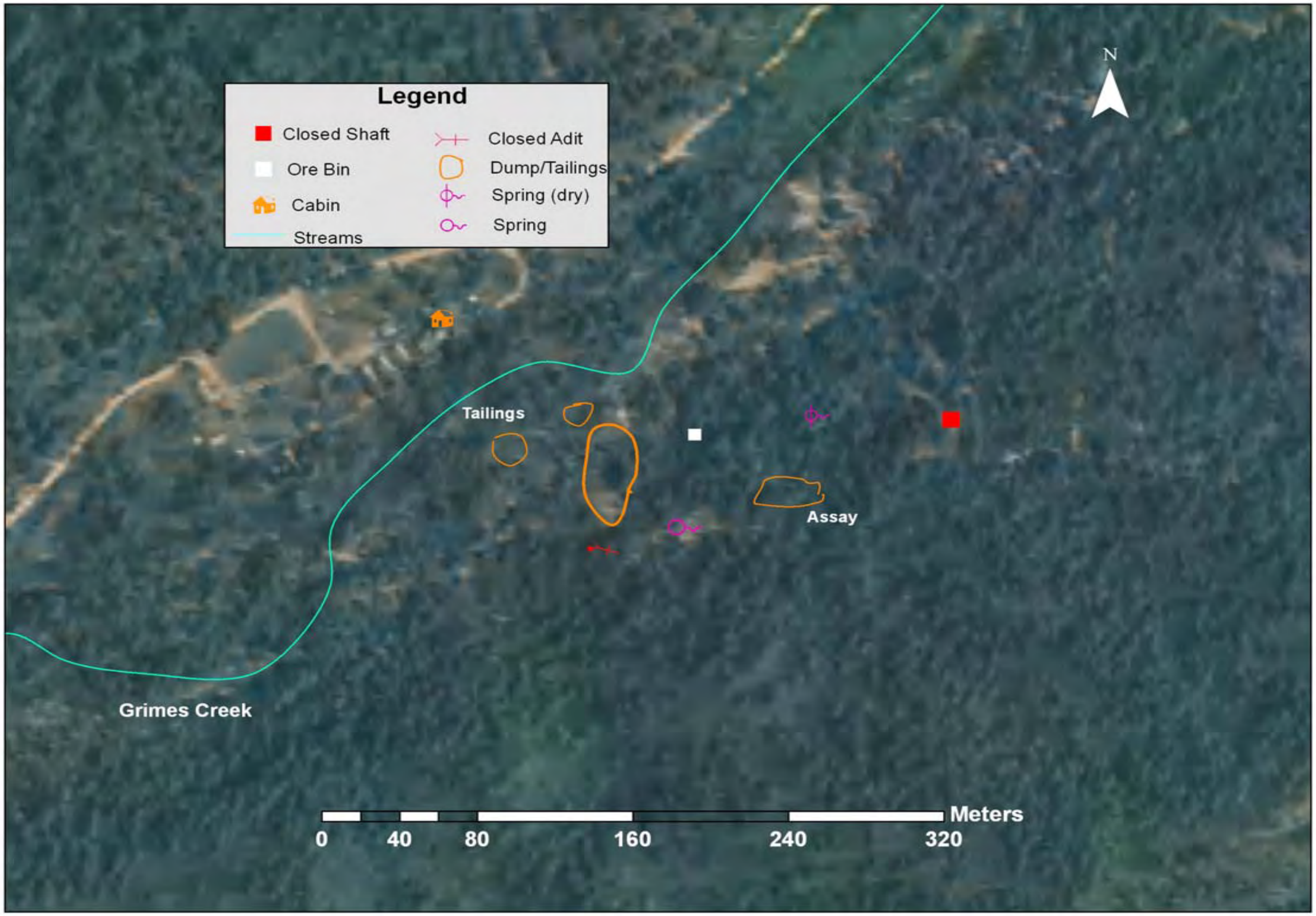



**Figure 3**
**Golden Age Mine workings**

## **Mine Workings**

According to Jones (1916), the mine was first opened by 200-foot shaft, followed by a 1,800-foot main tunnel and later by a 250-foot shaft. The latter shaft was sunk in close proximity to the old workings. None of these workings are accessible; the shafts (only one of which was located) are closed and the tunnel's portal is collapsed, now indistinguishable from the surrounding hillside. Concrete footings, discarded piping, miscellaneous equipment, a ruined ore bin and minor tailings are all that remains of the former mill site. The waste dumps support thickets of brush and scattered trees. Beside the burnt remains of a structure, possibly the assay office, fire bricks, spent crucibles and cupels and ash were observed.

Mill Site

As noted by Weed (1920), old tailings and concentrates were "reconcentrated". Later Ballard (1924) mentioned that the mill briefly processed sulfide ore with cyanide in its newly constructed 100-ton concentrator. Production records are scant or incomplete. IDEQ did not determine the thickness of the tailings, nor was a tailings volume established. The area was strewn with rusted equipment and other solid waste debris.

*Ash remains of former mill located along the south bank of Grimes Creek.*

*Tailings deposit and debris near former mill area.*
*Tailings sample 1 and 2 were collected here.*

*West tailings pile, approximately 200 feet south of Grimes Creek.*

*Photo No. 15: Miscellaneous ore processing equipment on south hillside*

*Former ore bin on south hillside***.**

<u>Tunnel</u>

The location of the adit was not readily apparent due to dense vegetation on the hillside above the waste dump. Perhaps the best view of the adit and associated waste rock was captured in the 1924 photograph by Ballard. The waste dump was measured to contain approximately 3,700 cubic yards of material.

*View to S. Waste dump material contained minor sulfides*

<u>Shaft</u>

Historical records indicate that two shafts were sunk to the east of the mine’s tunnel. During the site visit, IDEQ only located one of these shafts. It was not determined which shaft was located. The volume of the waste dump was not determined, though it appeared to contain less than 500 cubic yards.

*View to S. Waste dump of shaft. Decomposed granite, minor sulfides*

<u>Assay/Furnace</u>

Located on the south hillside, IDEQ located what appeared to be the former assay office. The concrete slab supported the remains of a furnace (fire brick), numerous crucibles and cupels used for assaying ore, and ash.

*Buried pipes and concrete footings of assay office (?) on south hillside.*
*Soil samples were collected near broken crucibles in this area.*

## Camp Area

As previously mentioned, when the 1931 fire roared through the Golden Age, the camp cottages were not destroyed. Several of these remain, some in good condition. Several of the structures are maintained, including the caretaker's cabin, a fuel storage shed and numerous small cabins. Solid waste such as abandoned equipment, empty chemical drums and refuse were scattered about the area.


*Storage tank (empty?) and old equipment in NE section of camp.*

*Several small containers of liquid chemicals in the trailer at center.*

*Empty 55-gallon drums located near storage shed in NE section of the camp.*
*No evidence of leaks or stained soil was observed.*

## **Section 6 Geology**

During the past 100 plus years numerous authors including Lindgren (1896), Jones (1916), Ballard (1924), Ross (1933) and Anderson (1947) have described the geology and/or ore deposits within the Boise Basin and specifically, of the Grimes Pass area. Later investigations of the area were conducted by Idaho Geological Survey (IGS) staff members (Gillerman & Schiappa, 1994 and Leppert, Berwick & Gillerman, 2002). However, the IGS was unable to receive permission from the owners to conduct an investigation of the Golden Age property.

The following excerpts from Anderson (1947) discuss the geology and mineralization encountered within the Boise Basin:

> *The area is underlain chiefly by granitic rock of the Idaho batholith, of Mesozoic age, which is cut locally by dikes and stocks of…granodiorite of Tertiary (?) age and by a host of porphyritic dikes and stocks of lower Miocene age…In places the granitic rock is concealed beneath lake beds and volcanics of lower Miocene age; and in other places with the dikes by flows of Columbia River basalt of middle or upper Miocene age, by Pleistocene basalt, and by Quaternary bench gravels and stream alluvium…The so-called "porphyry belts" are the most conspicuous and most important structural features in the region and comprise the zones along which most of the ore deposits are concentrated.*
>
> *The ore deposits are mainly valued for their precious metals, particularly gold, but some of them have also contributed small amounts of base metals. Metalization accompanied the igneous activity of both early Tertiary (?) and lower Miocene time, and the ore deposits therefore fall into two principal groups based on age. The early Tertiary (?) deposits comprise small lenticular veins in fissures and larger lodes along complex fissure and fracture zones produced by reverse faulting. The veins and lodes trend mostly west-northwest, dip southwest at moderate angles, and contain quartz as their most abundant filling…Erosion, however, has apparently stripped away all but the very roots of the ore shoots and has concentrated much of the gold in the placers below the outcrops.*
>
> *The lower Miocene deposits comprise both fissure veins and lodes along more complex zones of fracturing. The lodes trend in a northeast direction-the most important and conspicuous lodes about N. 70° E., and the others N. 10°-30° E. and N. 35°-60° E. The lodes are commonly in or near rhyolite porphyry dikes and other members of the "porphyry belt"…These lodes, the most productive in the area, have not been as deeply eroded nor have they contributed as much gold to the placers as the early Tertiary (?) deposits.*
>
> (pp. 119-120)

Samuel M. Ballard and E. L. Jones investigated the workings of the Golden Age Mine and discussed the geology and ore mineralization. Excerpts from their reports are present below:

> *The Gold Dollar vein to which all work has been confined, was formerly worked from a level about 30 feet below the collar of the present shaft…The Gold Dollar vein, as disclosed in several hundred feet of drifting thereon, has an average strike of N. 10° E. and a dip of 60°-80° W.; the last 60 feet of the north drift, however, shows a reversal of the dip to 70° E. The Gold Dollar vein is younger than the major fault fissures of the locality which strike N. 40°-60° E. and dip steeply to the southeast.*
>
> (Ballard, 1924, p. 76)

> *Diorite porphyry is the dominant rock of the crosscut tunnel, but near the vein there is exposed a mass of intrusive rhyolite 100 feet thick whose relation to the diorite porphyry is not clearly shown. The diorite porphyry is cut by several shear zones and small faults that trend nearly north and dip steeply both east and west. At 100 feet from the tunnel portal a shear zone 40 feet wide, known as the Jerry Simpson vein, is intersected. This zone contains many sulphide seams which constitute a low-grade ore, but no attempt has been made to mine the deposit. Other shear zones in the tunnel section show small sulphide veins, but only one of them has been exploited. Where cut by the tunnel the productive vein is a narrow sulphide vein in sheared wall rocks. It trends north and on the tunnel level and in the lower drift dips 60° W., but in places on the stoped-out parts of the vein above the tunnel level it dips east.*
>
> *The ore body is 600 feet long and has been largely removed above the tunnel level, the present production being made from stopes below it. On the tunnel level two drifts extend for 200 feet on split parts of the vein. At no place is the distance between the drifts greater than 20 feet. The split parts of the vein join at each end on the tunnel level and probably also below it, as but one ore body occurs on the lower level. Above the tunnel the two parts of the vein extend for 60 feet, the eastern limb bending over toward but not joining the western part. At the north end of the ore shoot the vein is displaced with small offsets by several east-west faults. Another fault of similar direction is apparently older than the mineralization as the vein continues through it undisturbed. The vein is essentially an aggregate of sulphides with subordinate quartz. The sulphides are pyrite, galena, sphalerite, and tetrahedrite. Stibnite is reported to occur but was not observed in the ore. Pyrite predominates over galena and sphalerite, and these sulphides in turn are in excess of tetrahedrite. The ore is of high grade and is valuable chiefly for its gold content, but it also contains silver. The battery feed of the ore now being mined is said to assay about $48 a ton in these metals. Much of the ore previously mined assayed from $7 to $20 to the ton. Assays of samples across the vein which showed notable amounts of tetrahedrite gave as much as 35 ounces of silver to the ton.- The ore now mined is much more base than that which was obtained from the upper mine workings, and a much lower saving of*

> *the precious metals is effected. The reported recovery is 60 per cent of the assay value. The ore is treated at the mine in a mill of 15 stamps, whose capacity for a product of the desired screen size is 20 tons in 24 hours. The ore is crushed to pass a 40-mesh screen. The gold that is liberated and polished by this crushing process is caught on the plates. The overflow from the plates is treated on Wilfley tables, where concentrates of two grades are made. Those of the first class assay from $90 to $200 a ton, and those of the second class, which are mainly pyrite, assay only $8 to the ton. The loss of sulphides and of amalgam in the tailings is considerable.*
>
> (Jones, 1916, pp. 105-106)

Figure 4 illustrates the lithology and structural geology along Grimes Creek and surrounding area.

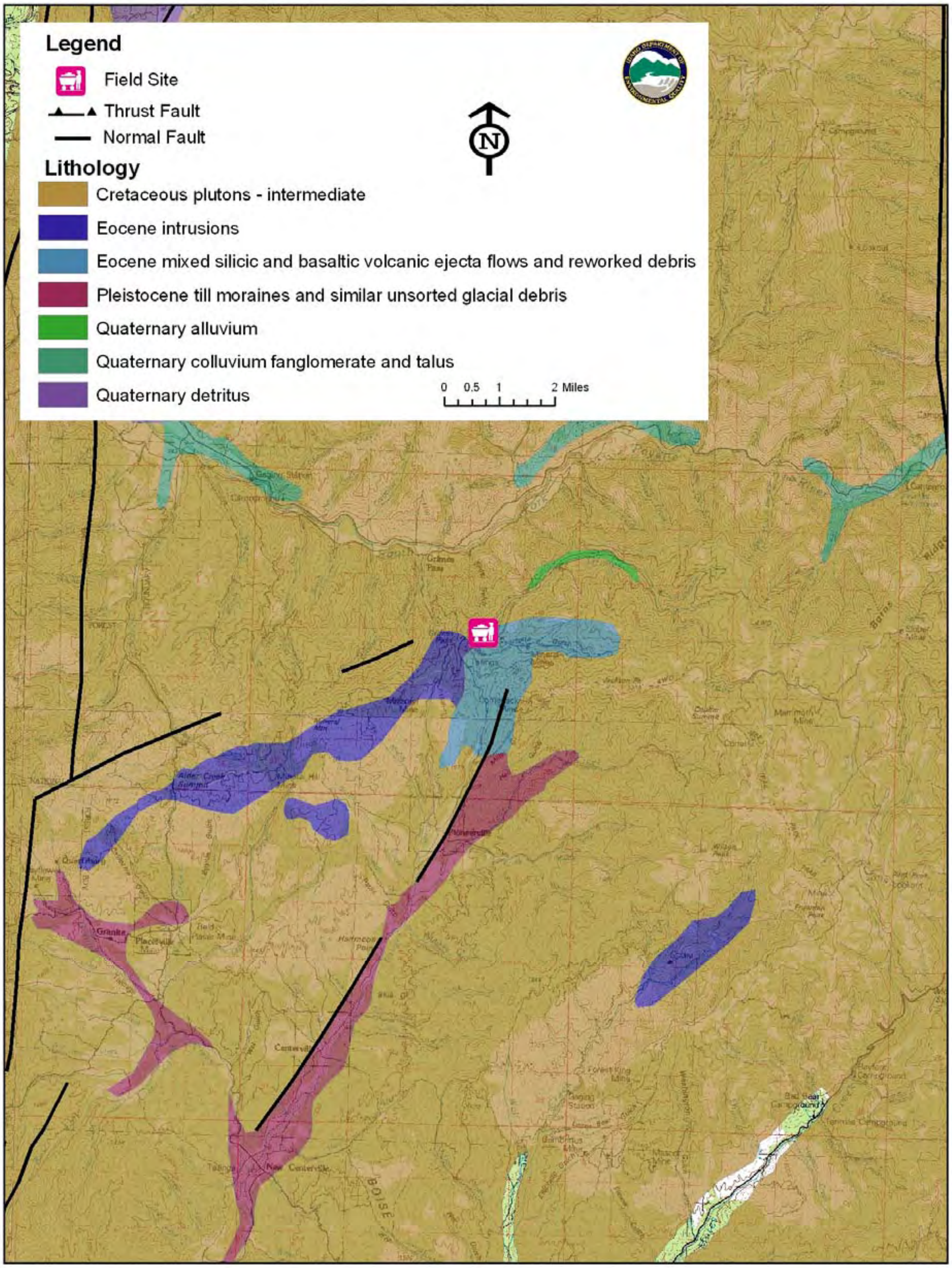

Legend
Field Site
Thrust Fault
Normal Fault
Lithology
Cretaceous plutons - intermediate
Eocene intrusions
Eocene mixed silicic and basaltic volcanic ejecta flows and reworked debris
Pleistocene till moraines and similar unsorted glacial debris
Quaternary alluvium
Quaternary colluvium fanglomerate and talus
Quaternary detritus
N
0 0.5 1 2 Miles

**Figure 4**

## Section 7 Current and Potential Future Land Uses

Current land uses in the area include recreational mining activities, off-road vehicle (ORV) use, hunting and hiking. The Cunningham family employs a resident caretaker to provide security for the property and minimize intrusion onto the Golden Age, but trails from adjacent gulches may permit access. As detailed in the Section 3 of this report, the most direct route approaches the mine from the Whitecap Road which branches off the main Grimes Creek Road. Although the road is marked as "Private", previous logging operations may have created alternate routes of entry into the property.

### Future Land Use

Future land use could potentially include some year-round and/or seasonal homes on the private parcels of property in the sub-basin. The site will also likely continue to provide grazing values to wildlife.

## Section 8 Waste Sampling and Characterization

### Sample Collection

A background water sample [Grimes Creek SW1] was collected near the eastern boundary of the claim block. However, a background soil sample was not collected. Sample locations are presented in Figure 5.

Waste

Soil/waste samples were collected from waste dump at the Golden Age shaft (GAWDSS-1), from two mill tailings piles (GATSS-1 & GATSS-2), from the former assay area (GACSS-1) and mill ruins (GCASS-2). The upper waste dump, attributed to the main tunnel, appeared entirely comprised of country rock and was, therefore, not sampled.

Each soil sample collected was, initially approximately ten (10) pounds in size. Each sample location was excavated several inches with the material discarded. Then the sample hole was excavated approximately 6" more to extract a sample. Waste dumps and tailings had at least three locations within a few square yards sampled and composited. Samples were placed in a large sterile plastic bowl from which coarse (+1") rock and woody debris were hand picked and disposed. The samples were then screened over a 10-mesh sieve and placed in a sterile plastic zip lock bag. The bag was appropriately marked with the sample identification, location description, date, and sampler name. It was then placed in a cloth sample bag, identically labeled. Sample descriptions were entered into field logbooks. The samples were logged on a standard chain-of custody lab submittal form. Once samples were taken to IDEQ's field office at the end of the day they were placed in secure storage to await shipping.

Water

At the time of the site visit, Grimes Creek was observed to maintain a seasonal flow. Background (GC-SW2) and down-gradient (GC-SW-1) samples were collected from the creek. Drinking

water for the site is obtained from a nearby spring. IDEQ collected a sample from this spring (GA-Spring).

*View to N: Spring-box and piping; supplies drinking water to the cabins in the mine camp.*

**Sample Description**

<u>Soils</u>

Sample **GAWDSS-01** was collected from the base slope of the shaft's waste rock dump. The sample location was excavated approximately 6 more inches in moderately coarse rock and soil. The yellow to gray colored sample was a composite of oxidized soil and sulfide material. Approximately 80% of the sample passed the 10 mesh sieve, less than 10% organic material was included.

Sample **GATSS-01** was a composite sample collected from concentrate tailings located below the shaft waste dump to the west of the old mill. The sample location was excavated approximately 6 more inches in coarse rock and soil. The yellow to orange colored sample was a composite of concentrate tails and sandy oxidized soil. Approximately 95% of the sample passed the 10 mesh sieve, less than 10% organic material was included.

Sample **GATSS-02** was a composite sample collected from concentrate tails located to the east from tailings pile #1. The sample contained some coarser fragments, but generally < 1". Here,

the tailings emitted a strong sulfurous odor. Approximately 90% of the sample passed the 10 mesh sieve, less than 10% organic material was included. The sample was generally buff to orange colored.

Sample **GACSS-01** was a composite sample collected from what appeared to be the former assay furnace area. The waste material was composed of partially crushed crucibles and cupels, and oxidized soil. The sample contained some coarse fragments greater than 2". After hand sorting to dispose of the plus 1" material, approximately <75% passed the 10 mesh screen. The sample was generally orange-yellow to brown.

Sample **GACSS-02** was a composite sample collected near GACSS-1. The oxidized soil contained substantial quantities of ash, possibly from the furnace. Approximately 80% of the sample passed the 10 mesh sieve, less than 10% organic material was included. The sample was generally buff or yellow to gray colored.

**Soil Sample Analysis**

IDEQ Sample Analysis of waste dump, tailings and assay/furnace materials is presented in Table 1. Samples were analyzed for Total Recoverable Metals (Totals), but subsequent TCLP analyses were not performed. In addition to IDTLs, the sample results were compared with the EPA Region 6 Human Health Medium-Specific Screening Levels (HHSL). Although HHSL values are not regulatory, they are derived from EPA guidance equations and commonly used defaults (EPA**,** 2007).

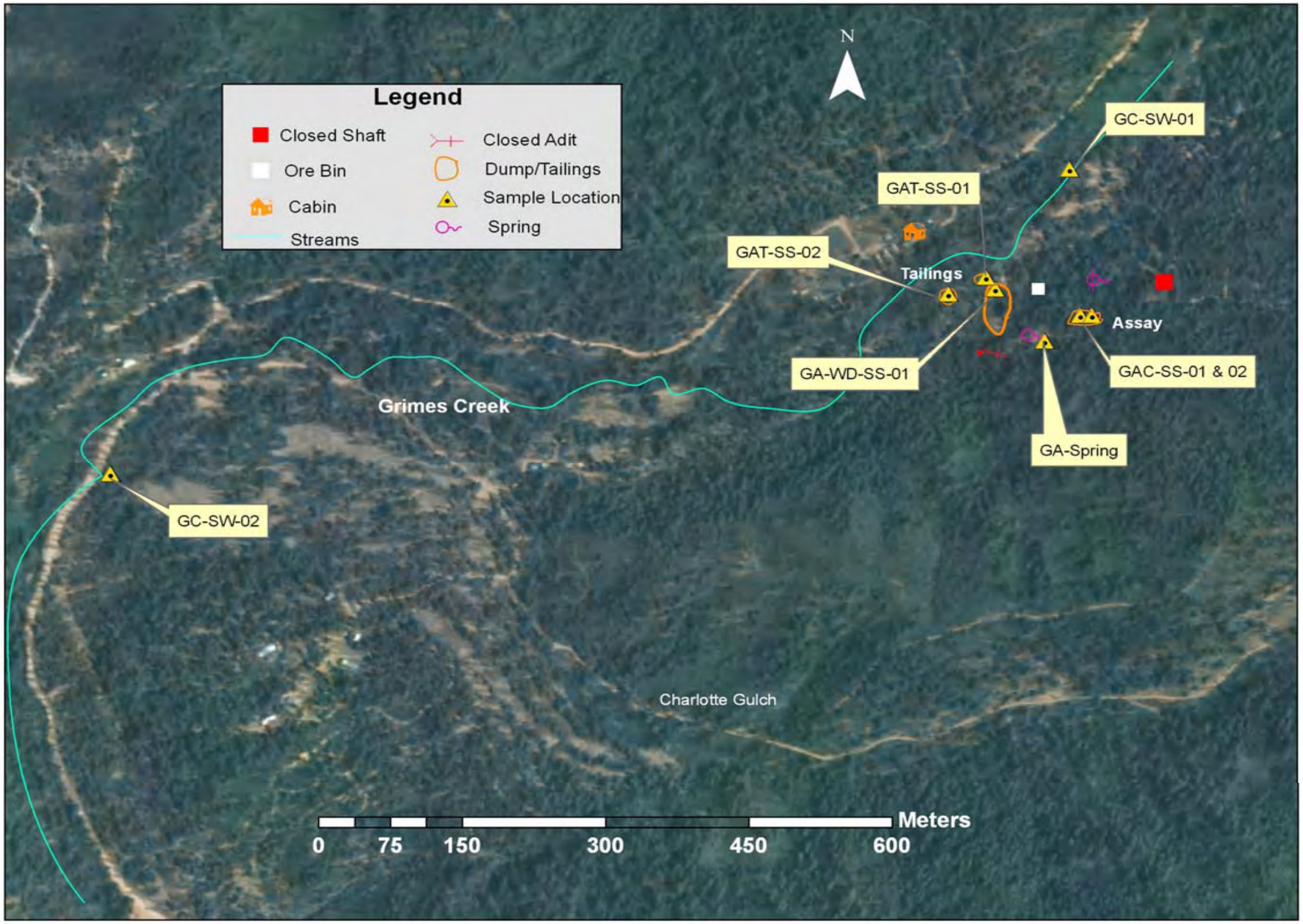

N
Legend
Closed Shaft
Ore Bin
Cabin
Streams
Closed Adit
Dump/Tailings
Sample Location
Spring
GC-SW-01
GAT-SS-01
GAT-SS-02
Tailings
Assay
GA-WD-SS-01
GAC-SS-01 & 02
GA-Spring
Grimes Creek
GC-SW-02
Charlotte Gulch
Meters
0
75
150
300
450
600

**Figure 5**

## Table 1: IDEQ Soils Samples Total Recoverable Metals Analysis (mg/kg)

| Description | IDEQ Initial Default Threshold Level (IDTL) | EPA Region 6 Human Health Screening Criteria | Golden Age Waste Dump #1 GAWDSS-01 | Golden Age Tailings # 1 GATSS-01 | Golden Age Tailings # 2 GATSS-02 | Assay Area Crucible # 1 GACSS-01 | Furnace Area Crucible # 2 GACSS-02 |
|---|---|---|---|---|---|---|---|
| **Arsenic** | 0.391 | **23** | 45.7 | 220 | 146 | 109 | 16.7 |
| **Barium** | 896 | **1600** | 244 | 76.9 | 21.5 | 1120 | 275 |
| **Cadmium** | 1.35 | **39** | 7.01 | 3.63 | 2.46 | 15.3 | 2.41 |
| **Copper** | 921 | **2900** | 139 | 142 | 95.4 | 696 | 97.6 |
| **Chromium** | 7.9 | **210** | 4.14 | 2.76 | 4.92 | 19.9 | 17.5 |
| **Lead** | 49.6 | **400** | 258 | 2870 | 413 | 1870 | 338 |
| **Mercury** | 0.00509 | **23** | 0.383 | 14.4 | 2.58 | 0.352 | 2.63 |
| **Selenium** | 2.03 | **390** | <4 | <4 | <4 | <4 | <4 |
| **Silver** | 0.189 | **390** | 3.51 | 48.1 | 11.6 | 23.1 | 3.30 |
| **Zinc** | 886 | **23000** | 792 | 372 | 186 | 3010 | 436 |
| (purple) | At or exceeds IDTLs | | | | | | |
| (yellow) | At or exceeds EPA Region 6 HHSLs | | | | | | |

**Note: MDL for Se exceeds IDTL value**

Soil sample analyses indicate that the mine concentrations for total arsenic, total barium, total cadmium, total chromium, total lead, total mercury, total silver and total zinc exceed Idaho's *Initial Default Target Levels* (IDTLs). The IDTLs are risk-based target levels for certain chemicals that have been developed by IDEQ using conservative input parameters, a target acceptable risk of $10^{-6}$, and a *Hazard Quotient* of 1. An exceedance of the IDTLs indicates that if pathways are complete, and receptors can get a prolonged exposure to contaminants from the site, then additional site assessment work may be necessary to qualify true risk under current site conditions.

Generally speaking, soils analysis indicates that the heavy metals of concern (highest result) for the Golden Age mine are: arsenic (220 mg/kg), and lead (2,870 mg/kg); which far exceeds both the IDTLs and EPA Region Six's Human Health Screening levels. These levels, although used for comparison even at remote locations, are more applicable in locations where these types of

contaminants are determined to be readily available to receptors; where exposures might produce an acute or chronic toxicological effect in a population. In the case of the Golden Age mine, these numbers suggest that additional site assessment should be undertaken if the tailings areas or the former assay site were to be developed for “unrestrictive uses” such as residential.

**Sample Description**

Sample **GA-Spring** was collected from a spring-box, located on the south side of Grimes Creek, west of the workings. PVC pipe carries the water across the creek to the caretaker’s house for use as drinking water. The water was clear and had no discoloration or odor. Field parameters taken at this point are as follows: pH = 6.98, Conductivity = 0.525mS/cm, Dissolved Oxygen = 18.12mg/L, Turbidity = 354 and Temperature = 10.6 $^{o}$C.

Sample **GC-SW-01** was collected as a background sample from Grimes Creek, upstream of any workings of the Golden Age mine. The water was clear and had no discoloration or odor. Field parameters taken at this point are as follows: pH = 7.66, Conductivity = 0.103mS/cm, Dissolved Oxygen = 10.95mg/L, Turbidity = 353 and Temperature = 22.5 $^{o}$C.

Sample **GC-SW-02** was collected from Grimes Creek, downstream of Charlotte Gulch above the bridge crossing of the Grimes Pass Road. pH = 7.83, Conductivity = 0.043mS/cm, Dissolved Oxygen = 11.1mg/L, Turbidity = 353 and Temperature = 22.5 $^{o}$C.

**Water Sample Analysis**

Sample results are presented in Table 2. The analyses were compared to the Idaho Water Quality Standards.

## Table 2: Total Recoverable Metals Analysis (mg/L)

(Standards in "dissolved" unless stated)

| Description | IDEQ Ground Water Standard (T) | IDEQ Drinking Water Standard MCL | IDEQ Cold Water Biota Standard Acute | IDEQ Cold Water Biota Standard Chronic | GCSW-01 | GCSW-02 | GA-Spring |
|---|---|---|---|---|---|---|---|
| **Arsenic** | 0.05 | 0.01 | 0.36 | 0.19 | <0.0030 | <0.0030 | 0.0877 |
| **Barium** | 2 | 2 | | | 0.0154 | 0.0167 | 0.069 |
| **Cadmium** | 0.005 | 0.005 | 0.00082 (H) | 0.00037 (H) | <0.0020 | <0.0020 | 0.0434 |
| **Copper** | 0.1 | 0.1 | | | <0.010 | <0.010 | 0.155 |
| **Chromium** | 1.3 | | 0.0046 (H) | 0.0035 (H) | <0.006 | <0.006 | <0.006 |
| **Lead** | 0.015 | 0.015 | 0.014 (H) | 0.00054 (H) | <0.00300 | <0.00300 | 0.108 |
| **Mercury** | 0.002 | 0.002 | 0.0021 | 0.000012 (T) | <0.00020 | <0.00020 | 0.00059 |
| **Selenium** | | 0.61 | 0.438 (H) | 0.049 (H) | <4 | <4 | <4 |
| **Silver** | 0.05 | 0.05 | 0.018 (T) | 0.005 (T) | <0.005 | <0.005 | <0.005 |
| **Zinc** | 0.1* | | 0.00032 (H) | | <0.010 | <0.010 | 2.68 |
| (purple) | At or Exceeds GW Standard | | | | | | |
| (yellow) | At or exceeds DW Standard | | | | | | |

* Secondary MCL (T) – Standard in Total (H) – Hardness dependent @25 mg/L

**Note – MDL for Se exceeds Standards**

## Section 6 Risk Analysis

The heavy metal concentrations exhibited in the tailings piles, the assay area and waste rock dumps may present an unacceptable health risk for receptors visiting and/or working at the site. To identify risks to human health from the Golden Age soils, DEQ performed the following risk evaluation using the DEQ 2004 Risk Evaluation Manual (REM). This analysis is based on exposure to surface soils, and it utilized the following sample data from the tailings, waste dump (adit) and assay area.

It is assumed that recreational visitors have the potential to contact contaminants at the site while hiking, hunting, and riding mountain bikes or ATVs. Therefore, the exposure routes, in decreasing order of significance, are incidental soil ingestion, inhalation of particulates, and dermal contact.

**Exposure Duration and Frequency**

Both excess cancer risk and non-cancer risk (hazard index) were modeled. The age-adjusted receptor represents an individual who visits the site over 30 years, six times as a child, nine times as an adolescent, and fifteen times as an adult. For non-residential receptor the exposure duration is 6.6 years. The exposure duration of a construction worker is 30 days; this is assumed to be a conservative estimate owing to the duration of most construction projects.

For exposure routes involving direct contact with soil, including soil ingestion and dermal exposure, it is assumed that receptors have contact with soil primarily in warmer months, when the ground is not frozen or snow covered. For this reason, an exposure frequency of 270 days per year is used for these exposure routes for both residential and nonresidential scenarios. The direct contact exposure frequency for construction workers is 30 days per year (REM, Appendix E, p. E-2).

**Discussion**

Although construction worker has been included for reference, the most appropriate receptor for the site is the non-residential. The construction worker scenario is presented to represent the timber harvesting worker, since the site has been logged in the past. Considering the climate, the elevation and slope aspect of the workings, late-May through early November might represent the recreational season.

**Excess cancer risk and non-cancer hazards at the Golden Age Mine are driven by arsenic concentrations, alone.** Construction worker receptors are not impacted by either the excess cancer risk or the non-cancer hazard.

Waste Dump # 1: Excess cancer risk for all residential and non-residential receptors is greater than the acceptable level of 1E-05, as defined by the REM. The non-cancer hazard is greater than the acceptable level (Hazard Index = 1) for only <u>residential</u> receptors.

Tailings # 1: Excess cancer risk for residential and non-residential receptors is greater than the acceptable level of 1E-05, as defined by the REM. The non-cancer hazard is greater than the acceptable level (Hazard Index = 1) for residential and non-residential receptors.

Tailings # 2: Excess cancer risk for residential and non-residential receptors is greater than the acceptable level of 1E-05, as defined by the REM. The non-cancer hazard is greater than the acceptable level (Hazard Index = 1) for residential and non-residential receptors.

Crucible # 1: Excess cancer risk for residential and non-residential receptors is greater than the acceptable level of 1E-05, as defined by the REM. The non-cancer hazard is greater than the acceptable level (Hazard Index = 1) for only residential receptors.

Crucible # 2: Excess cancer risk for residential and non-residential receptors is greater than the acceptable level of 1E-05, as defined by the REM. The non-cancer hazard is less than the acceptable level (Hazard Index = 1) for all receptors.

### Uncertainty

The risk estimates presented here are based on specific locations and may not be representative, as it is unlikely receptors would repeatedly spend so much time in these areas over an exposure duration of many years, or even 30 days.

The analysis presented here assumed that all of the arsenic is 100% bioavailable. It is likely that bioavailability varies in soils throughout this site; 60% arsenic bioavailability has often been assumed for arsenic in soils contaminated with mine waste.

## Section 9 Pathway and Environmental Hazard Assessment

Pathway and environmental hazards were assessed for groundwater, surface water, and soil/air exposure. The findings from these assessments are presented in the following.

### Ground Water

Ground water flow is expected to be controlled structurally within faults and fracture zones in the country rock and be expressed at the surface as springs. Two springs were observed near the base of the hill below the old workings. One is utilized as a drinking water source, while the other spring's flow had ceased, possibly owing to seasonal ground water fluctuations. Other than the presence of this spring, no discharges were observed emanating from the old workings. The amount of recharge of regional aquifers by surface and ground water in the upper Grimes Creek area is unknown.

According to Idaho Department of Water Resources July 2002 records, 1 private drinking water well is located within a 1-mile radius of the site. The closest domestic well is located approximately 0.6 miles to the east. No wells were sampled during this assessment. Drinking water wells are illustrated in Figure 6.

Although none of the wells were sampled, IDEQ did collect a sample from a spring, located near the camp. This spring supplies drinking water for the camp's caretaker and other cabins**.** Based upon water quality analysis, concentration of arsenic, cadmium and lead in the spring water **exceeds** IDEQ's Drinking Water Standard. Additionally, the IDEQ Ground Water Standard for arsenic, cadmium, lead and zinc is also **exceeded.**

During the cleanup activities of mining and milling properties, such as those encountered at the Triumph and the Minnie Moore in Blaine County, the first concerns were related to potential human health risks as a result of contamination of public and private drinking water supplies. Generally speaking, contamination of drinking water systems was thought likely to occur from two types of sources (ore bodies and waste dumps) and along three pathways, as illustrated by the following three scenarios. First, heavy metals are leached from mine waste dumps, enter ephemeral or perennial drains and then contaminate the area's shallow ground water system. Second, heavy metals leach from the local ore bodies and are transported through the geologic structure to the shallow ground water. Third, heavy metals could leach out of the ore bodies, and be discharged from the underground workings as adit water, that is then conveyed through ephemeral and perennial drains to the shallow ground water systems.

For the purposes of completing Preliminary Assessments, Source Water Assessments (completed for local public drinking water supplies) were used to identify any known affects to those systems. Although IDEQ's Source Water Assessments were used to evaluate potential affects of this mine on public drinking water supplies no inferences can be made about the affects that this and adjoining mines have on local private wells.

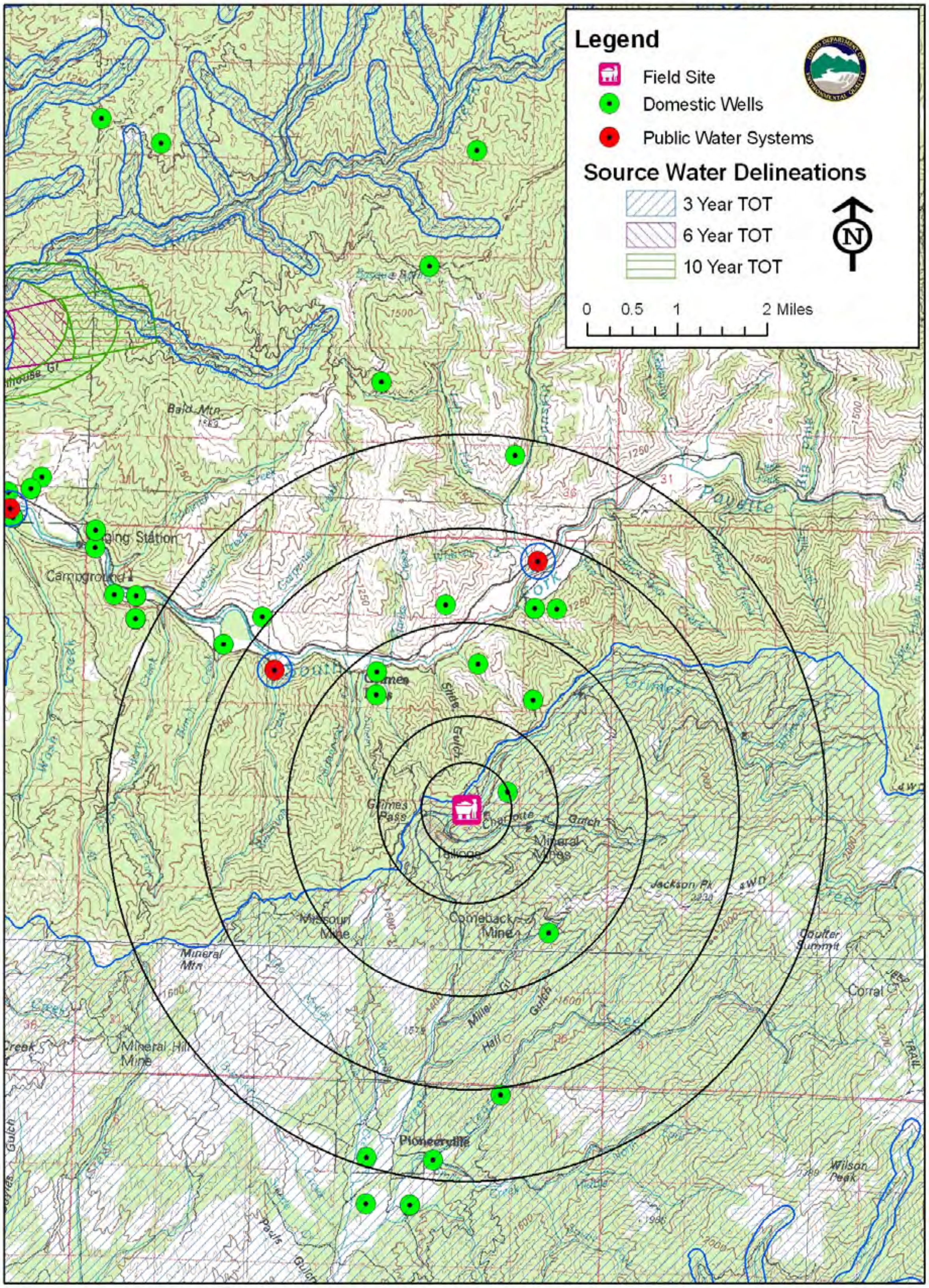

Legend
Field Site
Domestic Wells
Public Water Systems
Source Water Delineations
3 Year TOT
6 Year TOT
10 Year TOT
N
0 0.5 1 2 Miles
Bald Mtn
Campground
Payette
Grimes Pass
Charlotte Gulch
Mineral Mines
Tailings
Missouri Mine
Comeback Mine
Mineral Mtn
Mineral Hill Mine
Jackson Pk
Coulter Summit
Corral
Pioneerville
Wilson Peak
Hall
Miller Gl

**Figure 6**

For the purposes of completing Preliminary Assessments, Source Water Assessments (completed for local public drinking water supplies) were used to identify any known affects to those systems. Although IDEQ’s Source Water Assessments were used to evaluate potential affects of this mine on public drinking water supplies no inferences can be made about the affects that this and adjoining mines have on local private wells.

Source water assessments provide information on the potential contaminant threats to public drinking water sources. Each source water assessment:

- Defines the zone of contribution, which is that portion of the watershed or subsurface area contributing water to the well or surface water intake (**source area delineation**).
- Identifies the significant potential sources of drinking water contamination in those areas (**contaminant source inventory**).
- Determines the likelihood that the water supply will become contaminated (**susceptibility analysis**).

Each assessment is summarized in a report that describes the above information and provides maps of the location of the public water system, the source area delineation, and the locations of potential contaminant sources. Idaho began developing source water assessments in 1999, and in May 2003 met its obligation under the amendments of the Safe Drinking Water Act by completing delineations for all 2100+ public water systems that were active in Idaho as of August 1999 (IDEQ 2000). Source water assessments for new public drinking water systems are being developed as those systems come online. Each public water system is provided with two copies of its final assessment report. One source water assessments for drinking water supplies has been used in this Preliminary Assessment Process to evaluate the potential impacts to both public and private drinking water supplies near the site.

The information extrapolated from these reports is based on data that existed at the time of their writing, and the professional judgment of IDEQ staff. Although reasonable efforts were made to present accurate information, no guarantees, including expressed or implied warranties of any kind are made with respect to these reports or this Preliminary Assessment by the State of Idaho or any of its agents who also assume no legal responsibility for accuracy of presentation, comments or other information in these publications or this Preliminary Assessment report. The results should not be used as an absolute measure of risk, and they should not be used to undermine public confidence in public drinking water systems.

The Source Area delineation process establishes the physical area around a well or surface water intake that becomes the focal point of the source water assessment. The process includes mapping the boundaries of the zone of contribution (the area contributing water to the well or to the surface water intake) into time of travel zones (TOT) indicating the number of years necessary for a particle of water to reach a well or surface water intake (IDEQ 2000). The size and shape of the source water assessment area depend on the delineation method used, local hydrogeology, and volume of water pumped from the well or surface water intake.

IDEQ used a refined computer model approved by EPA to determine the 3-year (Zone 1B), 6-year (Zone 2), and 10 year (Zone 3) time of travel associated with the Mores Creek Hydrologic Province and its sources (IDEQ 2000). This information is illustrated in Figure 6.

This process involves collecting, recording, and mapping existing data and geographical information system (GIS) coverage to determine potential contaminant sources (e.g., gas stations) within the delineated source water assessment area. The potential contaminant source inventory is one of three factors used in the susceptibility analysis to evaluate the overall potential risk to the drinking water supply (IDEQ 2000). The inventory process goal is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water or surface water contamination.

This susceptibility analytical process determines the susceptibility of each public water system well or surface water intake to potential contamination within the delineated source water assessment area. It considers hydrogeologic characteristics, land use characteristics, potentially significant contaminant sources, and the physical integrity of the well or surface water intake. The outcome of the process is a relative ranking into one of three susceptibility categories: high, moderate, and low. The rankings can be used to set priorities for drinking water protection efforts (IDEQ 2000).

The Wilderness Ranch Owners Association Inc. operates and maintains a public drinking water system consisting of three wells and a surface water intake, located beyond the TDL, approximately 25 miles from the Golden Age Mine site (IDEQ 2002). Generally speaking, the Wilderness Ranch public drinking water system rated as high (IDEQ 2002). Multiple factors affect the likelihood of movement of contaminants from the sources to the aquifer, which lead to this moderate to high score. Soils in the area moderately to well drained and no aquitard is present. The vadose zone is predominantly decomposed granite, which increases the score. On the valley floors the average depth to ground water zero (0) to 70 feet below ground surface.

To date, routine water quality monitoring of public drinking water indicates that there are no significant volumes of heavy metals migrating through the regional or localized ground water systems. Arsenic, copper, fluoride, mercury and nitrate have been detected in the Wilderness Ranch wells, and all were well below MCLs except for arsenic which was detected at 70 ppb in 1998 (IDEQ 2002). There are not any long-term or recurring water chemistry problems in the Wilderness Ranch system.

## Sensitive Species and Wetlands

### Species of Concern

Redband rainbow trout [*Oncorhynchhus mykiss* gairdneri], brook trout [Salvelinus foninalis] and bull trout (Salvelinus confluentus) are present within Grimes Creek and bull trout is present in nearby Charlotte Gulch (IDFG, 2000). These are the closest official observations of fish to the mine site. Commercial or subsistence fishing does not occur within the 15-mile Target Distance Limit (TDL), but sport fishing does.

Bald Eagle (Haliaeetus leucocephalus) wintering areas lie along the South Fork of the Payette River, to the north as well as one state listed plant specie, the Giant Helliborne orchid (*Epipaticus gigantea).* Figure 7 illustrates these relationships.

Additionally, the Gray Wolf (Canis lupus) may also range in this area. Due to the much greater area of range for these animals compared to the size of the waste dumps, it is unlikely that individual animals would experience sufficient doses to be at risk.

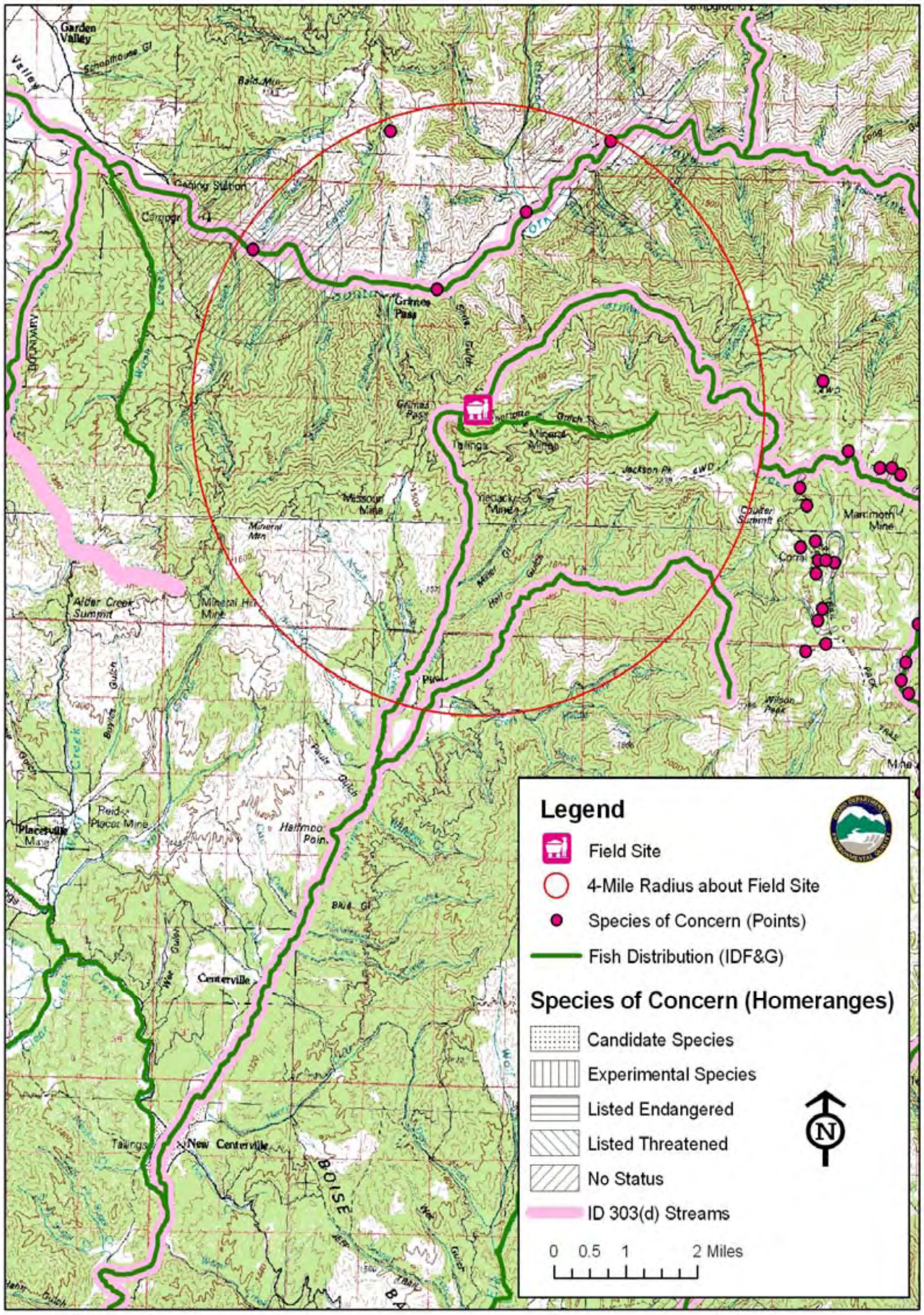



**Figure 7**

<u>Wetlands</u>

Wetland surveys near the site were reviewed (USFWS, 2007) along with aerial photographs (see Figure 8). Wetlands do not exist on the site or within the downstream TDL.

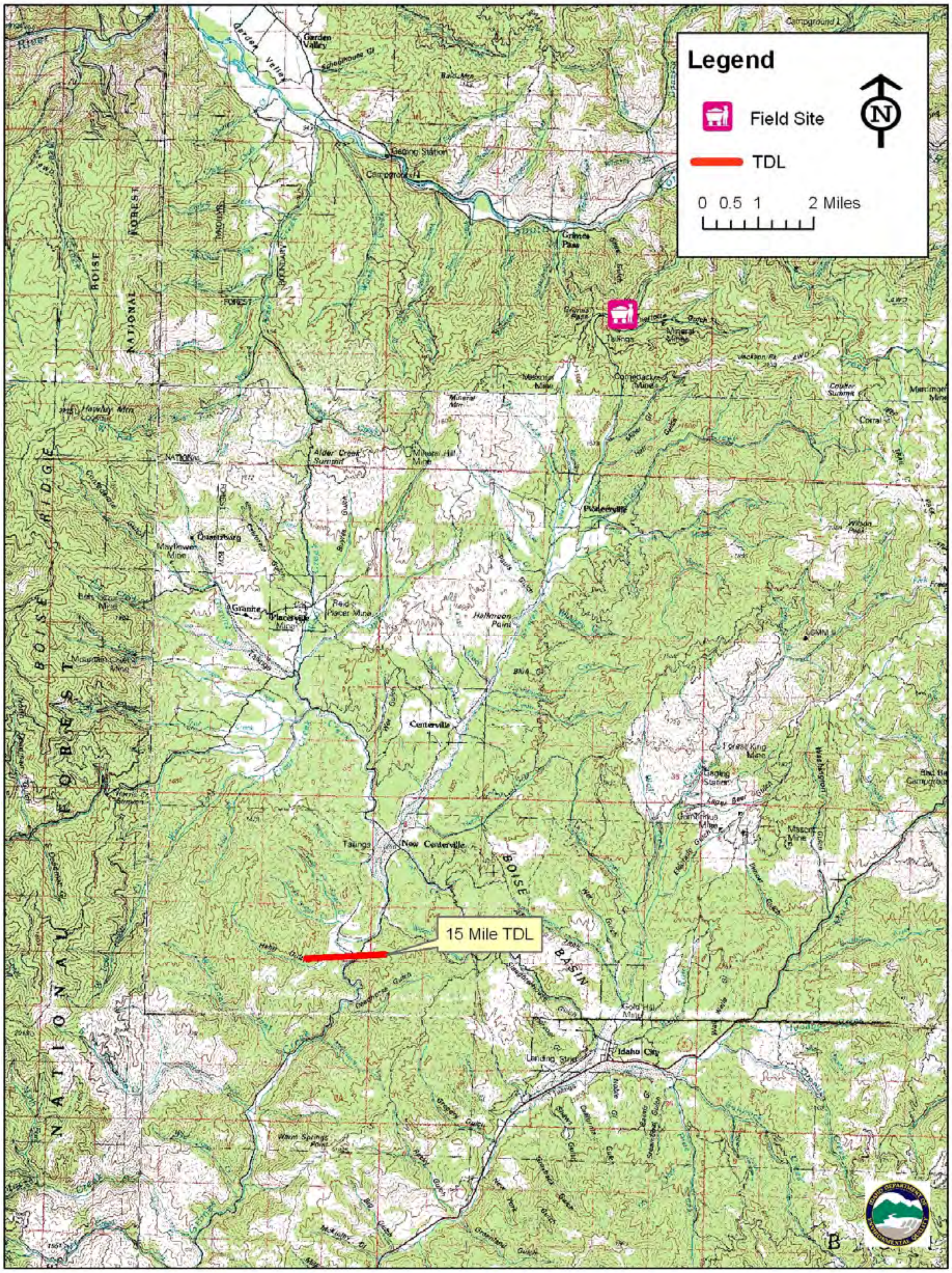

Legend
Field Site
TDL
0 0.5 1 2 Miles
15 Mile TDL
Centerville
New Centerville
Idaho City
Placerville
Granite
BOISE BASIN
BOISE NATIONAL FOREST

**Figure 8**

**Surface Water**

Grimes Creek is a perennial tributary to the Boise River basin. The Grimes Creek drainage contains several miles of stream alteration caused by placer mining operations. Placer tailings evidenced by gravel windrows line the channel of Grimes Creek and its many minor tributaries. Charlotte Gulch which enjoins Grimes Creek approximately 0.25 miles below the mine, is the first placer encountered. Grimes Creek flows west from the Golden Age, then trends south-southwest before reaching the 15-mile Target Distance Limit (TDL). Grimes Creek is an EPA CWA §303(d) listed stream for sediment.

**Soil Exposure and Air**

Access to the mine site is generally restricted from the Whitecap Road, though access from Charlotte Gulch remains unrestricted. Human and ecological receptors may be exposed to soils and mine waste by inhalation, dermal contact and ingestion. Visitors may have direct contact with heavy metals in wastes while exploring the site. Human activity around the site should be considered low, however, due to presence of the “year-round” caretaker.

**Potential Receptors**

Potential receptors include the caretaker and part-time or seasonal residents of the Golden Age property, hikers, hunters, and trail riders (motorized and non-motorized). Cattle may graze the surrounding area, but their presence within the mine site appears minimal. Outdoor enthusiasts remain the highest percentage of human receptors, as they may frequent the area for a number of recreational activities. The land within a one (1) mile radius of the site is primarily private, but public land administered by the USFS (Boise NF) borders to the north, east and south.

**Schools, Day-Care Facilities, Private Residences**

There are no schools or day-care facilities, or private residences within 200 feet of the site, but the mine’s caretaker resides on the north side of Grimes Creek within 0.25 miles of the site. In addition, outdoor recreation enthusiasts may occasionally be within 200 feet of the site.

## Section 10 Summary, Conclusions and Recommendations

The Golden Age mine and mill site was active between 1909 and 1925. Mining primarily focused on the oxidized ore zones and the associated free gold, while minimal sulfides were extracted for processing. Most of the early ore was processed through gravity separation and mercury amalgamation. Following a change of ownership, the mill was expanded in 1924 to include a 100-ton concentrator. Though development and production records were not available, IDEQ surmises that with the depletion of its readily milled ore, the Golden Age was unable to profitably process the limited sulfide ore remaining and ceased production. Such was a common fate of many mines during this time. The reconstructed mill and most of the surface plant was destroyed during a forest fire in 1931. Subsequently, timber harvesting and recreational gold mining activities have been conducted on the property.

The shafts and tunnel are all closed and no discharges were identified, though springs were evident near the valley floor below the workings. Waste dump material appears to be well stabilized by coniferous stands and moderate understory growth. Mill tailings remain on the flats below the mine and may become overtopped during periods of high-water snowmelt. However, the tailings were not observed to be directly impacted by the normal flow of Grimes Creek.

The level of arsenic in the tailings, the assay area (crucibles) and waste dump # 1 poses an excess cancer risk and a hazard for residential receptors. Of particular concern, however, is the spring water employed by the camp for its drinking water needs. Analysis indicates that both IDEQ Ground Water and Drinking Water Standards are exceeded for arsenic, cadmium and lead concentrations.

### Potential Exposure for Wildlife, Livestock, and Vegetation

Potential exposure from the waste dumps and landing areas to wildlife and vegetation from the site is present. Native plant species may bio-accumulate high concentrations of metals that may be consumed by the local wildlife or livestock. Livestock and wildlife may be exposed at the site, particularly to elevated lead and silver concentrations, but relative to the extensive range of the livestock and wildlife, compared to the area of the dumps, it is unlikely that significant exposures to heavy metals occurs.

### Potential Exposure for Humans

This site is infrequently visited by mountain bikers, hikers, hunters, snowmobile operators, off-road four wheeling, or various other outdoor recreation enthusiasts. Humans may receive very small doses of heavy metals, especially arsenic, cadmium, chromium, lead, mercury, silver and zinc. Aerial dispersion of waste particulates from the tailings or waste dumps appears minor, as these areas support health vegetation. Direct contact with the wastes appears to be the most significant route of exposure to humans for elevated constituents. Considering the site access is fairly restricted and understory growth is well established, these exposure levels are not likely to pose a substantial risk.

However, soils analysis indicates that the heavy metals of concern (highest result) for the Golden Age mine are: arsenic (220 mg/kg), and lead (2,870 mg/kg); which far exceeds both the IDTLs and EPA Region Six's Human Health Screening levels. These levels, although used for comparison even at remote locations, are more applicable in locations where these types of contaminants are determined to be readily available to receptors; where exposures might produce an acute or chronic toxicological effect in a population. In the case of the Golden Age mine, these numbers suggest that additional site assessment should be undertaken if the tailings areas or the former assay site were to be developed for "unrestrictive uses" such as residential. Furthermore, risk management tools should be employed prior to any such developments.

IDEQ collected a sample from a spring, located near the camp. This spring supplies drinking water for the camp's caretaker and other cabins**.** Based upon water quality analysis, concentration of arsenic, cadmium and lead in the spring water **exceeds** IDEQ's Drinking Water Standard. Additionally, the IDEQ Ground Water Standard for arsenic, cadmium, lead and zinc is also **exceeded.** Therefore, IDEQ recommends that other sources for drinking water are utilized for the caretaker and visitors.

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