

SITE INSPECTION REPORT

ONTARIO MINE

[Aka North Star, Ervine, Sunday, Niagara,
Hub No. 2, and Ontario patented mining claims; aka Bowler
Claims or Bowler Group]

And

ONTARIO MILL

[Aka Sunday Mill] blank

Sawtooth National Forest,
Ketchum Ranger District
Blaine County, Idaho

April 2012

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EXECUTIVE SUMMARY

In October 2010, Forest Service (USFS) personnel performed a site inspection of the Ontario Mine Site (aka North Star, Ervine, Sunday, Niagara, Hub No. 2, and Ontario patented mining claims; and aka Bowler Claims or Bowler Group), and the Ontario Mill Site (aka Sunday Mill Site). In this report the Ontario Mining Site and Mill Site will sometimes be referred to as the "Mine Site" and the "Mill Site" respectively.

Both the Mine Site and Mill Site are located within the Ketchum Ranger District of the Sawtooth National Forest, in Blaine County Idaho. The Mine Site consists of patented mining claims (private property), while the Mill Site is on National Forest System (NFS) land.

Mine Site

The Ontario Mine claims (Mine Site) were patented between 1884 and 1914. The mine was active from 1881-1887, and produced lead-silver ore worth nearly one million dollars. The mines also produced copper, zinc, and gold ore. The mine workings consisted of several adits driven along east-trending veins of alkali-granite and limestone of the Wood River Formation, and numerous prospects aligned along other east-trending structural zones.

The Ontario Mine was opened by tunnels aggregating several thousand feet of work both in the granite and in the Paleozoic sedimentary rock. Two systems of veins, each offset by numerous normal faults, have been explored (Idaho Department of Environmental Quality [IDEQ], 2009).

Waste rock volume is estimated to be between 25,000 and 34,000 cubic yards. Total disturbed area is about 6.2 acres.

Mill Site

The Ontario Mill, also known as the Sunday Mill, (Mill Site) was associated originally with the patented Sunday Lode mining claim. In 1883, Warm Springs Consolidated Mining Company established the Sunday Mill to process the Sunday Lode mine ore. The Boston-Idaho Company was reported to have taken over the Ontario group of claims and established a camp which included the readjustment of an old mill (assumed to be the Ontario Mill) on the property. Boston-Idaho Mining Company took title to the Mill in 1917, and then conveyed it to Wood River Mines, Inc. in 1921. Wood River Mines in turn conveyed the Mill to the Midvale Mining Company and the Ervine Mining Company in 1922. The Mill was then conveyed to individuals in 1935. Proofs of Labor documents were found for the years 1936 through 1992, although for the most part the work performed was not recorded. Various entities (e.g., Sun Valley Lead-Silver Mines, Inc., Mexico Pacific Mining Company, Inc., and Tri-State, Inc.) operated the Mill, presumably under lease agreements, from 1950 through 1979. Exploration work was performed by the Battle Mountain Exploration Company in 1990. The last known Proof of Labor for the Mill was filed in 1992.

The Mill Site is located on Rooks Creek approximately 0.6 miles east of the Sunday Lode mine claim. Total disturbed area is about 1.25 acres.

Risk Management Criteria

BLM has developed multimedia criteria for chemicals of concern at abandoned mine sites (heavy metals - antimony, arsenic, cadmium, copper, lead, manganese, mercury, nickel, selenium, silver, and zinc) as they relate to recreational use and wildlife habitat. These risk management criteria (RMC) provide numerical action levels for metals in environmental media. They were designed to both assist land managers in making natural resource decisions and to support ecosystem management. When comparing sample results to the RMC, risks were designated as follows:

- Less than RMC (criteria) = low risk;
- 1-10 times the criteria = moderate risk;
- 10-100 times the criteria = high risk; and
- Greater than 100 times the criteria = extremely high risk.

BLM suggests that moderate risk may be addressed by management or institutional controls, whereas high, or extremely high, risk may require remediation. Additionally, the criteria may be used as target cleanup levels if remedial action is undertaken.

The human RMC may be modified to be less stringent if the number of metals present is fewer or if background concentrations are locally elevated. Regarding the ecological risk evaluation, BLM has developed different RMC for different species of wildlife. For this evaluation, the sample concentrations were compared to a median RMC value for each contaminant. The median RMC represents a value appropriate for protecting groups of species as a whole. (Ford, 1996)

Results of the evaluation for human and ecological receptors are summarized in this Executive Summary and presented in detail elsewhere in this report.

IDEQ Preliminary Assessment Report

Idaho Department of Environmental Quality (IDEQ) had previously investigated contamination at the Mine Site, in surface water both from seeps and adit drainage, and from Rooks Creek. In all, four waste rock and two background soil samples, and six water samples were taken. In addition, two Rooks Creek sediment samples were taken upstream and downstream of the Mine Site. An IDEQ preliminary (site) assessment report, presenting and discussing analysis results of various samples, was issued in December 2009.

USFS Site Inspection

The purposes of the USFS inspection were to:

- Characterize the type, location, and extent of contamination at both the Mine and the Mill Sites;
- Gather information upon which to base USFS land transaction decisions regarding the Mine Site. The Mine Site is on private property which has been proposed for donation to the USFS; and
- Determine whether further action (e.g. institutional controls and/or removal actions) is warranted for the Mill Site under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

USFS sampled soil that appeared to be waste rock at nine locations throughout the Mine Site. Eight soil samples were collected in the proximity of the Mill Site. USFS also collected two background soil samples near the Sites.

Human and Ecological Risk

Human and ecological receptors in the vicinity of the Mine and Mill Sites could be exposed to metal contamination via several contaminant migration pathways including soil (earth, waste rock and tailings), groundwater, and surface water. Potential exposure routes include inhalation of airborne dust and ingestion of groundwater, surface water, soil, sediment, and animals and plants. The most significant threat to both human and terrestrial receptors likely comes from the soil/dust pathway. That pathway was selected for analysis.

USFS sampling efforts included collection of soil, tailings and waste rock samples which were then analyzed for antimony, arsenic, cadmium, copper, lead, manganese, mercury, nickel, selenium, silver, and zinc. The analytical results were compared to BLM risk-based criteria, thereby providing a screening-level risk assessment for human and ecological receptors. The human receptor scenario was limited to worker and recreational categories, since residential occupancy is unlikely to occur at the either site. For ecological receptors, concentrations were compared to a median RMC value representing the criterion appropriate for protecting groups of species.

Analyses of Sample Data

The BLM abandoned mine lands RMC were utilized to evaluate risk to human and ecological receptors for both the USFS and IDEQ sample data, thereby allowing for a consistent comparison of the two data sets. There was general agreement between the IDEQ and USFS data; the principal difference being that IDEQ data indicated arsenic concentrations at moderate to high human risk levels, while USFS arsenic data indicated moderate to extremely high risk levels for humans. The difference appears to be due primarily to the use by IDEQ and USFS of different sampling locations on the same site.

Soil exposure pathways were evaluated for both data sets. Both the Mine and Mill Sites showed similar results. Antimony, arsenic, cadmium, and lead were detected in

concentrations that present a moderate or higher risk to human receptors. Arsenic, cadmium, copper, lead and zinc were detected in concentrations that present a moderate or higher risk to ecological receptors.

IDEQ found that "Erosion of the waste dumps is prevalent, and most certainly contributes to sediment delivery to the perennial Rooks Creek. This sediment may pose physical impairment to Rooks Creek" (IDEQ, 2009).

While IDEQ concluded that there is no evidence that the sediment releases increase metals loading in the stream (IDEQ, 2009), their samples indicated that the Mine Site has likely contributed zinc and lead to Rooks Creek. The zinc concentration in the Rooks Creek sample downstream of the site exceeded Idaho's acute and chronic water quality criteria for cold water biota. Further, the zinc concentration in sediment downstream of the Mine and Mill Sites was two orders of magnitude greater than that upstream – 1,130 mg/kg vs. 29.6 mg/kg. The lead concentration in sediment was one order of magnitude greater downstream than upstream – 187 mg/kg vs. 9.66 mg/kg.

Although IDEQ's assessment was limited to the Mine Site, their Rooks Creek sample results are also relevant to the Mill Site. Erosion of the tailings directly into Rooks Creek is apparent. Besides contributing to physical impairment, the tailings likely contribute to the elevated zinc and lead levels found downstream of the Sites.

Potential Further Investigation

Analyses of both the USFS and IDEQ data indicate that the elevated levels of antimony, arsenic, cadmium, copper, lead and zinc above RMC warrant additional site investigation, and/or further action. It is possible that further investigation would show that the Sites do not present an unacceptable risk because of low traffic patterns.

However, while off-road vehicles are banned in the area; there is evidence of continued ATV use, especially during hunting season. Further, there are signs of camping on the Mill Site which is adjacent to both a road and Rooks Creek. In any case, it appears that neither the Mine Site nor the Mill Site, in their current condition, would be acceptable for unrestricted use.

Conclusions

Mine Site

Samples taken on the Mine Site indicate risk levels above Human RMC ranging from moderate to extremely high for antimony, arsenic, cadmium, and lead; and risk levels above Ecological median RMC ranging from moderate to extremely high for arsenic, cadmium, copper, lead and zinc. The Mine Site is privately held. If it were NFS property, land use restrictions and institutional controls would be required to minimize access (e.g. road gates and trail closures)

and to prevent any future site development. Further, there are seven open adits and shafts on the Mine Site that are safety hazards, and would need to be closed.

The waste rock piles would likely require stabilization, both to reduce the hazards to humans and wildlife and to reduce waste rock delivery to Rooks Creek. The remedy for this type of soil contamination is containment. The likely containment scenario would be to re-grade and cover the waste rock piles. However, the limited vehicular and/or equipment access and the relatively steep slopes that characterize the Mine Site would make such stabilization both difficult and expensive.

Mill Site

The parcel where the now defunct mill was located is on NFS land. The levels of contaminants on the Mill Site are similar to those of the Mine Site. They present risks to both human health and the environment. Based on the following factors, listed in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at 40 CFR 300.415, those risks are sufficient to warrant a CERCLA time-critical removal action:

1. Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants (300.415(b) (2) (i)

The Mill Site is accessible to the public. Based on a comparison to BLM abandoned mine lands RMC, the Site tailings present moderate to extremely high risks to humans (campers, workers and ATV drivers) from arsenic; moderate to high risks from antimony and lead; and moderate risk from cadmium. Additionally, the tailings piles present high to extremely high risks to wildlife from lead; a high risk from cadmium; moderate to high risks from arsenic and zinc; and a moderate risk from copper. Those metals are all hazardous substances as listed in 40 CFR 302.4.

2. Actual or potential contamination of drinking water supplies or sensitive ecosystems (300.415(b) (2) (ii).

Released hazardous substances from the Mill Site are being transported via wind and water from the tailings piles into the adjacent Rooks Creek. IDEQ water samples indicated that both the Mine and Mill Sites have likely contributed metals to the creek. The zinc concentration in the Rooks Creek sample downstream of the site exceeded the Idaho's acute and chronic water quality criteria for cold water biota. Further, the zinc concentration in sediment downstream of the Mine and Mill Sites was two orders of magnitude greater than that upstream – 1,130 mg/kg vs. 29.6 mg/kg. The lead concentration in creek sediment was one order of magnitude greater downstream than upstream – 187 mg/kg vs. 9.66 mg/kg.

The Wood River Sculpin has been identified as one of the "Idaho Species of Greatest Conservation Need" by the Idaho Department of Fish and Game (Idaho Comprehensive Wildlife Conservation Strategy, 2006). Per IDEQ: "An IDEQ fish survey has collected Wood River Sculpin

within (Rooks) Creek, downstream of the Ontario mine. Sculpins are species which have been documented to be sensitive to pH and heavy metals. Their presence within the creek indicates that any potential impacts from mining are not significantly affecting sensitive fish assemblages" (IDEQ, 2009). Our concern is that continued metal loading of the creek will change that circumstance for the worse. In addition, Rooks Creek supports both Brook and Rainbow Trout (IDEQ 2009); those populations might also be threatened by increased heavy metal concentrations in the creek.

3. High levels of hazardous substances or pollutants or contaminants in soils largely at or near surface, that may migrate (300.415(b) (2) (iv)).

As described above, the tailings have moderate to extremely high levels of antimony, arsenic, cadmium, copper, lead, and zinc at, or near, the surface. The tailings piles lack vegetation, and loose soil may migrate via both wind and surface water erosion.

Metal contamination at this site presents moderate to extremely high risks to both humans and wildlife via the soil exposure pathway. Additionally, metals may be transported via wind and water erosion, which is of particular concern for the adjacent stream. Sediment analyses indicate that the Site may present a risk to aquatic organisms in Rooks Creek and downstream, although additional evaluation would be needed to form definitive conclusions.

The presumptive remedy for this type of soil contamination is containment (U. S. Environmental Protection Agency [EPA], 1999). The most likely containment scenario would be to re-grade and cover the tailings piles.

Recommendations

The results of the USFS Site Investigation (and the IDEQ Preliminary Analysis) indicate that:

- USFS should not accept the Mine Site in its current condition into the NFS without further investigation and consideration of the environmental concerns presented in this report.
- USFS should strongly consider instituting more Mill Site institutional controls now, and when possible, conduct a CERCLA time-critical removal action for the site.

1.0 INTRODUCTION

In October 2010, Forest Service (USFS) personnel performed a site inspection of the Ontario Mine Site (aka North Star, Ervine, Sunday, Niagara, Hub No. 2, and Ontario patented mining claims; and aka Bowler Claims or Bowler Group), and the Ontario Mill Site (aka Sunday Mill Site). In this report the Ontario Mining Site and Mill Site will sometimes be referred to as the "Mine Site" and the "Mill Site" respectively.

Both the Mine Site and Mill Site are located within the Ketchum Ranger District of the Sawtooth National Forest, in Blaine County, Idaho. The Mine Site consists of patented mining claims (private property), while the Mill Site is on National Forest System (NFS) land.

The purposes of the visit were to:

- Characterize the type, location, and extent of contamination at both the Mine and the Mill Sites.
- Gather information upon which to base USFS land transaction decisions regarding the Mine Site. The Mine Site is on private property which has been proposed for donation to the USFS.
- Determine whether further action (e.g. institutional controls and/or remedial actions) is warranted for the Mill Site under USFS policy and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

Idaho Department of Environmental Quality (IDEQ) had investigated the Mine Site in 2009. Their sampling included soils (waste rock and background soil), seeps, adit drainage, and surface water and sediment from the receiving stream (Rooks Creek). IDEQ does not appear to have investigated the Mill Site, presumably because they knew it to be on NFS land. An IDEQ preliminary (site) assessment report was issued in December 2009.

In order to better understand the site's environmental condition, USFS reviewed the IDEQ report and analyzed the data before conducting the site inspection. During the inspection, waste rock and background soil samples were taken from the Mine Site, and soil/tailings samples were taken from the Mill Site.

2.0 SITE DESCRIPTION AND HISTORY

2.1 Site Location and Access

The Mine and Mill Sites are located within the Ketchum Ranger District of the Sawtooth National Forest, in Blaine County, Idaho. The Mine Site consists of six patented claims (private land), while the Mill Site is on NFS land. Access to the properties is gained by traveling west

from Ketchum, Idaho on Warm Springs Road, also known as Forest Development Road 227. The Warm Springs Road is paved for several miles beyond the Big Wood River, after which it turns into an improved gravel road. Warwick Hot Springs sub-division is approximately nine miles up Warm Springs Road; Rooks Creek Road comes at 11.25 miles.

The Sites can then be accessed as follows:

Primary Route: Turn onto Rooks Creek Road heading northerly for approximately 1.1 miles until reaching the ruins of the Ontario Mill Site. A bridge across Rooks Creek accessing the old mine road has been removed, but the creek is fairly easy to cross. To reach the Mine Site, one continues along the Mill ruins to the north where an old road is located. One switchback is present near the beginning of the road, and then the road traverses the hillside in a southwesterly and uphill direction for approximately 0.5 mile before reaching the south-eastern (Ontario) claim.

Alternate Route: From the intersection of Rooks Creek Road and Warm Springs Road, a partially overgrown two-track trail can be accessed by proceeding along Warm Springs Road approximately 100 meters in the upstream direction. The trail is present on the north side of the road and is visible on the grassy hillside as it winds uphill, staying on the east side of the main ridge. The Ontario Claim is located approximately 1.25 miles up the trail.

Site vicinity maps are included in Appendix B. Site photographs taken during the visit are shown in Appendix C.

2.2 Site History and Description

Mine Site

The Ontario Mine claims were patented between 1884 and 1914 and include the North Star, Ervine, Sunday, Niagara, Hub No. 2, and Ontario claims, aka the Bowler Claims or Bowler Group. The mine was active from 1881-1887, and produced lead-silver ore worth nearly one million dollars. The mine workings consisted of several adits driven along east-trending veins of alkali-granite and limestone of the Wood River Formation, and numerous prospects aligned along other east-trending structural zones. The Ontario mine is opened by tunnels aggregating several thousand feet of work both in the granite and in the Paleozoic sedimentary rock. Two systems of veins, each offset by numerous normal faults, have been explored (IDEQ, 2009).

The Ontario Claim patent contains more than ten waste dumps, and it appears that the slopes were used to access multiple levels, producing approximately 10-12,000 cubic yards of waste rock. The area of disturbance measures approximately 3.2 acres, and has been worked by a bulldozer since mining ended. (IDEQ, 2009)

The Sunday Claim is located near the headwaters of an unnamed tributary to Rooks Creek. According to the plat map, a blacksmith shop, boarding house and office were located on the

claim. There is very little that remains of these facilities. Approximately six adits were used to access the ore, producing roughly 7,000-10,000 cubic yards of waste rock which is distributed over an area of approximately 1.25 acres (IDEQ, 2009).

The Ervine Claim is located adjacent to the Sunday claim on a ridge to the northeast. Mineralization occurred along a north-northwest strike within a northwest trending ridge. Based upon waste rock volumes, the nearly vertical mineralized zone was accessed primarily where mineralization intercepted the surface on the south-facing side of the ridge. Approximately 1.25 acres of disturbed area totaling approximately 5,000-7,000 cubic yards of volume is present, which has been altered by bulldozing activity. (IDEQ, 2009)

The North Star Claim contains two or three adits, which have produced approximately 3,000-5,000 cubic yards of waste rock over an approximate area of 0.5 acres.

The Niagara and Hub No. 2 claims both contained very small (<500 cubic yards) waste dumps that contained almost solely country rock. Additionally, more than 25 other prospects are located throughout the Ontario Mine (IDEQ, 2009).

The Ontario Mine was active from 1881 - 1887 and produced lead-silver ore worth nearly one million dollars. By 1899, the Ontario, North Star, and Sunday claims were the best producers, with \$500,000 being taken from the Ontario claim alone. (Sawtooth National Forest Ontario Mill Potentially Responsible Party Draft Report, 2011)

Based on the estimates provided above, waste rock volumes are between 25,000 and 34,000 cubic yards. Total disturbed area is about 6.2 acres.

Mill Site

The unpatented Ontario Mill (aka Sunday Mill Site¹) is located on Rooks Creek approximately 0.6 miles east of the Sunday Lode mine claim. Tailings are situated immediately adjacent to the west side of the creek, and appear to comprise part of the creek bank. There also appears to be tailings material on the east side of the creek. The creek bank itself appears to be well-vegetated, but otherwise the tailings are sparsely vegetated and subject to erosion.

The Mill was originally associated with the patented Sunday Lode mining claim. As described above, the Sunday Lode mining claim was one of six patented claims which constitute the Ontario Mine. In 1883, Warm Springs Consolidated Mining Company located the Sunday Mill

¹ IDEQ lists Sunday Mill Site as an "also known as" for the Ontario Mine, probably because of the mill's association with the Sunday mining claim. According to information available from the Blaine County Clerk, on November 6, 1883, Warm Springs Consolidated Mining Company located the Sunday Mill Site to be used for mining and milling purposes in conjunction with the Sunday Lode mining claim. IDEQ investigated only the mining claims (private parcels), not the Mill (on NFS land), although the Rooks Creek samples are relevant to the Mill as well as the Mine. IDEQ typically does not investigate sites on public land. For purposes of this report, USFS treats the Mine and Mill as separate Sites.

Site to be used for mining and milling purposes in conjunction with the Sunday Lode mining claim. While County records provide reference to other mill site claims in the area (Niagara Mill and Denver Mill), it is unclear whether such mills were ever constructed. We believe that the ore from Ontario Mine, as well as that from other patented and unpatented claims in the vicinity, was processed at the Ontario Mill.

In 1907, the Boston-Idaho Company was reported to have taken over the Ontario group of claims and established a camp which included the readjustment of an old mill (assumed to be the Ontario Mill) on the property. In 1909, a new concentrating plant with 100-ton capacity was reported to be unproductive. In 1910 that Boston-Idaho Company equipped a concentrating mill and magnetic separating plant but very little work was done in the mine. Boston-Idaho Mining Company took title to the Mill in 1917, and then conveyed it to Wood River Mines, Inc. in 1921. Wood River Mines in turn conveyed the Mill to the Midvale Mining Company and the Ervine Mining Company in 1922. The Mill was then conveyed to individuals in 1935. Proofs of Labor documents were found for the years 1936 through 1992, although for the most part the work performed was not recorded. Various entities (e.g., Sun Valley Lead-Silver Mines, Inc., Mexico Pacific Mining Company, Inc., and Tri-State, Inc.) operated the Mill, presumably under lease agreements, from 1950 through 1979. Exploration work was performed by the Battle Mountain Exploration Company in 1990. The last known Proof of Labor for the Mill was filed in 1992.

The Mill Site is located on Rooks Creek approximately 0.6 miles east of the Sunday Lode mine claim. Total disturbed area is about 1.25 acres.

3.0 RISK MANAGEMENT CRITERIA

BLM has developed multimedia criteria for the chemicals of concern (heavy metals - antimony, arsenic, cadmium, copper, lead, mercury, manganese, nickel, selenium, silver, and zinc) as they relate to recreational use and wildlife habitat on abandoned mine lands. These risk management criteria (RMC) provide numerical action levels for metals in environmental media. They were designed to both assist land managers in making natural resource decisions and to support ecosystem management. When comparing sample results to the RMC, risks were designated as follows:

- Less than RMC (criteria) = low risk;
- 1-10 times the criteria = moderate risk;
- 10-100 times the criteria = high risk; and
- Greater than 100 times the criteria = extremely high risk.

BLM suggests that moderate risk may be addressed by management or institutional controls, whereas high risk or extremely high risk may require remediation. Additionally, the criteria may be used as target cleanup levels if remedial action is undertaken.

The human RMC may be modified to be less stringent if the number of metals present is low or if background concentrations are locally elevated. Regarding the ecological risk evaluation, BLM has developed different RMC for different species of wildlife. For this evaluation, the sample concentrations were compared to a median RMC value for each contaminant. The median RMC represents a value appropriate for protecting groups of species as a whole. (Ford, 2006)

Results of the evaluation for human and ecological receptors are summarized in Section 4.3 of this report.

4.0 ENVIRONMENTAL INVESTIGATION and HAZARD ANALYSES

IDEQ investigated the Mine Site in 2009. Their sampling included soils and waste rock, seeps and adit drainage, and surface water and sediment from Rooks Creek. IDEQ does not appear to have investigated the Mill Site, presumably because they knew it to be on NFS land. IDEQ issued a *Preliminary Assessment Report on the Ontario Mine (aka North Star, Ervine, Sunday, Niagara, Hub No. 2, and Ontario patented mining claims; and aka Bowler Claims or Bowler Group)* on December 23, 2009.

In order to better understand the site's environmental condition, USFS reviewed the IDEQ report and analyzed the data before conducting the site inspection. During the inspection, waste rock and background soil samples were taken from the Mine Site, and soil/tailings samples were taken from the Mill Site (see Table 1 - Soil Sample Log). BLM abandoned mine lands RMC (Section 3.0) were utilized to evaluate risk to human and ecological receptors for both the IDEQ and USFS sample data, thereby allowing a consistent comparison of the two data sets. USFS risk analyses using RMC to assess risks associated with both IDEQ and USFS data are presented in Section 4.3 of this report; as well as in Table 2 - Soil Sampling Results and Streamlined Risk Evaluation for Human Receptors, and Table 3 - Soil Sampling Results and Streamlined Risk Evaluation for Ecological Receptors.

4.1 IDEQ Preliminary Assessment

The 2009 IDEQ preliminary (site) assessment report recommended in part that, based on the existing conditions and usage of the site, the site status be designated "No Remedial Action Planned" (NRAP). The Preliminary Assessment did not cover the Mill Site, which has been found to be located on NFS land.

Some of IDEQ's conclusions regarding the Mine Site were:

- Samples of water emanating from mine features, taken at the Sunday, Ervine, and North Star patented claims displayed elevated concentrations of several metals, but the pathways to sensitive ecological receptors appear to be incomplete or *de minimis*.

- Erosion of the waste dumps is prevalent, and most certainly contributes to sediment delivery to the perennial Rooks Creek. This sediment may pose a physical impairment to Rooks Creek. Slope stabilization, water management, and promotion of top soil development of large waste dumps might effectively abate this production and delivery.
- There are seven open adits and shafts on the Mine Site that are dangerous and an attractive nuisance, and should be closed.
- IDEQ's Source Water Assessments were used to evaluate potential effects of the Mine Site on public drinking supplies. No direct effect was determined.

Regarding the soil exposure pathway, IDEQ noted that metals samples exceeded both the Idaho and EPA screening criteria; thereby indicating that additional site characterization and risk management might be warranted. However, IDEQ stated that the site is remotely located beyond where most human receptors would go, and where future development is unlikely, and therefore concluded that risks are likely *de minimis*. They also noted that additional site characterization and risk management should be conducted in the event of any future site development.

IDEQ concluded that there is no evidence that the sediment release from the Mine Site's eroding waste rock increases metals loading in the stream (IDEQ, 2009). However, IDEQ samples indicated that the Mine Site has likely contributed zinc and lead to Rooks Creek. The zinc concentration in the Rooks Creek sample downstream of the site exceeded the Idaho's acute and chronic water quality criteria for cold water biota. Further, the zinc concentration in sediment downstream of the Mine and Mill Sites was two orders of magnitude greater than that upstream – 1,130 mg/kg vs. 29.6 mg/kg. The lead concentration in sediment was one order of magnitude greater downstream than upstream – 187 mg/kg vs. 9.66 mg/kg.

Although IDEQ's assessment was limited to the Mine Site, their Rooks Creek sample results are also relevant to the Mill Site. Erosion of the tailings directly into Rooks Creek is apparent. Besides contributing to physical impairment, the tailings likely contribute to the elevated zinc and lead levels found downstream of the Sites.

4. 2 USFS Soil Sampling and Analyses

Human and ecological receptors in the vicinity of the Mine and Mill Sites could be exposed to metal contamination via several contaminant migration pathways including soil (earth, waste rock, and tailings), groundwater, and surface water. Potential exposure routes include inhalation of airborne dust and ingestion of groundwater, surface water, soil, sediment, and animals and plants.

Since the most significant exposure pathway for human and terrestrial receptors is likely the soil/dust pathway, USFS conducted soil sampling at the Mine and Mill Sites in October 2010 to supplement IDEQ's 2009 Mine Site sampling.

USFS sampling efforts included collection of soil, tailings and waste rock samples which were then analyzed for antimony, arsenic, cadmium, copper, lead, manganese, mercury, nickel, selenium, silver, and zinc. The analytical results were compared to BLM risk-based criteria to provide a screening-level risk assessment for human and ecological receptors. The human receptor scenario was limited to worker and recreational categories, since residential occupancy is unlikely to occur at the either site.

USFS soil sample results were compared to RMC developed for BLM abandoned mine lands. The RMC methodology provides a screening-level assessment of soil exposure risks to human and wildlife receptors. Soil, for the purpose of this investigation, included native disturbed and undisturbed soils, waste rock, and mill tailings. The primary sources of soil contamination in the vicinity of the Mine and Mill Sites included waste rock material, tailings, and natural background sources of metals from local geology.

The site inspection visit included sample collection of soil at various locations throughout both the Mine and Mill Sites. At each sample location, soil was collected in a plastic freezer bag, and the GPS coordinates of the sampling location (UTM) were recorded on the bag. Soil that appeared to be waste rock was sampled at nine locations throughout the Mine Site ("BM-WR" in the tables). Eight soil samples were collected in the proximity of the Mill Site (BM-S). Two background soil samples were also collected near both sites (BM-G). All samples were analyzed for metals with a calibrated X-Ray Fluorescence (XRF) handheld analyzer for mercury, arsenic, cadmium, copper, lead, manganese, nickel and zinc. Three separate XRF analyses were performed for each sample. The contents of the bag were homogenized before being sent for laboratory analyses. The sampling effort is summarized in Table 1.

In addition to the XRF analysis, four samples were analyzed at a laboratory. With the exception of the manganese samples, agreement between XRF and laboratory analyses was considered good ($R^2 > 0.75$). Results of the manganese XRF and laboratory analyses did not meet that level of agreement. However, both the manganese values generated by the XRF and the laboratory results were three to four orders of magnitude below the human RMC. We therefore concluded that manganese presents a low risk at both the Mine and Mill Sites.

Soil sampling results for USFS and IDEQ investigations, and streamlined risk evaluations for both human and ecological receptors are presented in Tables 2 and 3. Both the XRF and laboratory data for manganese are included in the tables.

4.3 Risk Analysis – Soil Exposure Pathway

As previously described, Human and Ecological receptors in the vicinity of the Mine and Mill Sites may be exposed to metal contamination via several contaminant migration pathways, but the soil exposure pathway was regarded as primary. Potential exposure routes include inhalation of airborne dust and ingestion of groundwater, surface water, soil, sediment, and animals and plants.

For this site inspection report, RMC developed for BLM mining sites were used to preliminarily assess risk to human and wildlife from exposure to contaminated soil. BLM has developed a method by which to categorize the level of risk to both human and ecological receptors when the criteria are exceeded. When comparing sample results to the RMC, risks – as shown in Section 3.0 of this report - were designated as follows:

- Less than RMC (criteria) = low risk;
- 1-10 times the criteria = moderate risk;
- 10-100 times the criteria = high risk; and
- Greater than 100 times the criteria = extremely high risk.

BLM suggests that moderate risk may be addressed by management or institutional controls, whereas high, or extremely high, risk may require remediation. Additionally, the criteria may be used as target cleanup levels if remedial action is undertaken. (Ford, 1996)

4.3.1 Data Analyses

Potential human receptors for soil contamination near the Site are most likely seasonal visitors (e.g. campers, workers, and ATV riders) that come into contact with the ground surface. Since there are no residences within 200 feet of the Site, we did not assess the risk to human residents. We believe it unlikely that anyone would be in contact with the ground surface material on either the Mine or the Mill Site for substantial lengths of time. Primary potential exposure routes for human receptors at the sites include ingestion of the soils and inhalation of airborne dust.

Terrestrial and avian wildlife may also be exposed to contaminated soils. Primary potential exposure routes for wildlife receptors include ingestion of the soils and inhalation of airborne dust, as well as ingestion of animal or plant material.

For the purposes of the risk analysis, metals concentrations from the three XRF analyses for each sample were averaged, and the resulting concentrations were used to determine risks for each individual metal. Where a laboratory result was available, that value was used in lieu of the XRF result when summarizing the risk analysis.

4.3.2 Human Receptors

RMC for human exposure has been developed for eleven contaminants of concern (heavy metals) - antimony, arsenic, cadmium, copper, lead, mercury, manganese, nickel, selenium, silver, and zinc. The RMC for workers, campers, and ATV drivers are presented in Table 2. In assessing the human risk from exposure to contaminated soils, we applied the most conservative RMC. For example, zinc RMC for workers, campers, and ATV drivers are 60,000 mg/kg, 40,000 mg/kg, and 550,000 mg/kg, respectively. We applied the camper RMC (40,000 mg/kg) when evaluating the degree of risk posed to human receptors from zinc at the site.

Please note that the following risk evaluation takes both USFS and IDEQ sampling data into account.

Antimony

- Mine Site - Antimony was detected in nine samples at levels that present a moderate risk to human receptors (1-10 times the lowest RMC for humans).
- Mill Site - Antimony was detected in four samples at levels that present a moderate risk to human receptors. It was also detected in two samples at levels that present a high risk to human receptors (10-100 times the lowest RMC for humans).
- Antimony was also detected in one of the four background samples as presenting a moderate risk to human receptors.

Arsenic

- Mine Site - arsenic was detected in three samples at levels that present a moderate risk to human receptors. It was also detected in nine samples at levels that present a high risk to human receptors, and in one sample at a level that presents an extremely high risk (>100 times the lowest RMC for humans) to human receptors.
- Mill Site - arsenic was detected in six samples at levels that present a high risk to human receptors, and in two samples at levels that present an extremely high risk to human receptors.
- Arsenic was also detected in all four of the background samples as presenting a moderate risk to human receptors.

Cadmium

- Mine Site - cadmium was detected in one sample at a level that presents a moderate risk to human receptors.
- Mill Site - cadmium was detected in one sample at a level that presents a moderate risk to human receptors.
- Cadmium was also detected in one of the four background samples as presenting a moderate risk to human receptors.

Lead

- Mine Site - lead was detected in nine samples at levels that present a moderate risk to human receptors. It was also detected in three samples at levels that present a high risk to human receptors.
- Mill Site - lead was detected in six samples at levels that present a moderate risk to human receptors. It was also detected in two samples at levels that present a high risk to human receptors.
- Lead was also detected in two of the four background samples as presenting a moderate risk to human receptors.

In summary: Antimony, cadmium (two samples only), and lead present moderate to high risk to humans, while arsenic presents a moderate to extremely high risk. Conversely copper, mercury, nickel, selenium, silver, and zinc all present low risk. We have concluded that manganese also presents a low risk to humans at both the Mine and Mill Sites.

4.3.3 Ecological Receptors

RMC have been developed for wildlife exposure to six constituents of concern including arsenic, cadmium, copper, lead, mercury, and zinc. For the Ontario site, the selected wildlife receptors are the deer mouse, mallard, big horn sheep, elk, and mule deer. For the risk evaluation, however, concentrations were compared to a median RMC value, which represents the criterion appropriate for protecting groups of species. Please note that the following risk evaluation takes both USFS and IDEQ sampling data into account.

Results for our analyses are summarized below:

Arsenic

- Mine Site - arsenic was detected in nine samples at levels that present a moderate risk to ecological receptors (1-10 times the median RMC for animals).
- Mill Site - arsenic was detected in five samples at levels that present a moderate risk to ecological receptors. It was also detected in one sample at a level that presents a high risk to ecological receptors (10-100 times the median RMC for animals).

Cadmium

- Mine Site - cadmium was detected in two samples at levels that present a moderate risk to ecological receptors, and one sample at a level that presents a high risk to animals.

- Mill Site - cadmium was detected in two samples at levels that present a high risk to ecological receptors.
- Cadmium was also detected in one of the four background samples as presenting a moderate risk, and one sample presenting a high risk, to ecological receptors.

Copper

Mine Site - copper was detected in one sample at a level that presents a moderate risk to ecological receptors.

Lead

- Mine Site - lead was detected in three samples at levels that present a moderate risk to ecological receptors. It was also detected in seven samples at levels that present a high risk to ecological receptors, and in three samples at levels that present an extremely high risk (>100 times the median RMC for animals) to ecological receptors.
- Mill Site - lead was detected in six samples at levels that present a high risk to ecological receptors, and in two samples at levels that present an extremely high risk to ecological receptors.
- Lead was also detected in three of the four background samples as presenting a moderate risk, and one sample presenting a high risk, to ecological receptors.

Zinc

- Mine Site - zinc was detected in 10 samples at levels that present a moderate risk to ecological receptors. It was also detected in three samples at levels that present a high risk to ecological receptors.
- Mill Site - zinc was detected in four samples at levels that present a moderate risk to ecological receptors, and in four samples at levels that present a high risk to ecological receptors.
- Zinc was also detected in all four of the background samples as presenting a moderate risk to animals.

Antimony - no ecological receptor RMC is available.

Manganese - no ecological receptor RMC is available.

Mercury posed a low risk to ecological receptors at all of the sample locations.

Nickel - no ecological receptor RMC is available.

Selenium - no ecological receptor RMC is available.

Silver - no ecological receptor RMC is available.

In summary: Arsenic, cadmium, copper (one sample only), and zinc showed moderate to high risk to ecological receptors, while Lead showed moderate to extremely high risk to ecological receptors. Mercury posed a low risk to ecological receptors at all of the sample locations.

5.0 SUMMARY AND CONCLUSIONS

Summary

In October 2010, USFS personnel conducted a site inspection for the Ontario Mine and Mill sites which are within the Ketchum Ranger District of the Sawtooth National Forest near Ketchum, Blaine County, Idaho. The site is the location of numerous mining claims, (mine) waste rock and (mill) tailings piles and the remains of a defunct mill. Mine operations are reported to have occurred onsite from 1881 to 1887.

Nineteen soil samples were collected by USFS, and analyzed for Target Analyte List metals [TALm] (mercury, arsenic, cadmium, copper, lead, manganese, nickel and zinc) with a handheld XRF; four of those USFS samples were split and also sent to a laboratory for analyses. Regression analyses were prepared comparing XRF readings with laboratory results for the same samples. Overall, the correlation was within expected limits, with the exception of the manganese data. We have concluded after further consideration that manganese presents a low risk to humans at both the Mine and Mill Sites

Analyses of site sample data from the 2009 IDEQ preliminary (site) assessment report were also conducted. Results were compared to BLM risk management criteria (RMC) to provide a streamlined risk evaluation of both sites (shown in Tables 2 and 3).

The BLM abandoned mine lands RMC were utilized to evaluate risk to human and ecological receptors for both the USFS and IDEQ sample data. This approach allowed for a consistent comparison of the two data sets. There was general agreement between the IDEQ and USFS data; the principal difference being that IDEQ data indicated arsenic concentrations at moderate to high risk levels, while USFS data indicated moderate to extremely high risk levels. The difference appears to be due primarily to the use by IDEQ and USFS of different sampling locations on the same site.

Soil exposure pathways for metals were evaluated. Both the Mine and Mill Sites showed similar results. Antimony, arsenic, cadmium, and lead were detected in concentrations that present a

moderate or higher risk to human receptors. Arsenic, cadmium, copper, lead and zinc were detected in concentrations that present a moderate or higher risk to ecological receptors.

IDEQ found that “Erosion of the waste dumps is prevalent, and most certainly contributes to sediment delivery to the perennial Rooks Creek. This sediment may pose physical impairment to Rooks Creek” (IDEQ, 2009).

While IDEQ concluded that there is no evidence that the sediment releases increase metals loading in the stream (IDEQ, 2009), their samples indicated that the Mine Site has likely contributed zinc and lead to Rooks Creek. The zinc concentration in the Rooks Creek sample downstream of the site exceeded Idaho’s acute and chronic water quality criteria for cold water biota. Further, the zinc concentration in sediment downstream of the Mine and Mill Sites was two orders of magnitude greater than that upstream – 1,130 mg/kg vs. 29.6 mg/kg. The lead concentration in sediment was one order of magnitude greater downstream than upstream – 187 mg/kg vs. 9.66 mg/kg.

Although IDEQ’s assessment was limited to the Mine Site, their Rooks Creek sample results are also relevant to the Mill Site. Erosion of the tailings directly into Rooks Creek is apparent. Besides contributing to physical impairment, the tailings likely contribute to the elevated zinc and lead levels found downstream of the Sites.

Analyses of both the USFS and IDEQ data indicate that the levels of antimony, arsenic, cadmium, copper, lead and zinc, elevated above RMC, warrant additional site investigation, and/or further action.

It is possible that further investigation would show that the Sites do not present an unacceptable risk because of low traffic patterns. However, while off-road vehicles are banned in the area; there is evidence of continued ATV use, especially during hunting season. Further, there are signs of camping on the Mill Site which is adjacent to both a road and Rooks Creek.

In any case, it appears that neither the Mine Site nor the Mill Site, in their current condition, would be acceptable for unrestricted use.

Conclusions

Mine Site

Samples taken on the Mine Site indicate levels above Human RMC ranging from moderate to extremely high for antimony, arsenic, cadmium, and lead; and levels above Ecological median RMC ranging from moderate to extremely high for arsenic, cadmium, copper, lead and zinc. The Mine Site is privately held; if it were NFS property, land use restrictions and institutional controls would be required to minimize access (e.g. road gates and trail closures) and to prevent any future site development. Further, there are seven open adits and shafts on the Mine Site that are safety hazards, and would need to be closed.

The waste rock piles would likely require stabilization, both to reduce the hazards to humans and wildlife and to reduce waste rock delivery to Rooks Creek. The remedy for this type of soil contamination is containment (EPA, 1999). The likely containment scenario would be to re-grade and cover the waste rock piles. However, the limited vehicular and/or equipment access and the relatively steep slopes that characterize the Mine Site would make such stabilization both difficult and expensive.

Mill Site

The parcel where the now defunct mill was located is on NFS land. The levels of contaminants on the Mill Site are similar to those of the Mine Site. They present risks to both human health and the environment. Based on the following factors, listed in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at 40 CFR 300.415, those risks are sufficient to warrant a CERCLA time-critical removal action:

1. *Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants (300.415(b) (2) (i)*

The Mill Site is accessible to the public. Based on a comparison to BLM abandoned mine lands RMC, the Site tailings present moderate to extremely high risks to humans (campers, workers and ATV drivers) from arsenic; moderate to high risks from antimony and lead; and moderate risk from cadmium. Additionally, the tailings piles present high to extremely high risks to wildlife from lead; a high risk from cadmium; moderate to high risks from arsenic and zinc; and a moderate risk from copper. Those metals are all hazardous substances as listed in 40 CFR 302.4.

2. *Actual or potential contamination of drinking water supplies or sensitive ecosystems (300.415(b) (2) (ii).*

Released hazardous substances from the Mill Site are being transported via wind and water from the tailings piles into the adjacent Rooks Creek. IDEQ water samples indicated that both the Mine and Mill Sites have likely contributed metals to the creek. The zinc concentration in the Rooks Creek sample downstream of the site exceeded the Idaho's acute and chronic water quality criteria for cold water biota. Further, the zinc concentration in sediment downstream of the Mine and Mill Sites was two orders of magnitude greater than that upstream – 1,130 mg/kg vs. 29.6 mg/kg. The lead concentration in creek sediment was one order of magnitude greater downstream than upstream – 187 mg/kg vs. 9.66 mg/kg.

The Wood River Sculpin has been identified as one of the "Idaho Species of Greatest Conservation Need" by the Idaho Department of Fish and Game (Idaho Comprehensive Wildlife Conservation Strategy, 2006). Per IDEQ: "An IDEQ fish survey has collected Wood River Sculpin within (Rooks) Creek, downstream of the Ontario mine. Sculpins are species which have been documented to be sensitive to pH and heavy metals. Their presence within the creek indicates

that any potential impacts from mining are not significantly affecting sensitive fish assemblages" (IDEQ, 2009). Our concern is that continued metal loading of the creek will change that circumstance for the worse. In addition, Rooks Creek supports both Brook and Rainbow Trout (IDEQ 2009); those populations might also be threatened by increased heavy metal concentrations in the creek.

3. High levels of hazardous substances or pollutants or contaminants in soils largely at or near surface, that may migrate (300.415(b) (2) (iv)).

As described above, the tailings have moderate to extremely high levels of antimony, arsenic, cadmium, copper, lead, and zinc at, or near, the surface. The tailings piles lack vegetation, and loose soil may migrate via both wind and surface water erosion.

Metal contamination at this site presents moderate to extremely high risks to both humans and wildlife via the soil exposure pathway. Additionally, metals may be transported via wind and water erosion, which is of particular concern for the adjacent stream. Sediment analyses indicate that the Site may present a risk to aquatic organisms in Rooks Creek and downstream, although additional evaluation would be needed to form definitive conclusions.

The presumptive remedy for this type of soil contamination is containment (EPA, 1999). The most likely containment scenario would be to re-grade and cover the tailings piles.

6.0 RECOMMENDATIONS

The results of the USFS Site Investigation (and the IDEQ Preliminary Analysis) indicate that:

- USFS should not accept the Mine Site in its current condition into the NFS without further investigation and consideration of the environmental concerns presented in this report.
- USFS should strongly consider instituting more Mill Site institutional controls now, and when possible, conduct a CERCLA time-critical removal action for the site.

7.0 WORKS CITED

EPA (1999) - Presumptive Remedy for Metals-In-Soils Sites; Washington, DC; EPA Office of Solid Waste and Emergency Response

Ford, Karl (1996) - Risk Management Criteria for Metals at BLM Mining Sites for Bureau of Land Management

IDEQ (2009) - Preliminary Assessment Report on the Ontario Mine (aka Sunday Mill Site, aka North Star, Ervine, Sunday, Niagara, Hub No. 2, and Ontario patented mining claims)

Idaho Department of Fish and Game (2006) - Idaho Comprehensive Wildlife Conservation Strategy

USFS Sawtooth National Forest (2011) - Potentially Responsible Party Draft Report (for) Ontario Mill

APPENDIX A - TABLES

Table 1 - Soil Sample Log

Table 1 - Soil Sample Log				
Sample ID	Collection Date	Depth (BGS)	Location	Analyte List
BM-WR-1	14-Nov-10	0 - 6"	Waste Rock	TAL m
BM-WR-2	14-Nov-10	0 - 6"	Waste Rock	TAL m
BM-WR-3	14-Nov-10	0 - 6"	Waste Rock	TAL m
BM-WR-4	14-Nov-10	0 - 6"	Waste Rock	TAL m
BM-WR-5	14-Nov-10	0 - 6"	Waste Rock	TAL m
BM-WR-6	14-Nov-10	0 - 6"	Waste Rock	TAL m
BM-WR-7	14-Nov-10	0 - 6"	Waste Rock	TAL m
BM-WR-8	14-Nov-10	0 - 6"	Waste Rock	TAL m
BM-WR-9	14-Nov-10	0 - 6"	Waste Rock	TAL m
BM-G-1	14-Nov-10	0 - 6"	Background	TAL m
BM-G-2	14-Nov-10	0 - 6"	Background	TAL m
BM-S-1	14-Nov-10	0 - 6"	Mill Area	TAL m
BM-S-2	14-Nov-10	0 - 6"	Mill Area	TAL m
BM-S-3	14-Nov-10	0 - 6"	Mill Area	TAL m
BM-S-4	14-Nov-10	0 - 6"	Mill Area	TAL m
BM-S-5	14-Nov-10	0 - 6"	Mill Area	TAL m
BM-S-6	14-Nov-10	0 - 6"	Mill Area	TAL m
BM-S-7	14-Nov-10	0 - 6"	Mill Area	TAL m
BM-S-8	14-Nov-10	0 - 6"	Mill Area	TAL m

Notes:

- TALm: Target Analyte List metals (mercury, arsenic, cadmium, copper, lead, manganese, nickel and zinc)
- Samples shaded in green were analyzed by XRF, and by confirmatory laboratory analysis. Laboratory values were considered to be the more accurate, and were used for the risk evaluation.

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TABLE 2 - Soil Sampling Results and Streamlined Risk Evaluation for Human Receptors

Sample ID	Sample Collection Date	Antimony				Arsenic				Cadmium				Copper				Lead				Manganese			
		mg/Kg	Camper	Worker	ATV Driver	mg/Kg	Camper	Worker	ATV Driver	mg/Kg	Camper	Worker	ATV Driver	mg/Kg	Camper	Worker	ATV Driver	mg/Kg	Camper	Worker	ATV Driver	mg/Kg	Camper	Worker	ATV Driver
USFS Samples																									
MINE SITE																									
BM-WR-1	10/14/2010	150				584				< LOD	78			< LOD				6387				79			
BM-WR-2	10/14/2010	208				474				< LOD	85			< LOD				6563				84			
BM-WR-3	10/14/2010	288				332				< LOD	89			< LOD				11275				63			
BM-WR-3 (L)	10/14/2010	N/A				210				41				< LOD				24000				220			
BM-WR-4	10/14/2010	294				2,558				< LOD	89			< LOD				23481				231			
BM-WR-5	10/14/2010	< LOD	226	226		892				< LOD	73			< LOD				5097				65			
BM-WR-6	10/14/2010	198				278				< LOD	80			< LOD				2857				75			
BM-WR-7	10/14/2010	122				98				< LOD				< LOD				1153				50			
BM-WR-8	10/14/2010	292				581				< LOD	118	118		< LOD				4877				99			
BM-WR-9	10/14/2010	< LOD	127	127		59				< LOD				< LOD		All		299				42			
BM-WR-9 (L)	10/14/2010	N/A				71				7.1				14		Low		390				560			
BM-G-1	10/14/2010	< LOD	136	136		60				< LOD				53		Risk		480				75			
BM-G-2	10/14/2010	128				95				< LOD	93			< LOD				1469				77			
MILL SITE																									
BM-S-1	10/14/2010	< LOD	130	130		202				< LOD	93			48				1910				54			
BM-S-2	10/14/2010	164				368				< LOD	87			< LOD				3120				63			
BM-S-3	10/14/2010	< LOD	195	195		280				< LOD	98			77				2679				81			
BM-S-4	10/14/2010	914				3,042				110				< LOD				20252				91			
BM-S-4 (L)	10/14/2010	N/A				2,500				48				77				49000				220			
BM-S-5	10/14/2010	178				371				< LOD	78			< LOD				2299				58			
BM-S-6	10/14/2010	175				819				< LOD				< LOD				3859				60			
BM-S-7	10/14/2010	132				199				< LOD	73			< LOD				1973				50			
BM-S-8	10/14/2010	1651				6,796				< LOD	117	117		< LOD				34397				430			
BM-S-8 (L)	10/14/2010	N/A				4500				64				77				45000				99			
IDEQ Samples																									
MINE SITE																									
Ontario	12/30/2009	72				404				1				61				8,700				258			
Ervine	12/30/2009	104				554				15				154		All		56,900				1,010			
Sunday	12/30/2009	33				348				88				9		Low		7,860				74			
North Star	12/30/2009	2				55				34				26		Risk		1,140				272			
Ontario BG	12/30/2009	13				76				7				20				1,150				509			
Ervine-North Star BG	12/30/2009	3				24				232				11				399				594			
Human RMC	Camper	50				20				70				5000				1000				19000			
	Worker	100				12				100				7400				2000				28000			
	ATV Driver	750				300				950				70000				1000				250000			

- 1 - A regression analysis indicated insufficient correlation between XRF and laboratory results for manganese. Typically, this would lead to the conclusion that the XRF data is unreliable. However, because the measured values were all one to two orders of magnitude below RMC, the data is included for this evaluation.
- 2 - Gray cells indicate that the detection limit was higher than the RMC; the results were deemed inconclusive. In this case, the detection limit is shown.
- 3 - XRF results are the average of three readings of bagged samples. If one or more values was above the detection limit, and another value was below, the values were averaged replacing (< LOD) values with their detection limits.

Risk Category Based on RMC Screening Levels (Ford, 1996)

Low Risk	< RMC Value
Moderate Risk	1-10 times RMC Value
High Risk	10-100 times RMC Value
Extremely High Risk	> 100 times RMC Value
Inconclusive	Level of Detection is higher than the RMC. The value shown is the detection limit.

TABLE 2 - Soil Sampling Results and Streamlined Risk Evaluation for Human Receptors

Sample ID	Sample Collection Date	Mercury				Nickel				Selenium				Silver				Zinc			
		mg/Kg	Camper	Worker	ATV Driver	mg/Kg	Camper	Worker	ATV Driver	mg/Kg	Camper	Worker	ATV Driver	mg/Kg	Camper	Worker	ATV Driver	mg/Kg	Camper	Worker	ATV Driver
USFS Samples																					
MINE SITE																					
BM-WR-1	10/14/2010	< LOD	55			< LOD				< LOD				80				3470			
BM-WR-2	10/14/2010	< LOD	79	79		< LOD				< LOD				92				2420			
BM-WR-3	10/14/2010	< LOD	91	91		< LOD				< LOD				157				2275			
BM-WR-3 (L)	10/14/2010	2.3				< LOD				N/A				N/A				6100			
BM-WR-4	10/14/2010	< LOD	110	110		< LOD				< LOD				345				1544			
BM-WR-5	10/14/2010	< LOD	54	54		< LOD				< LOD				69				1337			
BM-WR-6	10/14/2010	< LOD	52	52		< LOD				< LOD				105				1271			
BM-WR-7	10/14/2010	< LOD	40	40		< LOD				< LOD				53				574			
BM-WR-8	10/14/2010	< LOD	53	53		< LOD				< LOD				88				3057			
BM-WR-9	10/14/2010	< LOD	51	51		< LOD		All		< LOD		All		< LOD		All		384		All	
BM-WR-9 (L)	10/14/2010	0.048				16		Low		N/A		Low		N/A		Low		380		Low	
BM-G-1	10/14/2010	< LOD	54	54		< LOD		Risk		< LOD		Risk		< LOD		Risk		816		Risk	
BM-G-2	10/14/2010	< LOD	61	61		< LOD				< LOD				< LOD				2843			
MILL SITE																					
BM-S-1	10/14/2010	< LOD	59	59		< LOD				< LOD				< LOD				3919			
BM-S-2	10/14/2010	< LOD	44	44		< LOD				< LOD				74				1689			
BM-S-3	10/14/2010	< LOD	40	40		542				< LOD				< LOD				4750			
BM-S-4	10/14/2010	< LOD	109	109		< LOD				< LOD				308				3556			
BM-S-4 (L)	10/14/2010	2.2				10				N/A				N/A				4800			
BM-S-5	10/14/2010	< LOD	45	45		< LOD				< LOD				59				1516			
BM-S-6	10/14/2010	< LOD	46	46		< LOD				< LOD				86				652			
BM-S-7	10/14/2010	< LOD	61	61		< LOD				< LOD				71				704			
BM-S-8	10/14/2010	< LOD	164	164		< LOD				< LOD				517				4281			
BM-S-8 (L)	10/14/2010	2.1				43				N/A				N/A				6800			
IDEQ Samples																					
MINE SITE																					
Ontario	12/30/2009	<1				No Data				<4				58				946			
Ervine	12/30/2009	<1		All		No Data				<4		All		185		All		6,300		All	
Sunday	12/30/2009	<1		Low		No Data				<4		Low		48		Low		778		Low	
North Star	12/30/2009	<1		Risk		No Data				<4		Risk		5		Risk		508		Risk	
Ontario BG	12/30/2009	<1				No Data				<4				4				801			
Ervine-North Star BG	12/30/2009	<1				No Data				<4				<1				600			
Human RMC	Camper	40				2700				700				700				40000			
	Worker	60				4000				1000				1000				60000			
	ATV Driver	550				250000				9600				9600				550000			

- 1 - A regression analysis indicated insufficient correlation between XRF and laboratory results for manganese. Typically, this would lead to the conclusion that the XRF data is unreliable. However, because the measured values were all one to two orders of magnitude below RMC, the data is included for this evaluation.
- 2 - Gray cells indicate that the detection limit was higher than the RMC; the results were deemed inconclusive. In this case, the detection limit is shown.
- 3 - XRF results are the average of three readings of bagged samples. If one or more values was above the detection limit, and another value was below, the values were averaged replacing (< LOD) values with their detection limits.

Risk Category Based on RMC Screening Levels (Ford, 1996)

Low Risk	< RMC Value
Moderate Risk	1-10 times RMC Value
High Risk	10-100 times RMC Value
Extremely High Risk	> 100 times RMC Value
Inconclusive	Level of Detection is higher than the RMC. The value shown is the detection limit.

TABLE 3 - Soil Sampling Results and Streamlined Risk Evaluation for Ecological Receptors

Sample ID	Date	Antimony		Arsenic		Cadmium		Copper		Lead		Manganese		Mercury		Nickel		Selenium		Silver		Zinc	
		mg/Kg	Risk Category for Median RMC	mg/Kg	Risk Category for Median RMC	mg/Kg	Risk Category for Median RMC	mg/Kg	Risk Category for Median RMC	mg/Kg	Risk Category for Median RMC	mg/Kg	Risk Category for Median RMC	mg/Kg	Risk Category for Median RMC	mg/Kg	Risk Category for Median RMC	mg/Kg	Risk Category for Median RMC	mg/Kg	Risk Category for Median RMC	mg/Kg	Risk Category for Median RMC
USFS Samples																							
MINE SITE																							
BM-WR-1	10/14/2010	150		584	< LOD	78	< LOD	52	6387	79	< LOD	55	< LOD	< LOD	< LOD	< LOD	< LOD	80		3470			
BM-WR-2	10/14/2010	208		474	< LOD	85	< LOD	68	6563	84	< LOD	79	< LOD	< LOD	< LOD	< LOD	< LOD	92		2420			
BM-WR-3	10/14/2010	288		332	< LOD	89	< LOD	64	11275	63	< LOD	91	< LOD	< LOD	< LOD	< LOD	< LOD	157		2275			
BM-WR-3 (L)	10/14/2010	N/A		210		41		25	24000	220		2.3		< LOD	N/A		< LOD	N/A		6100			
BM-WR-4	10/14/2010	294		2558	< LOD	89	< LOD	75	23481	231	< LOD	110	< LOD	< LOD	< LOD	< LOD	< LOD	345		1544			
BM-WR-5	10/14/2010	< LOD		892	< LOD	73	< LOD	51	5097	65	< LOD	54	< LOD	< LOD	< LOD	< LOD	< LOD	69		1337			
BM-WR-6	10/14/2010	198		278	< LOD	80	< LOD	69	2857	75	< LOD	52	< LOD	< LOD	< LOD	< LOD	< LOD	105		1271			
BM-WR-7	10/14/2010	122		98	< LOD	59	< LOD	49	1153	50	< LOD	40	< LOD	< LOD	< LOD	< LOD	< LOD	53		574			
BM-WR-8	10/14/2010	292		581	< LOD	118	< LOD	82	4877	99	< LOD	53	< LOD	< LOD	< LOD	< LOD	< LOD	88		3057			
BM-WR-9	10/14/2010	< LOD	No	59	< LOD	67	< LOD	52	299	42	No	< LOD	51	< LOD	No	< LOD	No	< LOD	No	384			
BM-WR-9 (L)	10/14/2010	N/A	Criteria	71		7.1		14	390	560	Criteria	0.048		16	Criteria	N/A	Criteria	N/A	Criteria	380			
BM-G-1	10/14/2010	< LOD	Available	60	< LOD	67		53	480	75	Available	< LOD	54	< LOD	Available	< LOD	Available	< LOD	Available	816			
BM-G-2	10/14/2010	128		95	< LOD	93	< LOD	66	1469	77		< LOD	61	< LOD		< LOD		< LOD		2843			
MILL SITE																							
BM-S-1	10/14/2010	< LOD		202	< LOD	93		48	1910	54	< LOD	59	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD		3919			
BM-S-2	10/14/2010	164		368	< LOD	87	< LOD	54	3120	63	< LOD	44	< LOD	< LOD	< LOD	< LOD	< LOD	74		1689			
BM-S-3	10/14/2010	< LOD		280	< LOD	98		77	2679	81	< LOD	40	542	< LOD	< LOD	< LOD	< LOD	< LOD		4750			
BM-S-4	10/14/2010	914		3042		110		< LOD	20252	91	< LOD	109	< LOD	< LOD	< LOD	< LOD	< LOD	308		3556			
BM-S-4 (L)	10/14/2010	N/A		2500		48		77	49000	220		2.2		10	N/A	N/A	N/A	N/A		4800			
BM-S-5	10/14/2010	178		371	< LOD	78	< LOD	61	2299	58	< LOD	45	< LOD	< LOD	< LOD	< LOD	< LOD	59		1516			
BM-S-6	10/14/2010	175		819	< LOD	67	< LOD	43	3859	60	< LOD	46	< LOD	< LOD	< LOD	< LOD	< LOD	86		652			
BM-S-7	10/14/2010	132		199	< LOD	73	< LOD	52	1973	50	< LOD	61	< LOD	< LOD	< LOD	< LOD	< LOD	71		704			
BM-S-8	10/14/2010	1651		6796	< LOD	117	< LOD	103	34397	430	< LOD	164	< LOD	< LOD	< LOD	< LOD	< LOD	517		4281			
BM-S-8 (L)	10/14/2010	N/A		4500		64		77	45000	99		2.1		43	N/A	N/A	N/A	N/A		6800			
IDEQ Samples																							
MINE SITE																							
Ontario	12/30/2009	72		404		1		61	8,700	258		<2		No Data		<4		58		946			
Ervine	12/30/2009	104	No	554		15		154	56,900	1,010	No	<2	All	No Data	No	<4	No	185	No	6,300			
Sunday	12/30/2009	33	Criteria	348	< LOD			9	7,900	74	Criteria	<2	Low	No Data	Criteria	<4	Criteria	48	Criteria	778			
North Star	12/30/2009	<2	Available	55		2		26	1,100	272	Available	<2	Risk	No Data	Available	<4	Available	5	Available	508			
Ontario BG	12/30/2009	13		76		7		20	1,150	509		<1		No Data		1,150		4		801			
Ervine-North Star BG	12/30/2009	3		24		232		11	399	594		<1		No Data		399		<1		600			
Ecological RMC	Median	N/A		275		3		136	125	N/A		8		N/A		N/A		N/A		307			
	Deer Mouse	N/A		230		7		640	142	N/A		2		N/A		N/A		N/A		419			
	Mallard	N/A		116		1		141	59	N/A		4		N/A		N/A		N/A		196			
	Bighorn Sheep	N/A		387		9		64	152	N/A		6		N/A		N/A		N/A		369			
	Elk	N/A		328		3		131	127	N/A		11		N/A		N/A		N/A		275			
	Mule Deer	N/A		200		3		102	106	N/A		9		N/A		N/A		N/A		222			

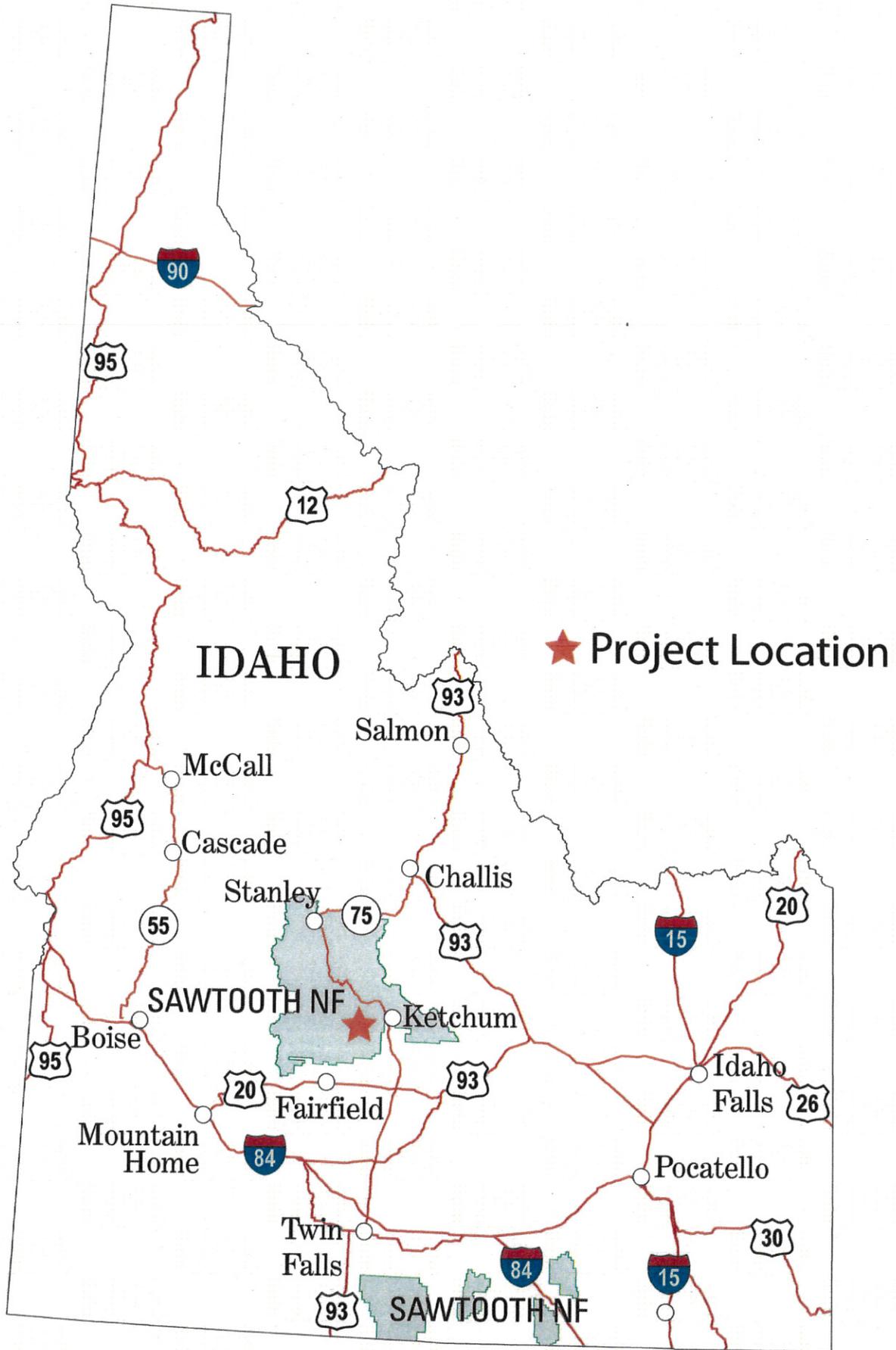
- 1 - Ecological RMC are available for 12 species. The evaluation presented here is based on the median RMC for those species. This value represents the criterion appropriate for protecting groups of species. The RMC for species most likely to inhabit the site are also presented for informational purposes
- 2 - A regression analysis indicated insufficient correlation between XRF and laboratory results for manganese. Typically, this would lead to the conclusion that the XRF data is unreliable. However, because the measured values were all one to two orders of magnitude below human RMC, the data is included for this evaluation.
- 3 - Gray cells indicate that the detection limit was higher than the median RMC; the results were deemed inconclusive. In this case, the detection limit is shown.
- 4 - XRF results are the average of three readings of bagged samples. If one or more values was above the detection limit, and another value was below, the values were averaged replacing (< LOD) values with their detection limits

Low Risk	< Median RMC Value
Moderate Risk	1-10 times Median RMC Value
High Risk	10-100 times Median RMC Value
Extremely High Risk	> 100 times Median RMC Value
Inconclusive	Level of Detection is higher than the RMC. Value shown is the detection limit.

APPENDIX B – MAPS

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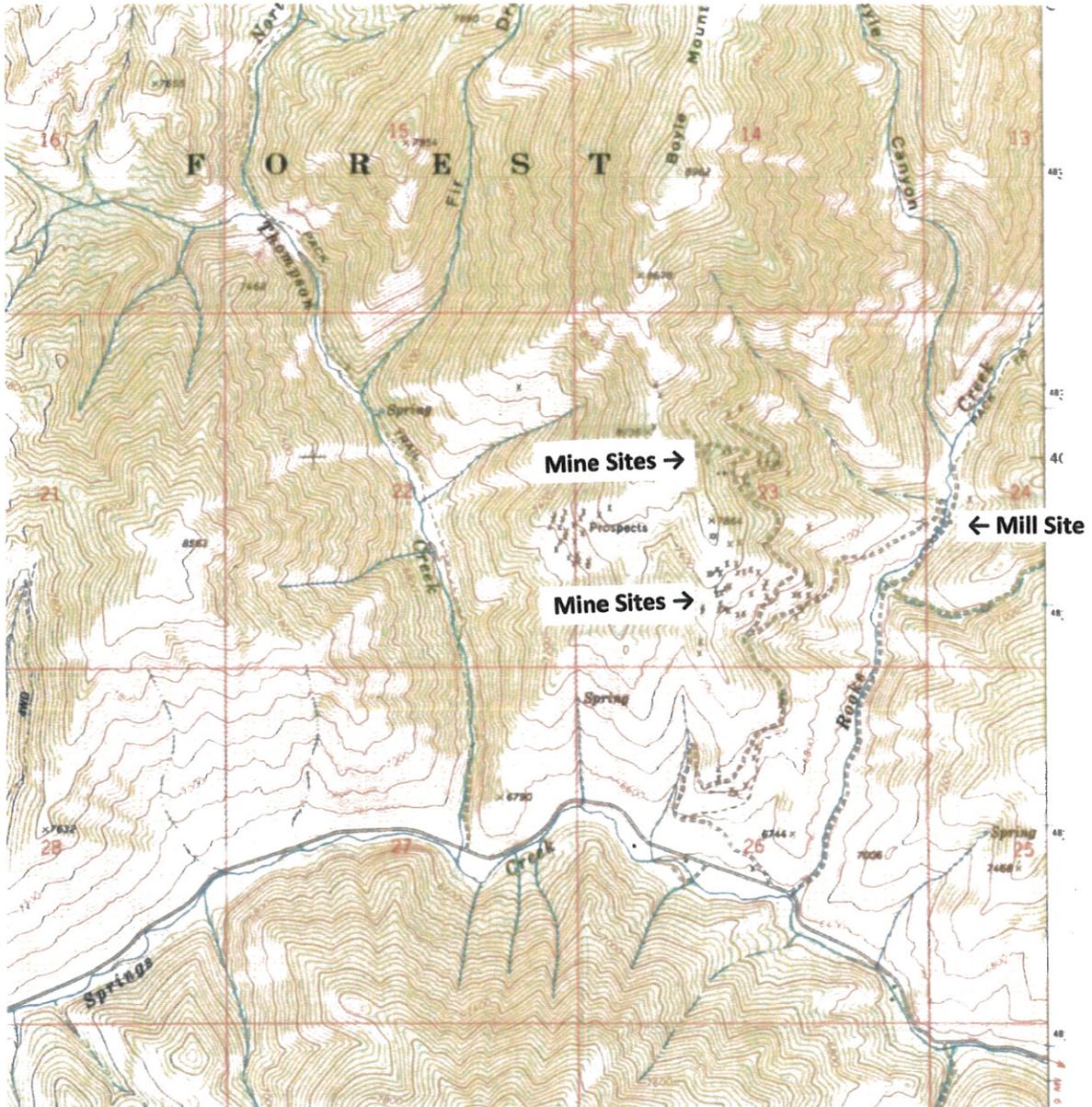
Map 1 - Ontario Mine and Mill Project Site



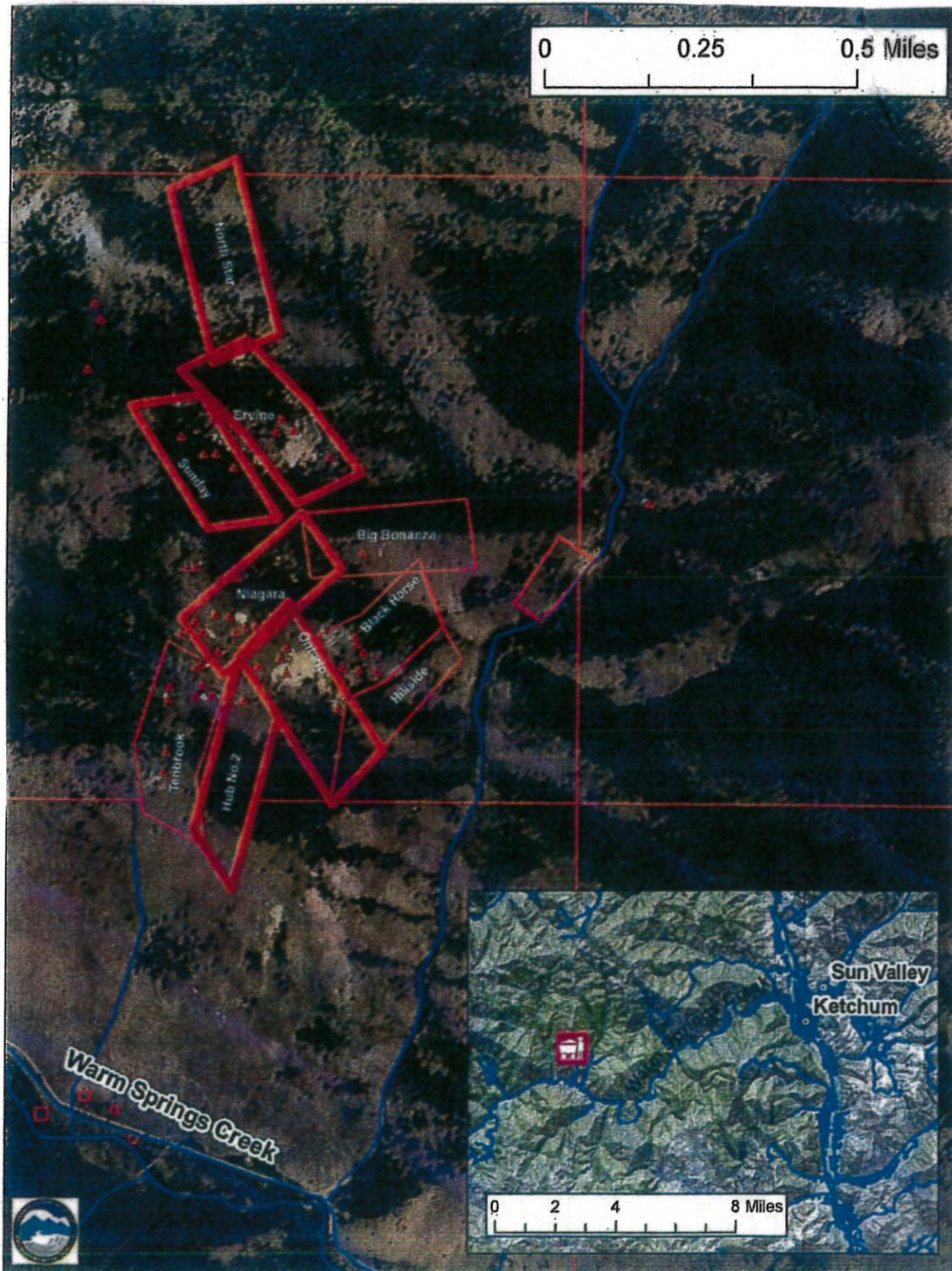
Map 2 - Ontario Mine and Mill Location

TARGET QUAD NAME: SUN VALLEY; MAP YEAR: 1992; SERIES: 30; SCALE: 1:100000

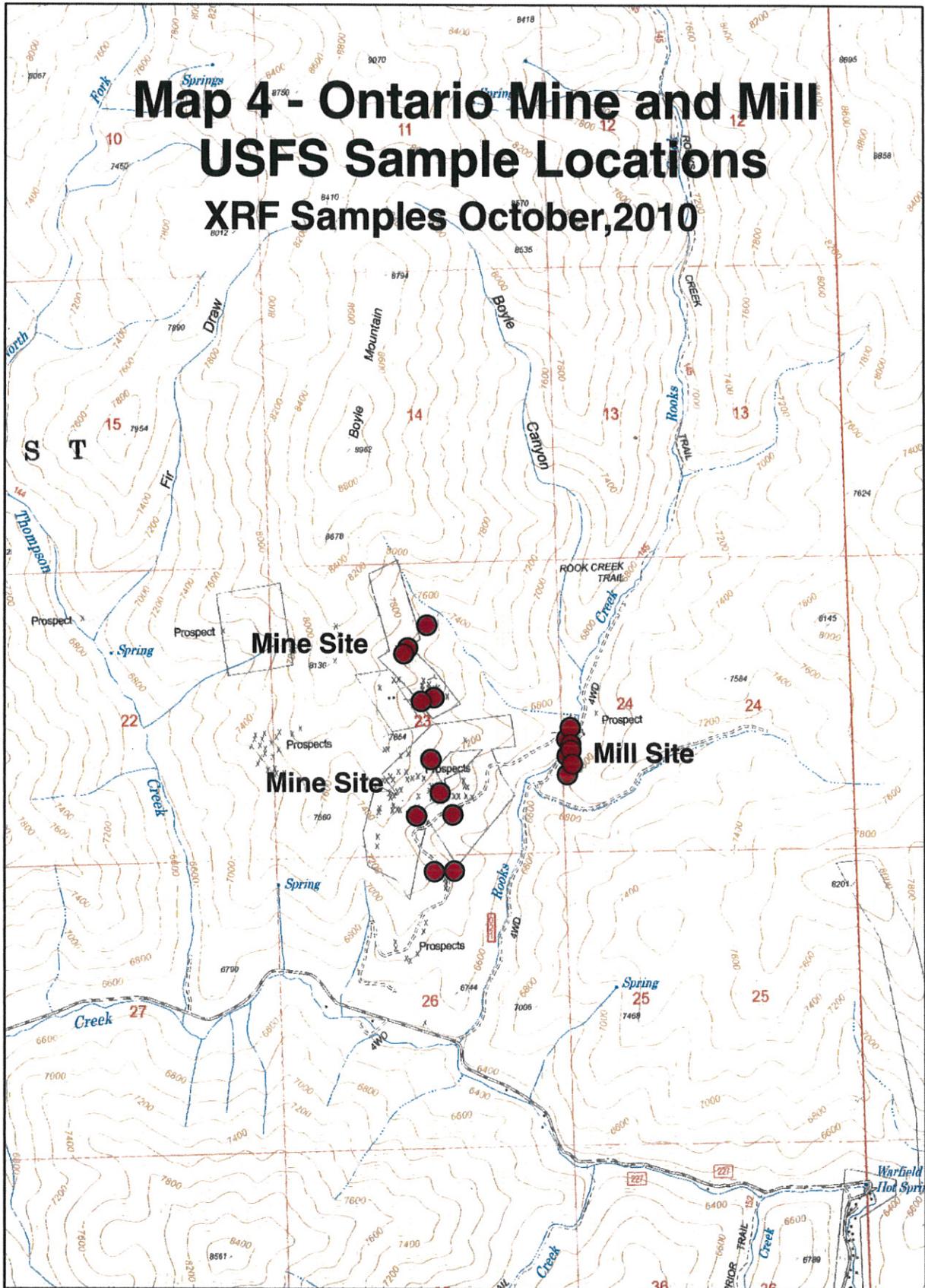
SITE NAME: Ontario Bowler Mine Site; ADDRESS: Ketchum, ID 83340; LAT/LONG: 43.6625 / -114.5194



Map 3 - Ontario Mine Bowler Patented Claims



Map 4 - Ontario Mine and Mill USFS Sample Locations XRF Samples October, 2010



APPENDIX C – SITE PHOTOGRAPHS



Photo 1 - Waste Rock



Photo 2 - Adit



Photo 3 - Unnamed stream



Photo 4 - Waste rock on slope



Photo 5 - Mound



Photo 6 - Waste rock on slope



Photo 7 - Orange waste rock

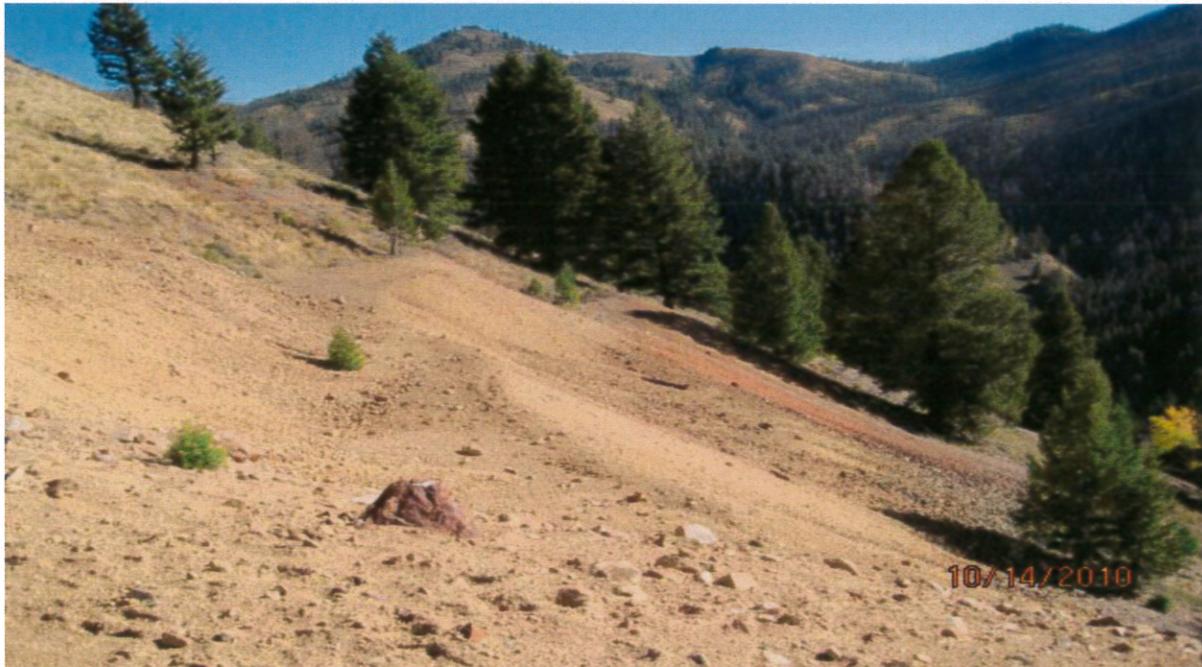


Photo 8 - Waste rock on slope



Photo 9 – Adit



Photo 10 - Waste rock



Photo 11- Unnamed stream with board crossing



Photo 12 - Erosion evident



Photo 13 - Waste rock on slope



Photo 14- Adit



Photo 15 - Waste rock on slope

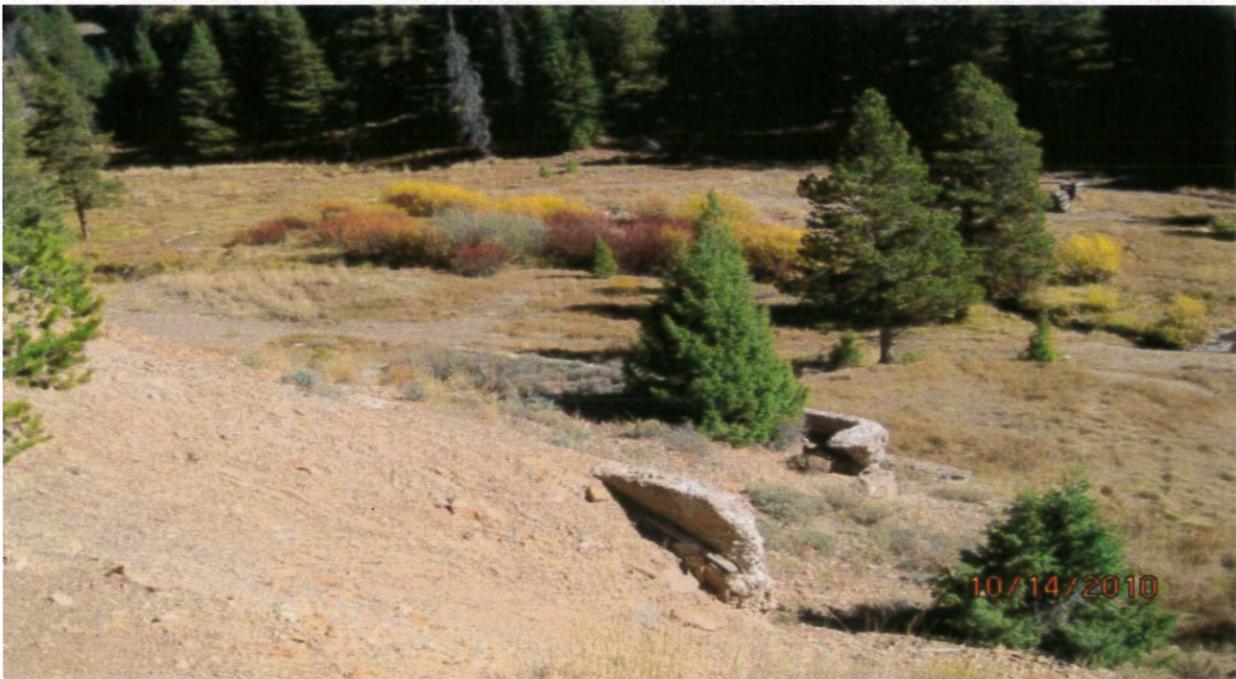


Photo 16 - Mill remains



Photo 17- Creek adjacent to mill



Photo 18 - Mill remains

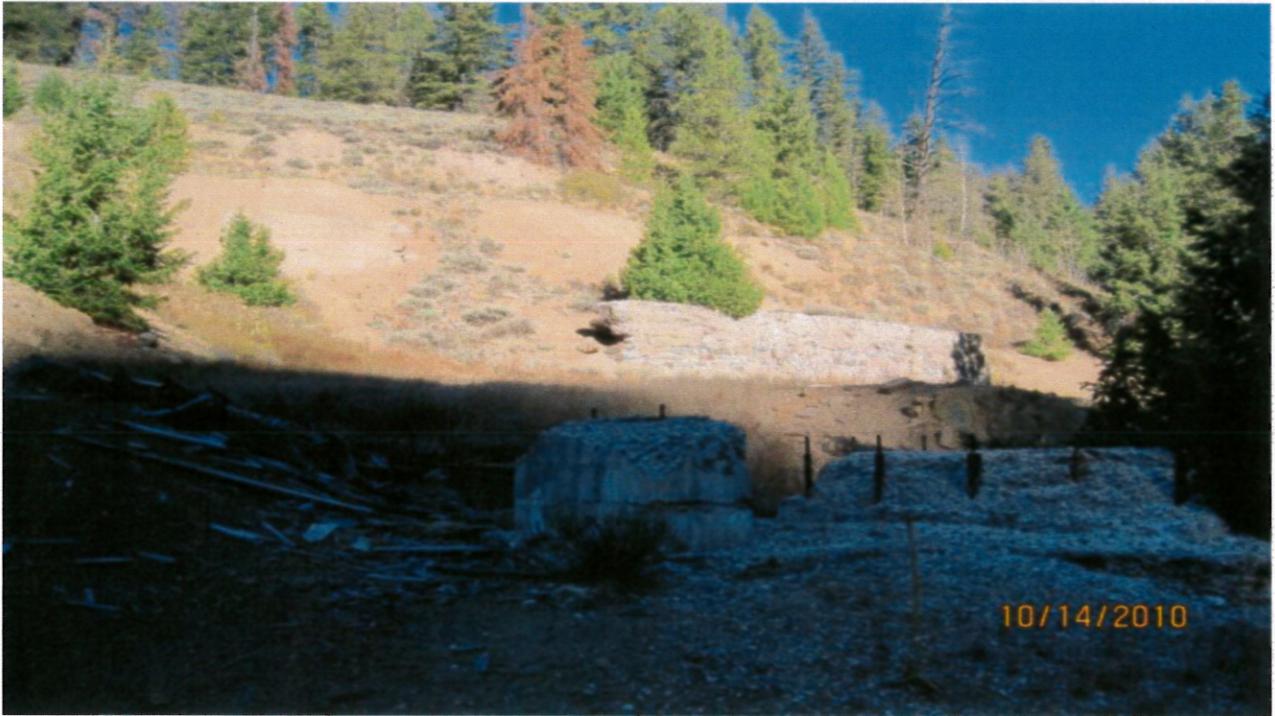


Photo 19 - Mill remains



Photo 20 - Mill remains