Jolly Sailor(s) and War Dance

Mines

(A.K.A: BD #5, BD #9, BD #12, Dedication No. 5, Dedication No. 10, Jungfrauspiel, Tatzlwurm)

Preliminary Assessment Report

Blaine County
State of Idaho

Department of

Environmental Quality

January 2009

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

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

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

January 6, 2009

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2647 Kimberly Road East
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Maggie Manderbach
USDA Forest Service Region IV
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RE: Preliminary Assessment of the Jolly Sailor(s) and War Dance mines, Section 29 T 3 N, R 17 E (N 43 33.100' W 114 27.18'and N 43 33.9' W 114 26.89, respectively).

Dear Mr. Gabardi and Ms. Manderbach:

The Idaho Department of Environmental Quality (IDEQ) has completed a review of historical mining data and geological information at the above referenced sites. Subsequent to that review, IDEQ conducted a site visit of the Jolly Sailor(s) and War Dance mines. During the site visit, mining facilities were mapped and sampled to complete the analysis necessary to finalize a Preliminary Assessment (PA) report.

Preliminary Assessments are conducted according to the Federal Comprehensive Environmental Response, Compensation and Liabilities Act. 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

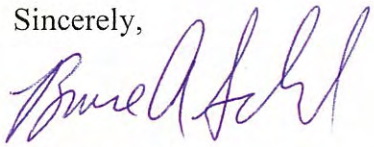
4) To gather data to facilitate later evaluation of the release through the Hazard Ranking System (HRS)

IDEQ has also completed PAs under contract with the U.S. Environmental Protection Agency in order to identify risks to human health and the environment, and to make recommendations to land owners regarding how risks might be managed under current site conditions and in future use scenarios.

Based on existing conditions and uses, historic information, data observations made during the site visit, and analysis of the mine wastes, potential pathways of contaminants to receptors, and potential exposures to ecological and human receptors, IDEQ has no recommendations and determines the Jolly Sailor(s) and War Dance mines as No Remedial Action is Planned (NRAP).

If you have any questions about this report please do not hesitate to contact me by phone, (208) 373-0554, or by email at bruce.schuld@deq.idaho.gov .

Sincerely,



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

BAS:TE:tg G:\Waste & Remediation\Bruce Schuld\Jolly Sailor and War Dance Mines\Final PA for Jolly Sailors and War Dance 12_2008

Attachment

cc: Ken Marcie - U.S. Environmental Protection Agency
Megan Stelma – Blaine County
file

Table of Contents

List of Acronyms 6
Section 1. Introduction 7
Section 2. Ownership 8
Section 3. Mine Site History 10
Section 4. Climate 12
Section 5. General Geology 13
5.1 Structure 15
Section 6. Current and Beneficial Uses 17
Section 7. Site Conditions and Waste Characterization 18
7.1 Jolly Sailors Mine area 18
7.2 War Dance Mine area 23
Section 8. Soil Sample Collection 30
8.1 Soils Analysis 31
Section 9. Surface Water Sample Collection 32
9.1 Surface Water Analysis 33
Section 10. Pathways and Environmental Hazards 34
10.1 Surface Water Pathways 34
10.2 Ground Water Pathways 35
10.3 Air Quality Pathways 39
10.4 Soil Exposure 39
10.5 Domestic Wells and Public Water Supplies 39
10.6 Residences, Schools and Day Care Facilities 39
10.7 Wetlands 40
10.8 Sensitive Species (Plant and Animal) 42
10.9 Fisheries 42
10.10 Sensitive Waterways 44
10.11 Livestock Receptors 44
Section 11. Summary and Conclusions 45
Section 12. References 46

List of Figures

Figure 1. Location of the Jolly Sailors and War Dance mines with USFS parcel data overlay. (Map source: Blaine County NAIP) 9
Figure 2. Geology of the Jolly Sailors and War Dance Mines area. (Map source: USGS 24k)... 16
Figure 3. Map of sampling locations, adits, and waste dumps at Jolly Sailors and War Dance Mine area. 34
Figure 4. Drinking Water Well locations and source water delineations (Map source: USGS 24k Quads). 38
Figure 5. Wetlands and 15-Mile TDL map. (Source Fair 100k, Sunv 100k, NAIP 2004)..... 41
Figure 6. Sensitive species near Jolly Sailors and War Dance mines. (Source: Fair 100k, Sunv 100k, NAIP 2004)..... 43

List of Pictures

Photo 1. View looking towards Adit #1, Main Jolly Sailors Mine 18
Photo 2. View looking east of the Main Jolly Sailor mine. 19
Photo 3. View looking south of the Main Jolly Sailor mine. Intermittent stream approximately 50 feet below dump. 19
Photo 4. View looking down from the top of the waste rock pile to the toe of the slope. Waste rock composed of granite diorite, tailings, and clay. Riparian buffer zone extends about 50 feet from the toe of the waste rock slope to the stream. 20
Photo 5. View looking north of Jolly Sailor mine. Remnants of a doghouse are located in the front left section of picture. 20
Photo 6. View facing southeast at upper Jolly Sailor tunnels. Jolly Sailor adit #2 is the lowest dump. 21
Photo 7. Upper Jolly Sailor (JS) Tunnel:. JS adit #2 on far right side of picture. JS adit #3 located under tree. JS adit #4 located at the top. JS adit #5 is in the fore front of the picture. 21
Photo 8. View looking north on slope west of the Main Jolly Sailor mine.UA#1 is located in the middle of the picture. UA#2 is in the far left side of the picture. UA#3 is located in the far- right side of the picture. 22
Photo 9. View facing north of UA #1. Adit is completely collapsed and there are no signs of water leaking from the adit. 23
Photo 10. View of War Dance Gulch, looking south towards Deer Creek Road. Remnants of road are located in the left corner of picture. 23
Photo 11. View of War Dance Gulch from top of dumps. 24
Photo 12. Looking northward from the War Dance Gulch Trail to the 24
mine site, one can observe at least three of the major 24
mine dumps of the War Dance Mine. 24
Photo 13. The toe of the War Dance Mine Waste Dump #1 is in the bottom of drainage. 25
However at this point, there is no apparent surface waters or 25
riparian/ wetlands communities present, and hence no definitive PPE. 25
Photo 14. War Dance Waste Dump #1 and Ore Bin 26
Photo 15. Typical ore from the mine is still present in small volumes 26
(<5 yd^3) ton waste dump #1. 26
Photo 16. Looking northeast towards War Dance Waste 27
Dumps #2 (lower right), #3 (center) and #4 (upper left). 27
Photo 17. Caved War Dance Adit #3 27
Photo 18. Caved Raise that is exposed approximately 50 feet above War Dance Adit #3 28
Photo 19. Looking northwest from War Dance Waste Dump #4 towards War 28
Dance Waste Dump #5, which contains less than 200 yd^3 of waste rock. 28
Note the caved opening for another raise that appears to have been 28
driven upwards from War Dance Adit #3. 28
Photo 20. Caved Raise northwest of War Dance Adit #5. 29

List of Tables

Table 1: Total Recoverable Metals Analysis (Mg/Kg)..... 30
Table 2: Total Recoverable Metals Analysis (Mg/Kg)..... 31
Table 3: Total Recoverable Metals Analysis (Mg/L) 32

List of Acronyms

Acronym	Definition
amsl	above mean sea level
BLM	United States Department of the Interior, Bureau of Land Management
DEQ	Department of Environmental Quality
EPA	United States Environmental Protection Agency
gpm	gallons per minute
IDTL	Initial Default Target Levels
IGS	Idaho Geological Survey
MCL	Maximum Concentration Limit
PPE	Probable Point of Entry
HHSL	Human Health Medium-Specific Screening Levels
TCLP	Toxicity Characteristic Leaching Procedure
TDL	Target Distance Limit
TMDL	Total Maximum Daily Load
USFS	United States Department of Agriculture, Forest Service

Section 1. Introduction

This document presents the results of the preliminary assessment (PA) for Jolly Sailors and War Dance mines. The 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 preliminary assessments at various mines within the Mineral Hill Mining District in Blaine County, Idaho.

DEQ 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, DEQ 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 by vehicle to the Jolly Sailors and War Dance mines is on the Deer Creek Road that takes off west from Highway 75 just two miles north of Hailey, Idaho. From Highway 75, it is approximately six miles to the Wood River Zinc mill site, which lies approximately two miles below the Jolly Sailors and War Dance mines.

As these sites are on public lands and are frequently used for recreation by the public, IDEQ staff did not formally request legal access to conduct a site visit.

Section 2. Ownership

Based on a limited search, there are no current owners of the unpatented mine sites. The mines are located on USDA Forest Service (Forest Service) administered lands.

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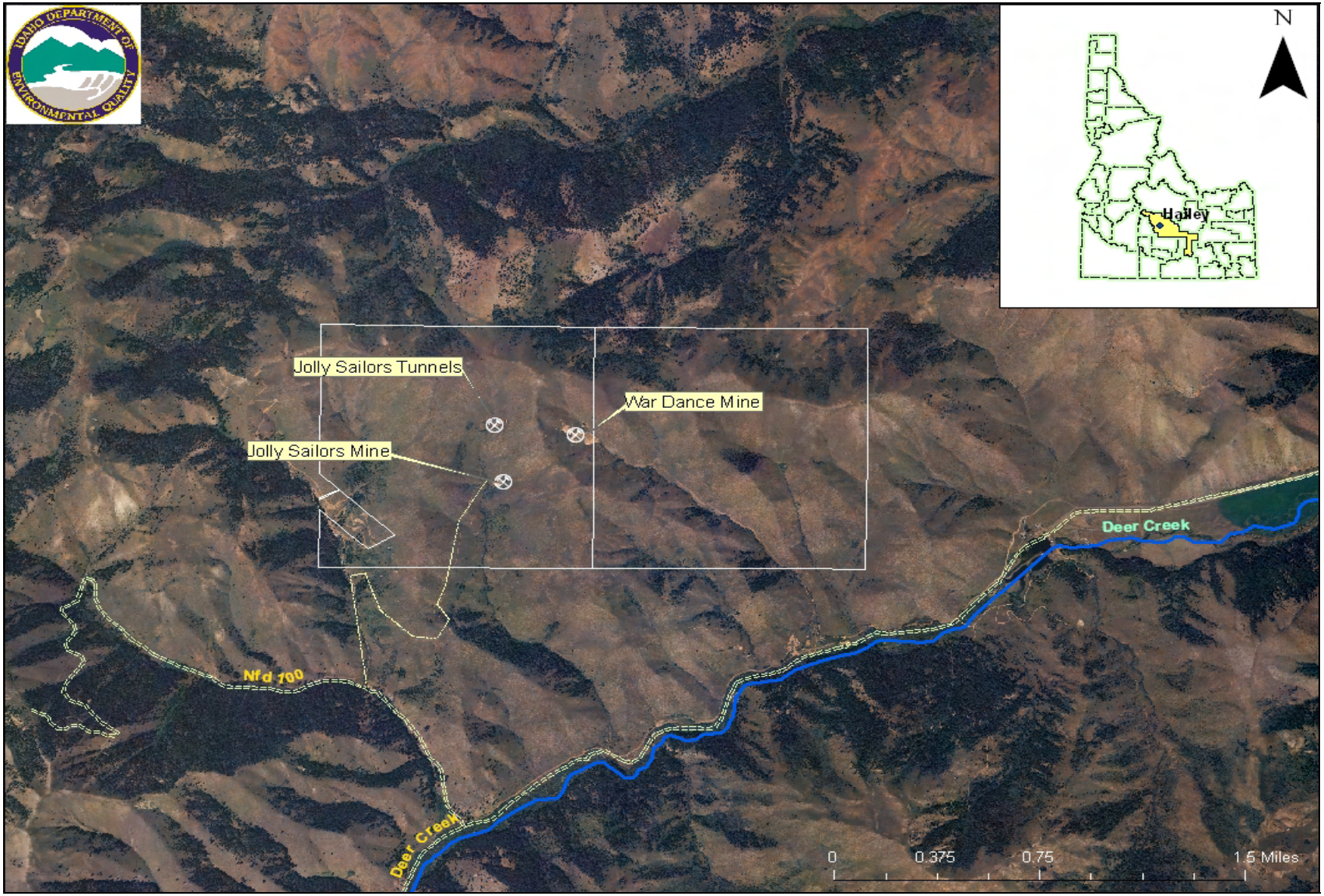


Figure 1. Location of the Jolly Sailors and War Dance mines with USFS parcel data overlay. (Map source: Blaine County NAIP)

Section 3. Mine Site History

The amount of history IDEQ found on the sites was limited. However, it appears that the War Dance and Jolly Sailors mines provided ore to the Wood River Zinc Mill.

The Salt Lake Mining Review (June 15, 1905) reported that according to the Hailey Times,

> *"John Williams, manager of the Wood River Zinc Company, and Frank C. Mandell and an assistant, were at War Dance Mines today, making a preliminary survey for the new tunnel that is proposed to be driven from the Jolly Sailor side of the mine."*

In 1921 the 23rd Annual (Inspector of Mines) report of the Mining Industry of Idaho, the Inspector noted:

> *"WAR DANCE MINING ASSOCIATION Officers: Andrew Prader, Supt. Hailey Property: Lease and bond on War Dance Group of 23 unpatented claims, in the Mineral Hill District. Deer Creek Hailey. Plant: Gas driven compressor and small mine equipment. Development: Approximately 7000 feet of underground workings. Ore: Principally lead-silver. Men Employed: Average 4. Remarks: This company has been actively engaged in prospecting the War Dance Group for past three years."*

In 1922 the War Dance Mining Association apparently evolved into the War Dance Mining Company with offices in Auburn California. Apparently, the company extended the working to a total of 10,000 feet of tunneling, but the inspector still noted this work as "Assessment".

After 1922 there are no references that IDEQ has found relative to exploration or production at the War Dance Group or the Jolly Sailors mine sites, except for Umpleby, Westgate and Ross (1930) who reported:

> *"The War Dance and Jolly Sailor mines, (are) now consolidated under the ownership of James Burns and Associates, are in Sections 28 and 29, T 3 N, R 17 E. The Jolly Sailor lies west of the War Dance. Its workings have long been abandoned little value having been found in them. The only production from the Jolly Sailor recorded by Daft is 0.47 tons containing 58 ounces of silver and 518 pounds of Lead, mined in 1882. The War Dance yielded lead silver ore of a gross value of $126,018 in the eighties, and intermittent work has been done on it since then. In 1913 and 1914 materials from the dump was jigged for zinc by using water from one of the tunnels, and mining has been continued intermittently since then."*

Production from the mine reported as of 1903 was 1,031.1 tons of concentrates containing 88,501 ounces of silver, 1,342 pounds of lead and 900 pounds of copper. From 1904 to 1918 approximately 1,154 tons of ore were sold or treated, with 120 tons shipped directly to the smelter, and 743 tons were concentrated in Wood River Zinc Mill which produced 1.20 ounces of gold, 3,212 ounces of silver, 36,932 pounds of lead, and 305,777 pounds of zinc.

It was also reported (Umpleby et al) that:

> *"Late in 1923 a vein of arsenic ore was found on the War Dance ground. It has been exposed to a number of shallow cuts on the hillside northwest of the Jolly Sailor Tunnel. The ore contains arsenopyrite partly oxidized to scorodite and other minerals. In the winter of 1923-24 R.B. French, working under lease, drove a short cross cut and short irregular raises from the Jolly Sailor tunnel under the old War Dance workings."*
>
> *The underground workings in the War Dance mine were estimated by Campbell to exceed 10,000 feet. There are six tunnels, only the lower two of which are now open for any considerable distance. The principal work was done from a drift to the north from the No. 5 tunnel and from drifts on two levels below and connected by winzes with this drift. In recent years a sixth tunnel, 1,300 feet long, starting on the Jolly Sailor ground, and a raise connecting this with the old workings just mentioned have been driven. Much of the old workings is now inaccessible, but there are small stopes on the fifth level, the two intermediate levels below it, and probably also on the upper levels. The principal production is reported to have come from a stope on a lens shaped mass sixteen feet wide, thirty feet high and forty feet long.*

Section 4. Climate

Climate information provided in this section is based on a climatological summary for Hailey, Idaho which was obtained from the National Oceanic and Atmospheric Administration (NOAA), National Climatic Data Center. The climatological data was collected at the Hailey Airport (elevation 5,328 amsl), and is for the period of 1951 through 1980. 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 site is characterized by short cool dry summers and very cold winters. The total annual precipitation measured at the Hailey Airport averages 16.2 inches. The majority of precipitation occurs as snow. Total annual snowfall averages 78.2 inches with most snowfall occurring in December and January. The driest months are July, August and September.

Based on records from 1951 to 1980, the average annual temperature measured at the Hailey Airport is 43 degrees Fahrenheit (F). The lowest temperature recorded for this period was – 28 degrees F in 1962. The highest temperature for this period of record was 100 degrees F in 1953. January is the coldest month with an average temperature of 19.5 degrees F. July is the hottest month with an average temperature of 67 degrees F.

Section 5. General Geology

Generally speaking the Wood River Zinc Millsite, the Jolly Sailor Mine, and the War Dance Mine are hosted by sheared and altered quart monzonite intrusives. The lower portions of the ephemeral drainages contain thick layers of colluvial fill, which are predominantly sandy remnants of the decomposed quartz monzonite. The colluvium is extremely erodible, and deeply incised by both seasonal runoff in War Dance Gulch and perennial flows in Deer Creek.

> *The Hailey-Bellevue mineral belt is underlain by a varied assemblage of sedimentary and igneous rocks, which, except for volcanics of mid-Tertiary age and some still younger unconsolidated sedimentary rocks, are all older than the ore deposits. The earlier rocks include fairly wide exposures of the Milligen and Wood River formations that host many of the ore deposits in the Wood River region. They also host rather large intrusive bodies of diorite and quartz monzonitic rock which are regarded as outliers of the Idaho batholith. There is a younger group of intrusive rocks which are of more pertinent interest because of their close association with the mineralization.…In addition to the Milligen formation (Mississippian age) and the Wood River formation (Pennsylvanian age), the area contains some strata in and beneath a series of Tertiary volcanics (Oligocene) and much poorly consolidated and unconsolidated slope wash, terrace gravels, and stream alluvium of Quaternary age.*
>
> Anderson, 1950, p. 2

Anderson (p 7) went on to note that, "The folding within the area is comparatively simple and consequently faulting constitutes the outstanding feature."

Numerous studies of the geology and mineral resources of the Wood River and adjacent areas have been made. Geologic studies have been conducted to investigate mineral deposits (Lindgren, 1900 & 1933; Umpleby et al, 1930; Anderson and Wagner, 1946; Anderson et al, 1950; Hall et al, 1978; Wavra and Hall, 1989; Link and Worl, 2001; Worl and Lewis, 2001); individual formations and units (Hall et al, 1974; Sandberg et al, 1975; Wavra and Hall, 1986; Worl and Johnson, 1995); quadrangles (Batchelder and Hall, 1978; Mitchell et al, 1991; Kiislgaard et al, 2001) and to compile regional information (Rember and Bennett, 1979). Preliminary and environmental assessment investigations have been conducted to assess current and potential impacts from historic mining in the region (Mitchell and Gillerman, 2005; IDEQ, 2002 & 2006; IDEQ & USEPA, 2006 & 2007).

The geology surrounding the mines is important in respects to the mineralogy of the ore. It was reported (Umpleby et al) that:

> *Both properties (War Dance and Sailor) are in a rather dark phase of quartz monzonite a short distance southwest of the contact with the Wood River formation.*
>
> *In places along the main drift on the fifth level, especially on the hanging-wall side of the vein, there are blocks of dark fine grained altered rock of sedimentary origin, containing irregular veinlets and small masses of zeolite, probably laumonite.*

The principal vein in the inaccessible part of the drift on the fifth level of the War Dance mine strikes north and dips about 45 degrees west. Beyond this part the drift appears to swing west. A short distance south of this turn another vein branches off on the hanging wall side with a strike of about N 60 W. The small stopes on the two levels below are probably on this vein. On these levels, there are short crosscuts that extend east to another vein, presumably the one followed by the main drift on the fifth level. The quartz monzonite between these two veins is sheared and somewhat altered. No ore has been found on the sixth or Jolly Sailor level, but a narrow zone of crushed and somewhat mineralized rock is exposed. This zone may be a continuation of a vein that crops out on the hillside above, which in turn is supposed to be an extension of the vein that was prospected unsuccessfully in the old Jolly Sailor workings. The exposures on the hillside show banded quartz with a few grains of arsenopyrite and faint copper stains on cracks.

The ore on the dumps and piles underground is all the same general character and evidently came from the two veins in the War Dance workings. Much of it is distinctly banded. The minerals noted are quartz, galena, sphalerite, and pyrite.

To the north of the mines a thrust fault separates the overlying sediments with the underlying intrusives. In discussion of the Red Elephant and Bullion areas, which are very similar in nature to the War Dance area, Link and Worl (2001) described geologic and historic information relating to stratigraphy and mineralization relationships within Dollarhide sedimentary sequences in the Mineral Hill district.

The Bullion mineralized area...is underlain by the lower and middle members of the Pennsylvanian and Permian Dollarhide Formation, which is folded into upright and west-overturned map scale folds….The lower member of the Dollarhide Formation, hosts most of the mineralized rock (Skipp and others, 1994). Fryklund (1950), following Umpleby and others (1930), labeled these rocks as Wood River Formation, though he notes, "it is possible that Milligen formation is also present" (p. 64). An unpublished map (circa 1970) of W.E. Hall labels the dark-colored rocks in the Bullion area as Milligen Formation. Hall (1985) showed the rocks as Dollarhide Formation, and Wavra and Hall (1989) showed them as upper member, Dollarhide Formation.

The lower member of the Dollarhide Formation in the Bullion area contains fine- to medium-grained sandstone, black siltite and black limestone or marble. A distinctive lithology in the lower member is channelized disorganized conglomerate that contains mainly intrabasinal soft-sediment clasts of siltstone and sandstone. The lower member occupies both sides of Bullion Gulch and the central part of Red Elephant Gulch. The rocks east of Bullion Gulch are mapped as being stratigraphically high in lower member Dollarhide Formation, because the middle member quartzite is not present. They are intruded on the east by the Deer Creek stock.

In the Bullion area the middle member of the Dollarhide Formation (regionally about 300 m [984 ft] thick) contains silicified sandstone that crops out as light-gray to brown quartzite that forms the high ridge between Red Elephant and Bullion Gulches. These rocks were shown as Wood River Formation on the map of Hall (1985). The mineralized veins of the Bullion area do not extend southward into the middle member

> *Dollarhide Formation. The middle member, much less silicified, is also present in west-dipping beds on the ridge of Kelly Mountains* (Link and Worl, 2001, pp. 12 & 14).

5.1 Structure

Fryklund (1950, pp. 65-66) noted the following in regards to the structure of the rocks:

> *The most obvious and significant structural features of the area are the major faults or fault zones which divide the area into a number of distinct blocks...The age of the oldest faults are to be placed as pre-intrusive and possibly all the major faulting is pre-intrusive...All of the major faults are probably pre-mineral as well as pre-intrusive.*

Umpleby, et al (1930, p. 217) noted a broad anticline southwest of the river:

> *Southwest of the river the beds dip generally westward at inclinations that largely range from 20º to 40º. It's thus clear that the sediments form a broad anticline, of which the crest almost coincides with the Big Wood River Valley.*

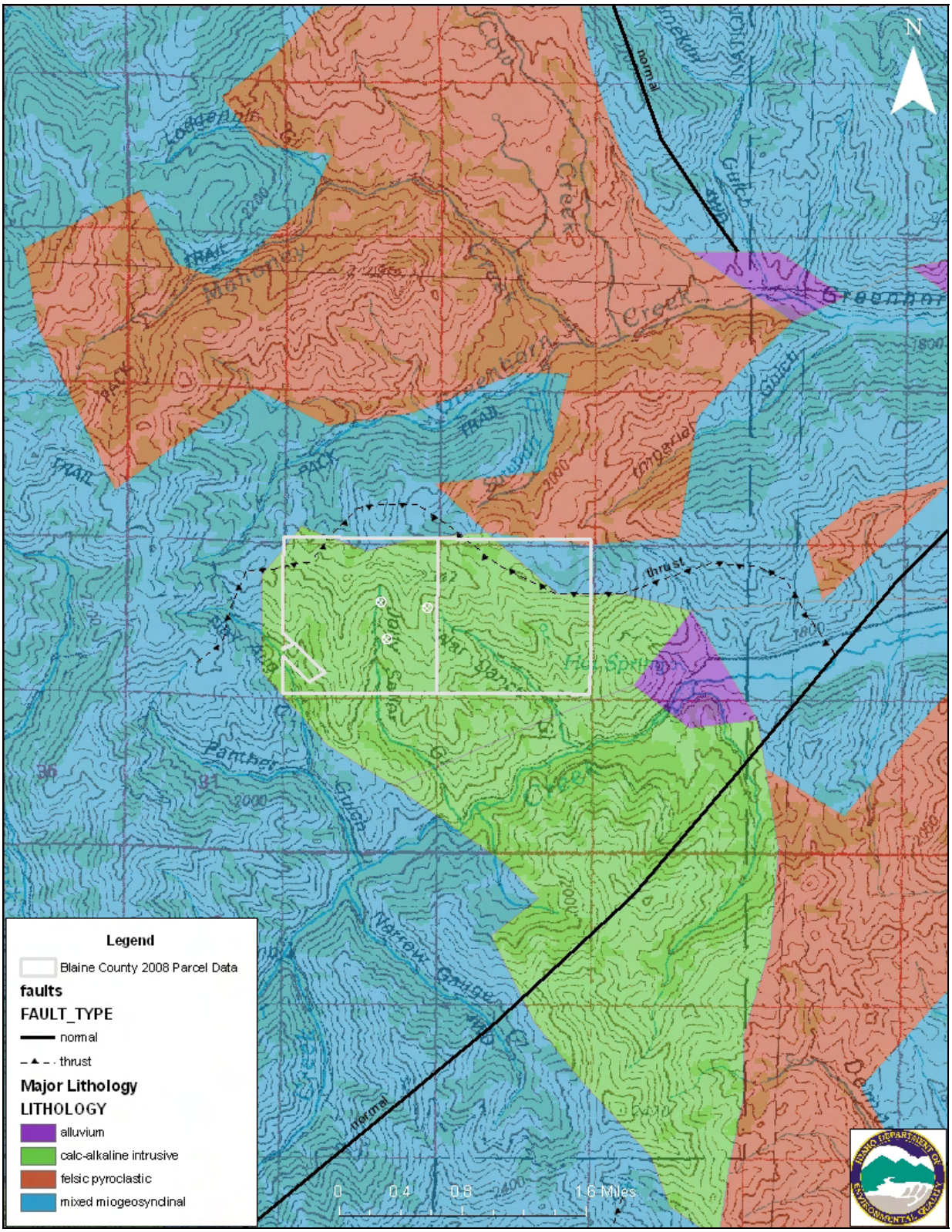


Figure 2. Geology of the Jolly Sailors and War Dance Mines area. (Map source: USGS 24k)

Section 6. Current and Beneficial Uses

There is extensive day and overnight use of the Wood River Zinc mill site for camping, recreational vehicle parking and off road vehicles (ORVs). The location of this campsite area encourages access to the War Dance mine area by hiking or horseback riding. The former road to the War Dance mine area has been reclaimed and prohibits entry by motorized vehicles. One must climb over a large hill without access by any roads to reach the Jolly Sailors mine area from the War Dance. Road NFD 100 is located west 1.5 miles from the Wood River Zinc mill site on Deer Creek road. NFD 100 continues for approximately 1 mile to a jeep trail that continues for another 1.7 miles to the Jolly Sailors mine area. The Jolly Sailors mine site is difficult to access and during the site visit no signs of humans were apparent.

Section 7. Site Conditions and Waste Characterization

7.1 Jolly Sailors Mine area

IDEQ performed the site assessment for the Jolly Sailors mine area on June 6, 2008. The mine area is composed of one large dump, approximately 2,000cy, and four small adits with negligible amounts of waste rock. Adit #1 of the main Jolly Sailors mine is fully caved in. There are no indications of adit discharge although the area appears very wet for a large portion of the year. There is a large community of rushes from inside the adit area spreading out completely across the dump surface. There may be a potential for seepage into the groundwater from melting snow and rain.



Photo 1. View looking towards Adit #1, Main Jolly Sailors Mine



Photo 2. View looking east of the Main Jolly Sailor mine.

There is dense staining in a portion of the dump which appears to only be representative of about 100cy of waste rock. The main Jolly Sailor mine appears to be predominated by granite diorite with no indications of massive sulfides. Rills with smooth slopes indicate slow erosional processes occurring. The appearance of the gully on the side of the dump and the smooth rills on the slope indicate the flow of water occurs in rain and snow events and not from the adit. A soil sample was taken from the head of the slope of the dump, sample JSWD1SS.



Photo 3. View looking south of the Main Jolly Sailor mine. Intermittent stream approximately 50 feet below dump.

There is an intermittent stream which flows beneath the toe of the dump. The slope of the waste rock dump is angled at approximately 30°. Coarse angular rocks mixed with clays prevent large scale erosion from depositing into the stream.



Photo 4. View looking down from the top of the waste rock pile to the toe of the slope. Waste rock composed of granite diorite, tailings, and clay. Riparian buffer zone extends about 50 feet from the toe of the waste rock slope to the stream.



Photo 5. View looking north of Jolly Sailor mine. Remnants of a doghouse are located in the front left section of picture.

The vegetation appears to be reestablished and healthy on the dump and around the edges of the waste rock pile. There are pieces of wood from the doghouse, but the vegetation is growing over the remnants.

The other four adits are part of the Upper Jolly Sailors Tunnels. Jolly Sailors adit #2 is the lowest dump and is composed of less than 500cy of granite diorite and serisite.



Photo 6. View facing southeast at upper Jolly Sailor tunnels. Jolly Sailor adit #2 is the lowest dump.

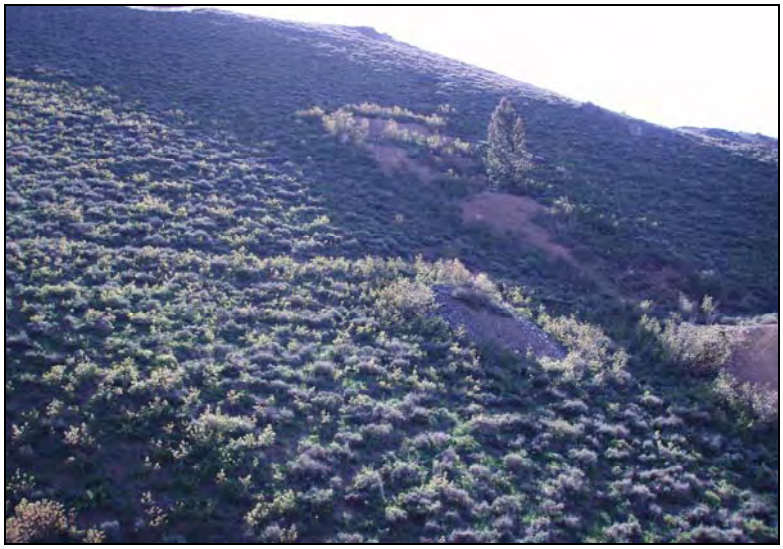


Photo 7. Upper Jolly Sailor (JS) Tunnel:. JS adit #2 on far right side of picture. JS adit #3 located under tree. JS adit #4 located at the top. JS adit #5 is in the fore front of the picture.

JS adit #3, contains less than 100cy of waste rock, JS adit #4, contains a very thin veneer of waste rock. Vegetation is reestablishing on the toe of the dump. JS #5 is completely collapsed and re-vegetated, waste rock is composed of large angular chunks of hornblende and granite diorite.

There were also adits identified on the way out of the Jolly Sailors mine area. These adits are referred to as Unknown Adits 1-3 (UA).

UA #1 has a small area of possible ore directly by the adit. The large sized waste rock is composed of the country rock, granite diorite.

Extensive vegetation in riparian buffer zone spanning 200 feet to the creek of UA #2 is collapsed and re-vegetated. The UA #2 dump has a healthy amount of vegetation covering the area. No ore is present, waste rock is composed of altered granite diorite. The waste dump is less than 200 tons.

UA #3 is located on the top right side of picture. This adit is mostly vegetated with coarse waste rock on the slope. There is a large riparian buffer zone to the creek, approximately 500 feet. The adit is collapsed and fully vegetated. The waste dump contains approximately less than 200 tons.

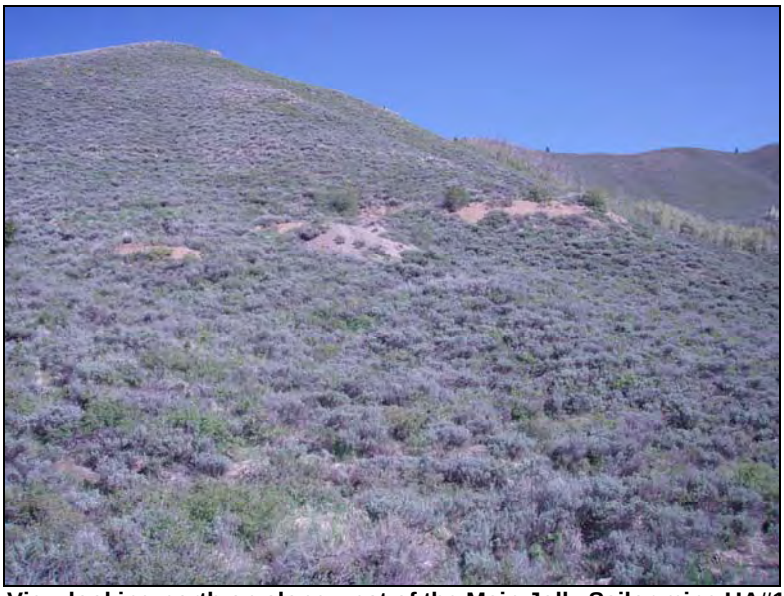


Photo 8. View looking north on slope west of the Main Jolly Sailor mine.UA#1 is located in the middle of the picture. UA#2 is in the far left side of the picture. UA#3 is located in the far- right side of the picture.



Photo 9. View facing north of UA #1. Adit is completely collapsed and there are no signs of water leaking from the adit.

7.2 War Dance Mine area

IDEQ performed the site assessment for the War Dance mine area on October 6, 2008. The War Dance Mine is accessible to hikers and horseback riders along a very rustic one mile long trail that exists on top of the reclaimed mine road in War Dance Gulch, The trail begins at the Forest Service campgrounds near the Wood River Zinc Mill on Deer Creek.

The vegetation on the reclaimed War Dance road appears to be very successful, and although the trail still provides some public access up War Dance Gulch, it is entirely restricted to equestrians and hikers.



Photo 10. View of War Dance Gulch, looking south towards Deer Creek Road. Remnants of road are located in the left corner of picture.

The War Dance Workings are approximately 1,600 feet above and 1.5 miles north of the Wood River Zinc Mill which is on Deer Creek.



Photo 11. View of War Dance Gulch from top of dumps.



Photo 12. Looking northward from the War Dance Gulch Trail to the mine site, one can observe at least three of the major mine dumps of the War Dance Mine.

The War Dance Mine site contains numerous mine dumps, adits and raises that were caved at the surface. Although voluminous (>5,000 yd^3 in total), the dumps have been overlapped and pushed around so much that it is impossible to define specifically how many individual dumps existed at

the site. However, IDEQ evaluated the site assuming that there were five (5) major dumps and mine levels at the site.

Although IDEQ observed that there were no surface waters connecting War Dance Gulch with Deer Creek, there was a significant flow in War Dance Gulch from approximately 500' below the mine site to approximately 200' above the Forest Service Camp grounds. Furthermore, IDEQ did not observe any significant connection of the mine waste dumps to the surface waters or riparian/wetlands areas in the lower War Dance Gulch. Therefore IDEQ did not collect a sample at a Probable Point of Entry (PPE).



Photo 13. The toe of the War Dance Mine Waste Dump #1 is in the bottom of drainage. However at this point, there are no apparent surface waters or riparian/ wetlands communities present, and hence no definitive PPE.

The lowest dump (Waste Dump #1) at the War Dance Mine Site is also the site of the remnants from the ore bin and jig mill. There is not a significant amount (< 5 yd^3) of jig tailings remaining at the site.



Photo 14. War Dance Waste Dump #1 and Ore Bin.



Photo 15. Typical ore from the mine is still present in small volumes (<5 yd^3) ton waste dump #1.

Although both ore and jig tailings are evident around Waste Dump #1, the 5 yd^3 or so represents a small percentage of the waste dump that was estimated at greater than 5,000 yd^3 of waste. This waste is dominated by altered granodiorite and other country rock.

Waste Dump #2 appears to have been generated as a result of an adit being driven into the base of upper War Dance Gulch. The waste rock is unaltered quartz monzonite. IDEQ believes that the lack of alteration is because the adit was driven on the opposite side of the fault (defining War Dance Gulch) from the altered ore zone. Hence there were no sulfides or other alteration minerals present on the dump.



Photo 16. Looking northeast towards War Dance Waste Dumps #2 (lower right), #3 (center) and #4 (upper left).

Waste Dump #3 is actually a series of mid level waste dumps, closed adits and collapsed raises. Cumulatively, these workings contain less than 1,500 yd^3 of altered waste rock. However, there were very few indications of sulfides.



Photo 17. Caved War Dance Adit #3



Photo 18. Caved Raise that is exposed approximately 50 feet above War Dance Adit #3

Like many of the mine workings in the Big Wood River basin, several of the adits appear to have had raises driven to the surface just shortly after the tunnel encountered stable bed rock. Although these are not currently physical hazards, they are worthy of note and occasional monitoring.



Photo 19. Looking northwest from War Dance Waste Dump #4 towards War Dance Waste Dump #5, which contains less than 200 yd^3 of waste rock. Note the caved opening for another raise that appears to have been driven upwards from War Dance Adit #3.



Photo 20. Caved Raise northwest of War Dance Adit #5.

Section 8. Soil Sample Collection

One soil sample was collected from the Main Jolly Sailors waste dump (JSWD1SS). Two soil samples were collected from the War Dance mine area; one background sample from the area above the waste dumps (WDBGSS1), and one from waste dump #1 (WDWDSS1). Each sample was approximately five pounds in size and was screened through a No. 10 sieve screen. Approximately 95% of each sample passed through the screen. The material passing was mixed in a clean bucket prior to placing it in a one gallon zip lock bag, which was then placed in a cloth mineral sample bag. Both bags were appropriately marked, and then documented on Chain of Custody Forms for submittal to SVL laboratories.

Table 1: Total Recoverable Metals Analysis (Mg/Kg)

Jolly Sailors Mine Soil Sample			
Description	IDTLs	EPA Region 6 HHSLs	Sample No. JSWD1SS
	Units: Mg/Kg		Mg/Kg
Antimony	4.77	314	7.7
Arsenic	0.391	23	**2140**
Cadmium	1.35	39	<0.20
Copper	921	2,900	38.9
Iron	5.76	55,000	**70,200**
Lead	49.6	400	**423**
Magnesium	NSA	NSA	5960
Mercury	0.00509	23	1.09
Silver	0.189	390	3.73
Zinc	886	23,000	230

Table 2: Total Recoverable Metals Analysis (Mg/Kg)

War Dance Mine Soil Samples				
		EPA Region 6 HHSLs	Sample No.	Sample No.
Description	IDTLs Units:	Mg/Kg	WDBGSS1 Mg/Kg	WDWDSS1 Mg/Kg
Arsenic	0.391	23	**140**	**1820**
Cadmium	1.35	39	3.02	9.07
Copper	921	2,900	31.5	56.9
Iron	5.76	55,000	26,500	**57,100**
Lead	49.6	400	161	**3,280**
Manganese	223	3,500	852	1,290
Mercury	0.00509	23	0.307	6.27
Silver	0.189	390	1.24	20.9
Zinc	886	23,000	416	1,900

8.1 Soils Analysis

Background levels of total arsenic exceeded both Idaho's *Initial Default Target Levels* (IDTLs) and EPA Region 6's Preliminary Human Health Screening Levels (HHSL) at all the sites. The IDTLs are risk-based target levels for certain chemicals that have been developed by DEQ using conservative input parameters, a target acceptable risk of 10^{-6}, and a *Hazard Quotient* of 1. These numbers, although used for comparison even at remote locations, are more applicable to sites where it is expected to see "unrestricted uses" such as residential development. Similarly, the Region 6 HHSLs are human health based risk derived for screening where residents are at risk for exposure. These concentrations are not unusual for a location or facility in a historic mining district.

Concentrations of total arsenic, total iron, and total lead in the waste dump samples at both places exceeded the IDTLs. At the Jolly Sailors mine, concentrations of total antimony, total mercury and total silver were in between the IDTLs and HHSLs.

Section 9. Surface Water Sample Collection

One surface water sample was collected from the War Dance mine area. The area was in the War Dance Gulch approximately ¼ of a mile southeast from the lowest dump (Waste Dump #1). Field parameters were not taken.

Table 3: Total Recoverable Metals Analysis (Mg/L)

War Dance Water Sample

	IDTLs MCL by default, (RB)Risk Based	National Primary Drinking Water Standards * Secondary DW Standards	IDEQ Cold Water Biota Standard Acute	IDEQ Cold Water Biota Standard Chronic	Sample No.
Description	Units: Mg/L				WDSW1
Arsenic	.01	.01	0.34	0.15	<0.025
Cadmium	.005	.005	0.0013 (H)	0.0006 (H)	0.0134
Copper	1.30	1.30	0.017 (H)	0.011 (H)	<0.010
Iron	NSA	.3*	NSA	NSA	0.184
Lead	.015	.015	0.065 (H)	0.0025 (H)	0.0198
Manganese	.25 (RB)	.05	NSA	NSA	0.0131
Mercury	.002	.002	NSA	NSA	<0.00020
Silver	.0521 (RB)	NSA	0.00034 (H)	NSA	<0.0050
Zinc	3.13 (RB)	NSA	0.120 (H)	0.120 (H)	3.29

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

9.1 Surface Water Analysis

The chemistry of the surface water collected at the War Dance mine area met all of the water quality standards within the IDTLs and HHSLs with the exception of cadmium, lead, and zinc which have minor elevations. Due to the lack of the surface water pathway being completed by connecting to Deer Creek, the elevated amounts appear to be negligible. Furthermore, it should be noted that criteria for human health and drinking water is expressed in "Totals" concentration, Aquatic life criteria is expressed in "Dissolved" concentrations, and sample values are derived from "Totals" analysis. This is to provide screening level analysis only. If more precise risk analysis were warranted for human health and ecological pathways and exposure to water, both totals and dissolved analysis of metals in water would be warranted. Additional analysis for hardness would also be warranted for hardness dependent parameters.

Section 10. Pathways and Environmental Hazards

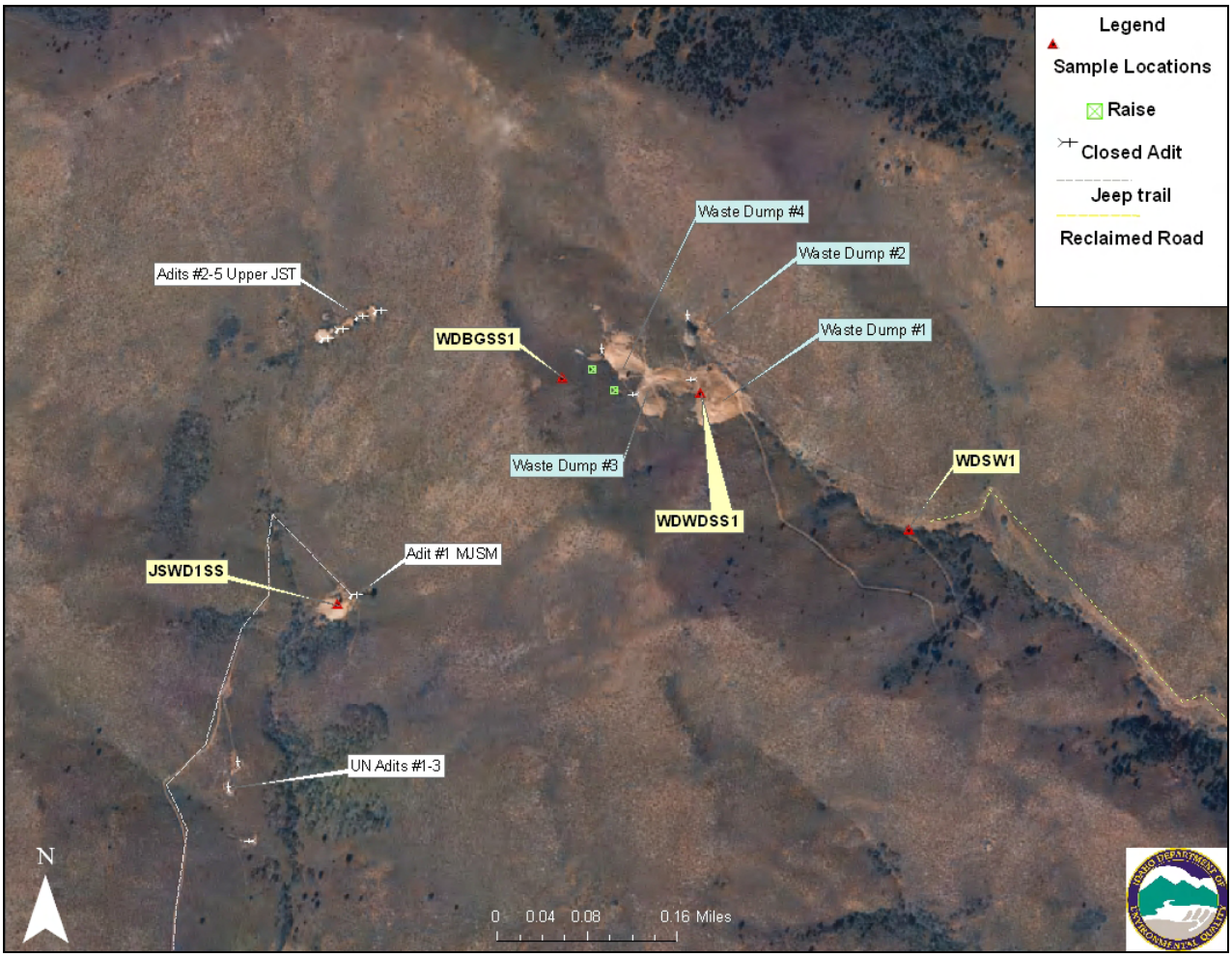


Figure 3. Map of sampling locations, adits, and waste dumps at Jolly Sailors and War Dance Mine area.

10.1 Surface Water Pathways

At the Jolly Sailors mine area there was one intermittent stream approximately 50 feet below the main Jolly Sailors waste dump. The vegetation was lush and well-established and there was no evidence of waste rock eroding into the stream.

War Dance Creek runs through War Dance Gulch where it eventually converges into Deer Creek. During the site visit IDEQ observed that there were no surface waters connecting War

Dance Gulch with Deer Creek, even though there was a significant flow in War Dance Gulch from approximately 500 feet below the mine site to approximately 200 feet above the Forest Service Camp grounds. Furthermore, IDEQ did not observe any significant connection of the mine waste dumps to the surface waters or riparian/wetlands areas in the lower War Dance Gulch.

10.2 Ground Water Pathways

During the cleanup activities of the nearby mines, specifically the Minnie Moore and Triumph mines, some of 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 tailings piles and waste rock 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.

Source water assessments provide information on the potential contaminant threats to public drinking water sources. In the Big Wood River Valley Idaho, most of those sources (>95%) are ground water (IDEQ 2000). 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. Four source water assessments for drinking water supplies have been used in this Preliminary Assessment Process to evaluate the potential impacts to both public and private drinking water supplies in and around Sun Valley, Ketchum, Hailey and Bellevue, Idaho.

The information extrapolated from these source water assessment 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 Big Wood River Aquifer and its sources (IDEQ 2000). This information is illustrated in Figure 4.

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).

There are numerous public and private drinking water supplies in the Big Wood River Basin. The Sun Valley Water and Sewer District operates and maintains nine wells in two groupings (IDEQ 2000). The City of Ketchum drinking water system consists of seven wells in two groupings. The City of Hailey's drinking water system consists of six wells and a spring (IDEQ 2000).The City of Bellevue drinking water system consists of two wells and three springs (IDEQ 2000).

Generally speaking, public drinking waters systems in the Big Wood River Valley are rated as moderate to high (IDEQ 2000). 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 are poorly to moderately drained. The vadose zone is predominantly gravel, which increases the score. On the valley floors the average depth to ground water is twenty to fifty feet.

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. There is no current, long term or recurring water chemistry problems in the City of Ketchum's drinking water sources. Arsenic, nickel, antimony, barium, selenium, chromium, cyanide and nitrate have been detected in Ketchum's wells, but all were well below MCLs (IDEQ 2000). There is no long term or recurring water chemistry problems in the City of Hailey's drinking water sources. Manganese, zinc, chromium, and mercury have been detected in Hailey's wells, but all were well below MCLs (IDEQ 2001). Currently, there are no data that indicate that any metal concentrations have exceeded MCLs in the Bellevue drinking water systems (IDEQ 2000).

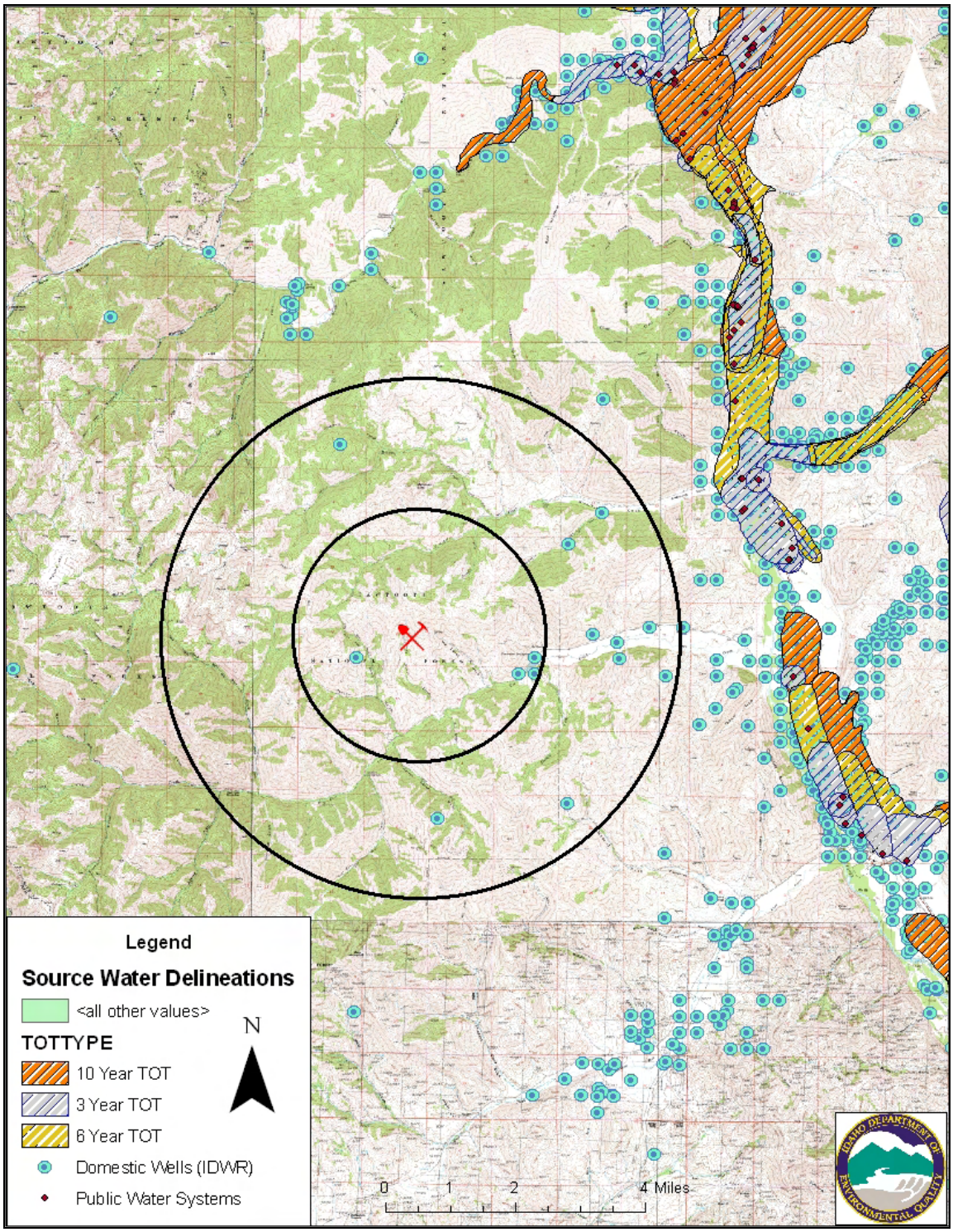


Figure 4. Drinking Water Well locations and source water delineations (Map source: USGS 24k Quads).

10.3 Air Quality Pathways

The reclaimed road at War Dance prevents ORVs from entering the area where the most likely air quality pathway would be that relative to fugitive dust emissions. The delivery of dust from the site to local residents is not likely because of the distance (+1 mile) to those residents.

10.4 Soil Exposure

According to IDEQ's Risk Evaluation Manual if pathways are determined to be complete, or if pathways are anticipated to become complete as a result of future uses, and the IDTLs are exceeded for any constituents, two options should be considered:

1. Adopt the IDTLs as the cleanup levels and develop a *Risk Management Plan* (RMP).
2. Perform a more detailed, site-specific evaluation, which includes developing site-specific background concentrations for comparative purposes.

The soil exposure pathways were not completed at any of the sites assessed in this report.

10.5 Domestic Wells and Public Water Supplies

There are fourteen domestic drinking water wells and no public drinking water supplies within a four mile radius of the mine. Four domestic drinking water supplies are located approximately 1 mile from the site are more likely affected by watershed wide sources of contaminants than by this mine site.

10.6 Residences, Schools and Day Care Facilities

The nearest residence is approximately 2 miles due east of the Jolly Sailors and War Dance mine sites.

The nearest Day Care or School Facility is more than 6 miles due east of the Jolly Sailors and War Dance mine sites.

10.7 Wetlands

Significant wetlands exist along Deer Creek adjacent to and below the Wood River Zinc mill site. However, there are no wetlands in the immediate area of the Jolly Sailors and War Dance mines. There is no evidence of erosion taking place from these mines into the streams below them.

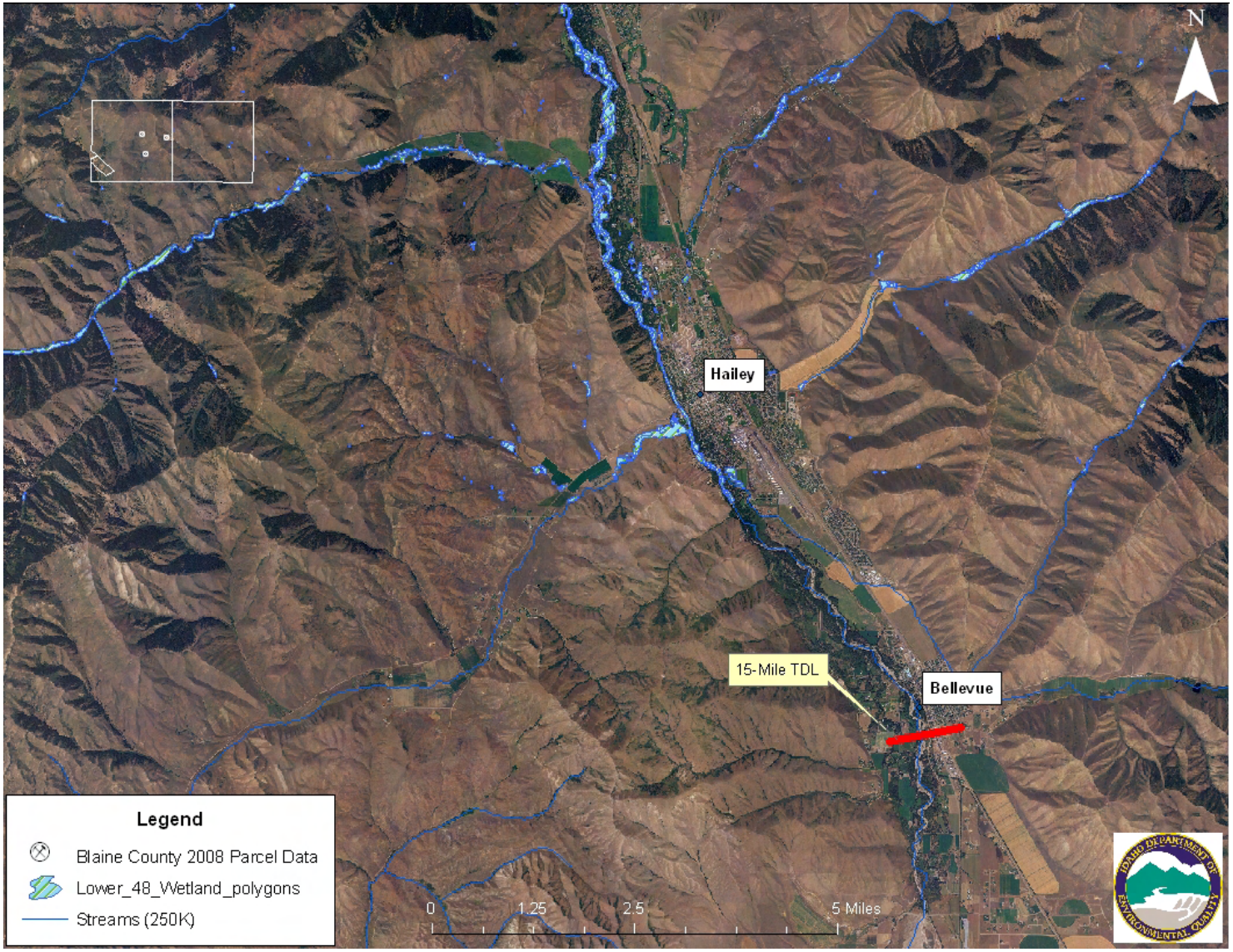


Figure 5. Wetlands and 15-Mile TDL map. (Source Fair 100k, Sunv 100k, NAIP 2004)

10.8 Sensitive Species (Plant and Animal)

Although the site is located within a defined range and habitat for wolves, the size of the dumps relative to the total range is very minuscule and therefore unlikely to be a significant source for exposure.

10.9 Fisheries

Fish density and diversity studies have not been conducted on Deer Creek to confirm any fish species that may reside in this stream. Visual observations confirm the presence of brook trout [Salvelinus foninalis] in Deer Creek. Redband rainbow trout [*Oncorhynchhus mykiss* gairdneri], mountain white fish [Prosopium williamsoni], wood river sculpin [Cottus leiopomus], and brook trout [Salvelinus foninalis] are present within the Big Wood River (IDFG, 2000).

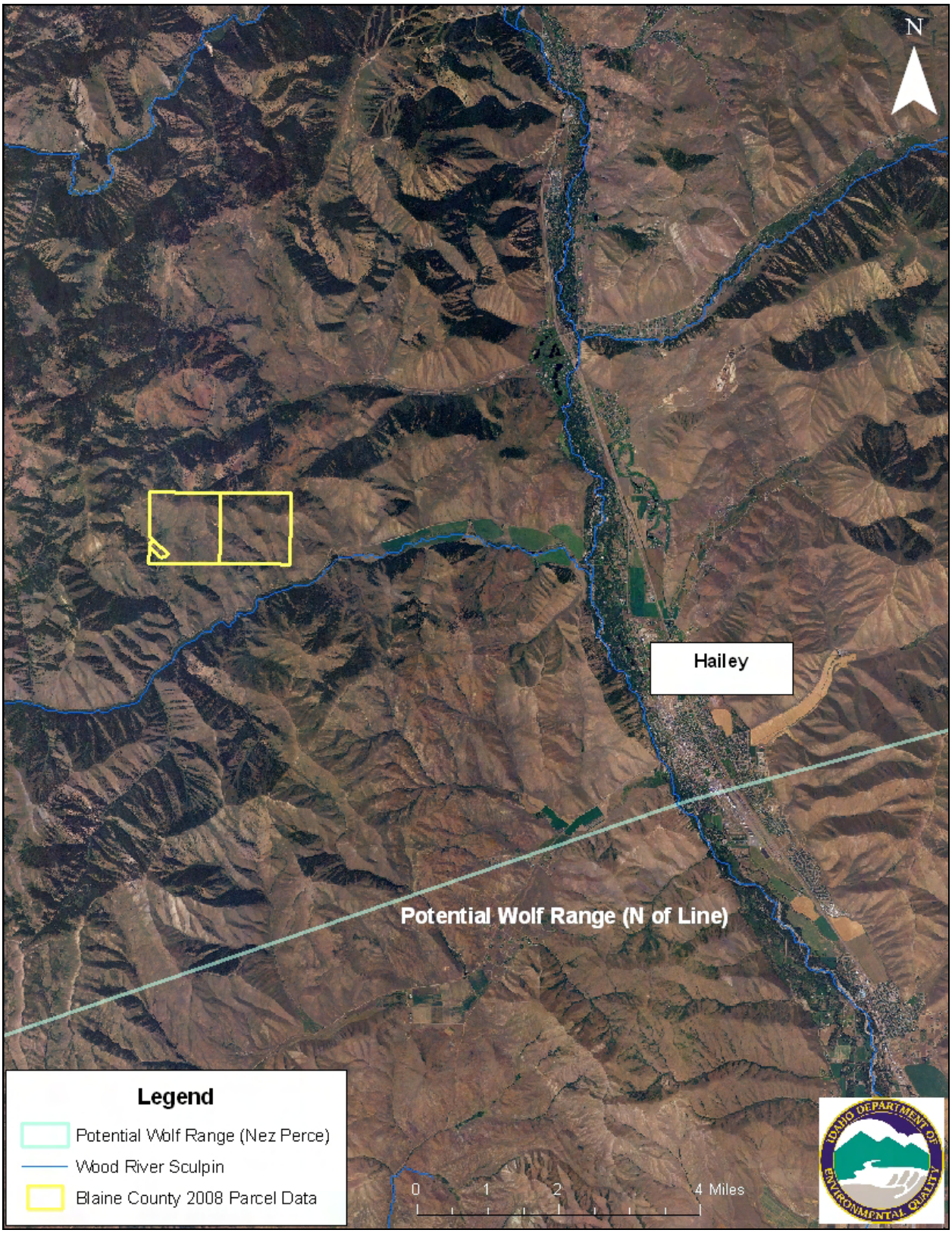


Figure 6. Sensitive species near Jolly Sailors and War Dance mines. (Source: Fair 100k, Sunv 100k, NAIP 2004)

10.10 Sensitive Waterways

There are no Clean Water Act 303(d) listed streams immediately down gradient from the site, which might be adversely affected by contaminant delivery from the site.

10.11 Livestock Receptors

There were very few indications that the area is used for livestock grazing, which is presumably for sheep. However, there are indications that hunters have seasonally grazed horses and mules.

Section 11. Summary and Conclusions

Based on existing conditions and uses, historic information, data observations made during the site visit, and analysis of the mine wastes, potential pathways of contaminants to receptors, and potential exposures to ecological and human receptors, IDEQ has no recommendations and determines the Jolly Sailors and War Dance mines as No Remedial Action is Planned (NRAP).

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