AREA WIDE INVESTIGATION
SOUTHEAST IDAHO PHOSPHATE MINING RESOURCE AREA
DEQ #WST.RMIN.SEAW.6005.67068

ORPHAN MINE SITE PRELIMINARY ASSESSMENT SCREENING REPORT

APRIL 2004

PREPARED BY:

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IDAHO DEPARTMENT OF LANDS
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UNITED STATES FOREST SERVICE

EXECUTIVE SUMMARY

The following report was prepared by the Idaho Department of Environmental Quality (DEQ) in collaboration with the United States Bureau of Land Management (BLM), the United State Forest Service (USFS), and the Idaho Department of Lands (IDL) comprising the primary mining administration agencies in Southeast Idaho. This report documents the interagency preliminary assessment and risk screening activities for orphan mine sites located within the boundaries of the Southeast Idaho Phosphate Mining Resource Area, as shown on Figure 1. For preliminary assessment purposes, orphan mine sites were considered to be any historic mining operations not previously scheduled for CERCLA site-specific investigations under the ongoing selenium investigation activities. This effort was conducted to ensure all historic mining sites within the Resource Area have been inspected and evaluated under the auspices of the Area Wide Investigation goals and objectives.

The orphan mine site screening effort included preliminary assessment activities at fourteen historic mines sites identified through lease records and literature reviews of past mining activities in Caribou and Bear Lake Counties in southeastern Idaho. The screening process consisted of preliminary site inspections and environmental sampling of potentially impacted media (surface water, soil, sediment and vegetation) conducted by interagency sampling teams in May and July of 2002. The risk evaluation process consisted of reviewing the resulting site data in terms of site conditions, areas of impact, potential for continued releases and regional risk-based action levels developed for the Area Wide Investigation process and reported in DEQ's Area Wide Risk Management Plan dated February 2004. The recommendations contained herein are directed at addressing localized release pathways and associated ecologically significant risks, and to address any existing public safety concerns such as the presence of open adits, portals or mine shafts.

Many of the orphan sites consisted of underground workings or exploration activities that generated little waste or surface disturbance, and were deemed to be relatively benign from an environmental risk perspective. However, several of the sites did include surface mining activities that have resulted in the presence of unstabilized waste piles and potential migration pathways warranting further action.

Of the fourteen sites evaluated, five sites resulted in a No Further Action recommendation by Interagency reviewers. These were the;

- Bear Lake Mine,
- Rattlesnake Canyon Mine,
- Swan Lake Gulch,
- Wyodak Coal Site,
- and, Sulfur Canyon Exploration Site.

Two sites were recommended for integration into pending site-specific investigation (SI) activities by the Agencies and mining companies, consisting of the;

- Diamond Gulch Mine to be included in the USFS/Rhodia Wooley Valley Mine Site Investigation AOC,
- and, the Right Fork Georgetown Canyon Mine to be included in the DEQ/Nu-West Georgetown Canyon Mine Site Investigation AOC.

The remaining seven sites were recommended for additional sampling, and potential erosion control and reclamation improvements, as follows;

- Bennington Canyon Mine,
- Home Canyon Mine,
- Waterloo Mine,
- Hot Springs Mine,
- Consolidated Mine,
- Bloomington Canyon Mine,
- and, Paris Canyon Mine.

Additionally, six sites were identified for safety concerns and recommended for adit, portal and/or collapsed shaft inspections and closure improvements. These were the;

- Rattlesnake Canyon Mine,
- Home Canyon Mine,
- Consolidated Mine,
- Bloomington Canyon Mine,
- Paris Canyon Mine,
- and, East Fork Georgetown Canyon Mine.

The Agencies are planning to conduct additional surface water sampling activities during the spring of 2004 at several of the identified sites. The sampling efforts will be targeted at identifying migration routes and evaluating potential impacts to adjacent surface water bodies during seasonal runoff. The Agencies will also evaluate the need for further erosion controls and reclamation improvements at the identified sites based on the results of these efforts. Upon

completion of the site-specific evaluations, the appropriate Lead Agency representatives will initiate discussions with land managers and site owners.

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1.0 INTRODUCTION

The orphan mine site preliminary assessment and screening tasks were conducted under the Idaho Department of Environmental Quality's (DEQ) Area Wide Investigation of selenium and related trace metal releases from historic mining operations in the Southeast Idaho Phosphate Mining Resource Area, as shown on Figure 1. It was intended to ensure that all historic mining sites in the region had been inspected and evaluated by the conclusion of the area wide efforts. There were fourteen orphan sites identified in Caribou and Bear Lake Counties, Idaho within the SOW-defined boundaries of the Resource Area and subject to screening activities. For preliminary assessment purposes, the term "orphan site" applies to historic inactive mine sites that were not initially projected for CERCLA site-specific investigation activities under the area wide selenium efforts. The orphan site preliminary assessment activities presented in this document were performed by an Interagency sampling team to identify potential release pathways, conduct limited sampling of various site media and evaluate regulatory risk concerns existing at the sites.

Concurrent site-specific investigations are being conducted under Agency oversight, by the mining companies that comprise the Idaho Mining Association (IMA) Selenium Committee, at fourteen open pit mines to evaluate local effects from historic mining associated with the release of selenium and related trace metals. An area wide investigation of the entire phosphate mining Resource Area has been in progress since 1996. Associated risk assessment activities have reduced the current list of contaminants of ecological concern to cadmium, chromium, nickel, selenium, vanadium and zinc. This target analyte list for orphan site screening investigations also included cobalt and copper, which had not been eliminated at the time of sampling.

1.1 Objectives

The primary objectives of the orphan mine site screening activities are to:

- Ensure that significant human health or ecological risks, or public safety concerns do not exist at historic abandoned phosphate mine sites in Southeast Idaho per the Area Wide Investigation Scope of Work,

- Develop detailed site descriptions and collect representative environmental samples, as applicable, from soils, sediments, surface water and vegetation at the orphan sites for documentation in the Administrative Record,

- Identify and evaluate any potential existing source areas, migration pathways or target receptors for the specified contaminants of concern (COCs) to supplement the Area Wide Investigation database, and,

- Provide site-specific data using consistent and appropriate sampling and analytical protocols for future orphan site investigative activities and/or reclamation/remedial recommendations, if any.

1.2 General Approach

The assessment activity was conducted under the Idaho Department of Environmental Quality's technical lead, but involved a number of Land Management Agency representatives with overlapping jurisdiction at the subject sites. The assessment team was composed of the following individuals with the listed responsibilities:

Rick Clegg-DEQ Soda Springs: Project Coordinator
Tom Askew-DEQ Twin Falls: Field Sampling Team Leader/XRF/Sampler
Greg Hill-DEQ Pocatello: Field Recorder/Document Manager
Bill Stout-BLM Pocatello: Field Sampling Team Geologist/Sampler
Richard Anderson-USFS Soda Springs: Photographer/GPS Coordinator
Boyd Cook-IDL Idaho Falls: Site Historian/Guide

The Soda Springs DEQ Satellite Office provided administrative and logistical support for the screening activities. Analytical services were provided by the University of Idaho Analytical Sciences Laboratory to remain consistent with previous Area Wide screening activities and methodologies.

The following fourteen orphan mine sites were visited and evaluated during this effort:

Sulfur Canyon Exploration	Diamond Gulch Mine
Swan Lake Gulch	Bennington Canyon
Rattlesnake Canyon Mine	Waterloo Mine
Home Canyon Mine	Bear Lake Mine
Paris Canyon Mine	Consolidated Mine
Wyodak Coal	Bloomington Canyon Mine
Hot Springs Mine	Right Fork Georgetown Canyon Mine

Twelve of the fourteen sites were visited and sampled over the five-day span of May 5th through May 9th, 2002. Due to the continued presence of snow in the higher elevations, site visits to the Sulfur Canyon Exploration site and Right Fork of Georgetown Canyon Mine were delayed until July 2nd, 2002.

1.3 Field/Laboratory Methods

Field sampling and laboratory procedures are described in detail in DEQ's *Orphan Mine Site Sampling and Analysis Plan (SAP)* dated April 2002. At each site a field notebook was kept to record all field data, site descriptions, and site conditions. Digital photos and sketches were used to record site features and sample locations. GPS coordinates of site features and sample locations were taken with a Garmin handheld unit and duplicated with a Trimble Pathfinder unit during the May site visits, and taken with a Trimble GeoExplorer 3 during the July visits. Coordinates were recorded in decimals of degrees latitude and longitude, and are reported in Attachment 1.

Following an initial inspection of the mine site, sample sites were chosen to assess potential contamination sources and release pathways. Vegetation, soil (*in situ* soil and spoils piles), surface water and sediments were sampled based on observations and availability. Field blanks and duplicates were taken according to the SAP. Sample labeling, storage, and chain of custody procedures are also described in the SAP.

The University of Idaho Analytical Sciences Laboratory (UIASL) supplied the analytical support for the orphan site screening effort. UIASL provided certified, pre-preserved sample bottles for surface water sampling and labels/chain of custody forms for sample tracking.

The analytical methods and target analytes specified for the orphan site screening efforts were consistent with those utilized during the Area Wide Investigation. Table 1-1 provides information regarding the laboratory methods for this investigation.

Table 1-1: Laboratory Methods

Target Analytes from AWI COCs	Soil Method and Detection Limit	Water Method and Detection Limit	Vegetation Method and Detection Limit	Holding Times and Remarks
Cadmium	3050B/6010B 0.75 ug/g	200.8 0.13 ug/L	HNO_3/ICP 0.40 ug/g	6 months
Cobalt	3050B/6010B 1.50 ug/g	200.8 2.50 ug/L	HNO_3/ICP 0.40 ug/g	6 months
Chromium	3050B/6010B 1.50 ug/g	200.8 0.50 ug/L	HNO_3/ICP 0.40 ug/g	6 months
Copper	3050B/6010B 0.75 ug/g	200.8 0.13 ug/L	HNO_3/ICP 0.40 ug/g	6 months
Nickel	3050B/6010B 1.90 ug/g	200.8 0.13 ug/L	HNO_3/ICP 2.00 ug/g	6 months
Selenium	Perchloric/HG-ICP 0.04 ug/g	HG-ICP 1.0 ug/L	Perchloric/HG-ICP 0.04 ug/g	6 months
Vanadium	3050B/6010B 2.00 ug/g	200.8 0.25 ug/L	HNO_3/ICP 0.80 ug/g	6 months
Zinc	3050B/6010B 0.75 ug/g	200.8 0.50 ug/L	HNO_3/ICP 0.40 ug/g	6 months
Hardness (Ca, Mg)	NA	Part 2340 mg/L as CaOH	NA	NA

2.0 BEAR LAKE MINE

2.1 Site History

Walter Lewis of Paris, Idaho, initially developed the Bear Lake Mine in December of 1919. At the time, no leases had been issued. Mr. Lewis mined by hand until March 1920. In 1920, the Bear Lake Phosphate Company was formed and applied for the necessary phosphate lease. Phosphate ore was being transported down the canyon to Paris by horse drawn wagons. The federal mining lease (BL-034988) was issued in February of 1921. By March of 1921, the mine closed due to poor business practices. At the time of closure, approximately 1,500 feet of underground workings had been developed.

The mine remained closed until it was sold to Keystone Phosphate Company in September 1926. The mine opened briefly and shipped ore until November 1926. In 1930, following a legal dispute, the federal lease was transferred from Bear Lake Phosphate Company to Mary Stucki and others. Stucki and her partners subleased the mine to the Agricultural Potassium Phosphate Company of California putting Keystone Phosphate Co. out of business. The mine reopened in December 1930, but closed again in less than a year. Although additional phosphate leases were issued in 1947 and 1956, and a subsequent exploration permit was issued in 1971, the mine never reopened.

2.2 Site Description

Located in Bear Lake County, Idaho, the Bear Lake Mine is situated on private land on the south-facing slope of Sleight Canyon about 2 ¼ miles west of the town of Paris. The mine area consists of: a collapsed underground portal; a long, narrow, waste dump/loading area; a flat area for buildings as well as above the mine portal; several well vegetated trenches; and possible collapsed shaft features. Very little evidence exists of any black shales or ore piles. The area is strongly oxidized and the Phosphoria Formation can be followed along the strike at least two canyons to the south. Sleight Creek is a perennial stream in the canyon that passes by the site approximately 75 feet south of the waste dump.

The underground portal has been collapsed shut. A significant number of timbers, most likely from the old ore-shoot, surround it. The waste dump runs to the southwest out of the portal area and is approximately 100 feet long and 40 to 50 feet wide. It is composed of strongly oxidized tan shale and limestone. No black shale was found in the area of the mine. Slightly upslope and to the northwest of the portal lies a flat area approximately 40 feet by 40 feet. It appears to be a historic building site.

Above the portal and building area, there are several dozer trenches and possible collapsed shaft features. They are strongly vegetated and do not expose any black shales.

2.3 Site Evaluation/Sample Locations

Two samples were taken on the site. The first sample (OS-BLM-SO-01-01) was taken in the central portion of the top of the waste dump. It consisted of strongly oxidized, tan shale with about 10% brown clay. The second sample (OS-BLM-SO-02-01) was taken down slope from the waste dump, between the dump and the road. It consisted of fluffy, brown soil with 30% tan, oxidized shale. Due to the distance and gradient to adjacent stream, the threat of surface water releases was considered negligible and water samples were not collected.

2.4 Analytical Results

Table 2.1 Bear Lake Mine Analytical Results in ppm

SAMPLE ID	MEDIA	Cd	Co	Cr	Cu	Ni	Se	V	Zn	Hardness	Species/Type
OS-BLM-SO-01-01	SOIL	40	8.3	700	58	240	15	880	1100		dump
OS-BLM-SO-02-01	SOIL	2.8	8.1	95	20	40	0.73	110	150		soil

2.5 Risk Evaluation

The Bear Lake Mine appears to present little risk to the environment or local ecological receptors. While exceedances of soil action levels were observed in the waste dump soils, this area consists of only 0.11 acres and is not considered a significant wildlife exposure area. Waste volumes are extremely small and the potential for migration is negligible, as demonstrated by the low concentrations observed in the downgradient soil sample. Vanadium was the only constituent of concern marginally (~10%) exceeding the soil action level that was established for riparian areas. No immediate surface water release pathways or riparian areas were observed at the site.

2.6 Recommendations

Based on the site inspection, sampling results and observed site conditions, the Agencies recommend no further action at the Bear Lake Mine at this time.

3.0 RATTLESNAKE CANYON MINE

3.1 Site History

Located in Bear Lake County, Idaho, the Rattlesnake Mine site is situated on public lands in the Caribou National Forest. Originally, eight citizens of Montpelier, Idaho filed three placer mining claims on June 13, 1906. Little mining was initiated until 1920 when the claimants contracted with Merriman Potash Products Company of Merriman, Nebraska and limited underground mining was carried out. Initially only exploratory mining was done, during which time the mine produced approximately one railcar of ore per day. By the middle of 1920, production at the Rattlesnake Canyon site was abandoned. In 1954, a closed bid lease sale of the property was initiated, but there were no bidders, which led to case closure on August 2, 1956. This site was previously subject to a limited sampling effort by the BLM in 2000.

3.2 Site Description

The mine is located on the north-facing slope of Big Canyon, approximately two miles east of Highway 30. Today, the Rattlesnake Canyon Mine site is almost completely overgrown with brush and trees. The site consists of two collapsed adits, two small waste piles, a series of dozer cuts, a possible outhouse, and an area of black shale contoured to the slope face.

The two adits are both collapsed and almost completely overgrown, however, the western adit is partially open and may provide enough space for human entrance. There are timbers and period

rail-cart tracks, at or near the entrance. Small waste piles, each less than 15 cubic yards, are present at each adit. Both consist of mostly limestone and are thickly covered with vegetation to the point where the rock surface is barely visible.

A series of three or more progressive dozer cuts, run parallel to the slope between the adit elevation and the top of the hill. Grass, shrubs, and small trees are present to stabilize the cuts.

Below the cuts, lies an area of black shales approximately 75 feet wide and 100 feet long. It is either the remnants of a waste pile that once existed and was later removed, or it is down-slope slough from when the dozer cuts were created. The area is moderately vegetated with grass, shrubs, and small trees.

Down slope from the easternmost adit is a hole, approximately six (6) feet in diameter. The purpose of this sinkhole is undeterminable; however, there are timbers and other debris in the hole. Possible uses may have been an outhouse or a collapsed shaft.

3.3 Site Evaluation/Sampling Locations

Two samples were taken at the Rattlesnake Mine site. Both samples were located on the black shale area of the site. The first (OS-RSM-SO-01-01), a soil sample composed of dark brown to black shale. The second sample (OS-RSM-VE-02-01) was of pine grass growing in the black shales. There was no surface water on site and no erosion or migration of the black shale area was observed.

3.4 Analytical Results

Table 3.1 Rattlesnake Mine Analytical Results in ppm

SAMPLE ID	MEDIA	Cd	Co	Cr	Cu	Ni	Se	V	Zn	Hardness	Species/Type
OS-RSM-SO-01-01	SOIL	84	1.7	660	69	170	9.1	1100	1200		likely waste DUMP
OS-RSM-VE-02-01	Vegetation	1.8	0.2	8.3	12	4.2	33.0	12.0	93.0		Pine grass

3.5 Risk Evaluation

The Rattlesnake Canyon Mine appears to present little risks to the environment or local ecological receptors. As expected, exceedances of soil action levels were observed in the waste dump soils, however, this area is less than ¼ acre and is not considered a significant wildlife exposure area. Waste volumes are extremely small and the potential for migration is negligible, due to the lack of adjacent surface water features. Selenium was observed in exceedance of the vegetation action level but is not expected to provide a significant forage source for wildlife or domestic grazing due to the limited area, heavy reforestation, and sparse forage vegetation.

3.6 Recommendations

Based on the site inspection, sampling results and observed site conditions, the Agencies recommend no further action related to environmental protection at the Rattlesnake Canyon Mine at this time. However, for safety considerations, the western adit should be inspected by Forest Service staff and closed, as necessary, to prevent future access.

4.0 SWAN LAKE GULCH

4.1 Site History

The Swan Lake Gulch Mine is located in Caribou County, Idaho in Section 29 of Township 9 South, Range 43 East. The area has been well prospected; much of the early work was done by the San Francisco Chemical Company. According to *Mansfield, 1927*, most of the exploration work was done in 1910, including a 70-foot tunnel drifting due north. This tunnel was not identified during the site investigation. There is no known production from the site.

4.2 Site Description

The area is located in the south facing slope of the Swan Lake Gulch about ¼ mile northeast of Lakey Reservoir. It lies on Caribou National Forest lands and has public access. The site consists of two areas approximately 900 feet apart. The southwest or "main" area consists of: the remnants of an ore stockpile; two exploration cuts; a stock pond; and a dry pond. The "east" area contains a black shale pile and a well-vegetated dozer trench. The main area contained abundant tracks of elk, moose, and deer.

The main area ore stockpile is approximately 2 to 3 feet thick and 30 feet in diameter and appears to be the residual from a temporary ore stockpile since removed. It is composed of mostly black shales and oolitic, phosphate ore that are poorly vegetated. The first exploration cut is located about 60 feet upslope and 100 feet to the north of the ore pile. The cut was about 10-15 feet wide and over 100 feet long; parallel to the contour of the hill. The second smaller trench lies about 150 feet directly above the first. The stock pond is located about 45 feet southwest of the ore pile remnants. It is approximately 25-30 feet in diameter and about 3 feet deep at the deepest point. The water in the pond was stagnant with no visible mode of surface migration. There were animal tracks around the pond. Another pond existed about 300 feet to the northeast, but it did not contain any water.

The waste pile in the northeast area is fan shaped; approximately 25 feet wide at the base and 6 feet thick at the highest point. It is also located on the south-facing slope of the canyon. The waste dump has very limited vegetation growing on it. It is composed of approximately 95% high carbon, high sulfide, black shale and 5% dark grey to black chert. South of the waste pile about 100 feet is a dozer trench, approximately 4 feet deep and 15 to 20 feet wide, running northeast/southwest. The trench is completely revegetated and stabilized. The trench borders a dry streambed at the bottom of the valley, approximately 50-60 feet to the south of the waste pile.

4.3 Site Evaluation/Sampling Locations

Five samples were taken at the Swan Lake Gulch site; four from the main area and one from the east area. The first sample (OS-SLG-SO-01-01) was a soil sample collected about 1 foot down slope of the toe of the ore pile remnants. It consisted of black, organic soil and 10 – 15 % black shale. Samples OS-SLG-VE-02-01 and OS-SLG-SO-04-01 were collected on the top of the ore pile. The vegetation sample consisted of grazed, Great Basin Wild Rye growing near the top of the ore stockpile. The soil sample was taken in the same location. It was composed of predominantly black shale or oolitic ore shale. Sample OS-SLG-SW-03-01 was taken of surface

water from the southern edge of the stock pond. An XRF sample was taken from the lower trench.

The fifth sample (OS-SLG-SO-05-01) was a soil sample collected on the black shale pile in the east area consisting of approximately 95% black shale and 5% chert. A QA duplicate sample was also collected at this location.

4.4 Analytical Results

Table 4.1 Swan Lake Gulch Analytical Results in ppm

SAMPLE ID	MEDIA	Cd	Co	Cr	Cu	Ni	Se	V	Zn	Hardness	Species/Type
OS-SLG-SO-01-01	SOIL	39	<1.5	300	43	68	4.8	910	350		SOIL
OS-SLG-VE-02-01	vegetation	2.8	0.24	5.4	13	<2.0	5.0	15.0	93.0		Great Basin Wild Rye
OS-SLG-SW-03-01	surface water	0.0007	<0.0025	0.0009	<0.00013	0.05	0.037	0.04	0.068	1316	pond ~30' diam
OS-SLG-SO-04-01	SOIL	73	<1.5	610	84	140	7	1700	740		DUMP
OS-SLG-SO-05-01	SOIL	7.1	7	610	99	320	26	480	770		DUMP
OS-SLG-SO-05-02	DUPLICATE	8.5	6	580	100	300	25	490	740		DUPLICATE

4.5 Risk Evaluation

The Swan Lake Gulch Mine appears to present little risks to the environment or local ecological receptors. As expected, exceedances of soil action levels were observed in the limited ore and waste dump soils present at the site, however, the cumulative area of these non-contiguous features are less than an acre and are poorly vegetated, therefore, not considered a significant wildlife forage or domestic animal grazing exposure area. Waste volumes are small and the potential for contaminant migration is limited. The vegetation and surface water samples from the site were both below the action levels established for unacceptable exposure risks and do not appear to present a threat to local populations.

4.6 Recommendations

Based on the site inspection, sampling results and observed site conditions, the Agencies recommend no further action at the Swan Lake Gulch Mine at this time.

5.0 DIAMOND GULCH MINE

5.1 Site History

The Diamond Gulch Mine site is located in Caribou County, Idaho in Section 33 of Township 9 South, Range 43 East. The site is located on Caribou National Forest lands and has public access. Eight employees of the San Francisco Chemical Company (SFCC) located the first two placer claims in 1905 and 1907 respectively. In the summer of 1910, the SFCC started their exploration program consisting of many trenched and small adits. Although SFCC found ore on both sites, the claims were not patented and the property was abandoned until 1956.

Seeing a downturn of production from their Waterloo Mine, the SFCC successfully bid on a 360-acre federal lease in 1957 and open-pit mining began at the site in the spring of 1960. The mining was contracted out to Cherf Bros., Inc., and Sankey Contractors, Inc. The ore was

transported by truck and pulverized in Montpelier, Idaho. Approximately 84,000 tons of ore were excavated in the summer of 1960, the only season of the mine's operation. It mine was closed because of excessive faulting and pinching which made the ore too difficult and expensive to mine. Minor reclamation was conducted on the site during 1961 and 1962.

On December 31, 1968, the SFCC was dissolved and the Stauffer Chemical Company assumed all of its assets and liabilities. In June 1987, Imperial Chemical Industries of the United Kingdom acquired the Stauffer Company. During all of this time, the Diamond Gulch mine was inactive and left to reclaim. In September of 1987, Rhone-Poulenc Basic Chemicals, Inc. had acquired Imperial Chemical Industries' Idaho operations, and on May 12, 1993, Rhone-Poulenc relinquished its federal lease (I-07881) on the property.

5.2 Site Description

The Diamond Gulch Mine is a moderate sized open-pit operation, covering an area of approximately 32 acres along about 3000 feet of strike. The mine consisted of two connected open pits and several waste dumps. It appears that only the upper ore zone was mined at a very low strip ratio. Thus, the floors of the pits are at the top of the middle waste shale layer. Mining took place along the intersection of the gently dipping, but highly faulted, Phosphoria Formation; the curved topography of the hill making a crescent shaped footprint of disturbance. There are some erosion control measures in place; however, there are some areas of observed erosion in the pit and on the waste dumps. Very little modern reclamation has been completed. Volunteer, invasive vegetation is starting to return to the site. The mine was subject to a previous preliminary sampling effort by the BLM in 2000.

5.3 Site Evaluation/Sampling Locations

Because Linda Eslick of the Bureau of Land Management had sampled the mine extensively during a previous investigation, it was determined that only a soil sample and vegetation sample were needed at this time. There was no water on the site. The samples were collected from the northwest facing pit floor. The vegetation sample (OS-DIG-VE-01-01) consisted of Wheat Grass, and a soil sample (OS-DIG-SO-02-01) was collected from the same location. The soil sample, from the weakly eroding pit floor, was composed of mostly black mudstone mixed with traces of ore. Due to high moisture concentration in the soil, the sample was not processed through the #12 ASTM sieve normally used in soil sample collection.

5.4 Analytical Results

Table 5.1 Diamond Gulch Mine Analytical Results in ppm

SAMPLE ID	MEDIA	Cd	Co	Cr	Cu	Ni	Se	V	Zn	Hardness	Species/Type
OS-DIG-VE-01-01	Vegetation	6.3	0.37	13	15	5.9	1.0	32.0	170.0		Wheat Grass
OS-DIG-SO-02-01	SOIL	130	2.7	740	100	190	25	2100	1600		Pit Floor

5.5 Risk Evaluation

The Diamond Gulch Mine operations were complex and apparently supported only upper ore bed access resulting in low waste generation and little disturbance of middle waste shales. As expected, the pit floor does expose materials exceeding soil action levels but the sparse vegetation is not expected to provide a significant exposure pathway for wildlife. The vegetation sample indicates a marginal exceedance of action levels for cadmium. A previous BLM preliminary assessment also indicated minimal potential for ecological risks. No surface water migration pathways were observed at the site.

5.6 Recommendations

The Diamond Gulch Mine is currently owned by Rhodia, Inc. and was originally considered for site-specific evaluation under CERCLA by the Forest Service. Because this is a moderately sized site, the Agencies recommend that final evaluation be incorporated as a component of the upcoming USFS Administrative Order on Consent for Rhodia's Wooley Valley site investigation.

6.0 BENNINGTON CANYON MINE

6.1 Site History

The Bennington Canyon Mine is located in Bear Lake County, Idaho in Section 14 of Township 12 South, Range 44 East on private land. Ore was first discovered on the Bennington Canyon Mine site in 1907. The San Francisco Chemical Company (SFCC) gathered mining claims and did minor exploratory work in 1909, but no work was done on the site from 1909-1920. In 1914, the land on which the mine was located was patented to John C. Nelson under the Homestead Laws.

On November 25 1939, the Teton Phosphate Company of Boise, Idaho obtained the rights to mine the area. The eight incorporators, namely, Houston T. Hitt, C. Van Clark, F. P. Van Horn, J.C. McKinley, Sr., Milton Robison, Conover Wright, Frank D. Maxwell, and Edward G. Rosenheim, started exploratory work in 1940 and began open pit operations in 1941. The intent of the Teton Phosphate Company was to produce phosphorus that could be sold for direct application on farmlands. Due to poor economic conditions, the mine was closed in 1943. Approximately 1000 cubic yards of ore was procured from the mine during 1941 and 1943. In 1946, the property was leased to J.L. Ogilvy of Spokane, Washington. George W. Lane of Montpelier, Idaho currently owns the property, and access to the mine was granted to the investigation team on March 12, 2002.

6.2 Site Description

The mine, a small open pit and adit, is located approximately three miles east of the town of Bennington, Idaho. The site abuts a small section of plowed farming land immediately to the west. The Phosphoria Formation is slightly overturned and very steeply dipping to the west. The main cut or pit is about 200 feet long and strikes north/south. At the north end of the cut is the remnant of a pile of waste shale, approximately 50 feet across. Some of the waste has been excavated, possibly for use as road grade. On the south end of the main cut is another, smaller pile of black shale waste, approximately 35 feet across.

Directly down slope from the cut is a collapsed adit, approximately 20 feet across, with visible metal track protruding out of the portal. The track is a remnant of the underground mining operation that existed along with the open pit that is visible on the surface. Next to the collapsed adit on the south, is a decrepit structure that may have served as an ore shoot or some other production facility. Much of the original metalwork and large timbers still exist.

Approximately 25 feet down slope (west) and directly below the wooden structure is a large sinkhole, possibly another adit that has been completely collapsed. It is currently seeping water at a very low rate. The seep has eroded through the black shale waste dump from where it emerges. There is an old irrigation pipe protruding from the seep, leading the investigation team to believe that owner may be using water from the seep to irrigate his field. The seep is intersected with another pile of black waste shale down slope and in direct contact with the field and spreading out from the seep in an alluvial fan. On the opposite side of the field (west side) between the field and the access road is a small waste pile, approximately 5 feet in diameter. It is less than 2-3 cubic yards in volume.

6.3 Site Evaluation/Sampling Locations

Seven samples were collected at the Bennington Canyon Mine site. Sample number OS-BMS-SO-01-01 is a soil sample of middle waste collected from the collapsed adit. Sample number OS-BMS-VE-02-01 is a vegetation sample (wild rye) collected from the same location. Sample number OS-BMS-SW-03-01 was a water sample taken from the seep. Sample number OS-BMS-SW-03-02 was taken as a QA duplicate water sample from the same location with a temperature of 9.5°C and a pH of 7.84. Samples OS-BMS-VE-04-01, a vegetation sample, and OS-BMS-SO-05-01, a soil sample, were taken from the central, largest waste dump. They represent the material possibly eroding into the field below; the soil sample contained black, high carbon waste shale. Sample number OS-BMS-SO-06-01 is a soil sample collected from the confluence of the adit seep and the plowed field, approximately 75 feet below the major collapsed adit.

6.4 Analytical Results

Table 6.1 Bennington Canyon Mine Analytical Results in ppm

SAMPLE ID	MEDIA	Cd	Co	Cr	Cu	Ni	Se	V	Zn	Hardness	Species/Type
OS-BMS-SO-01-01	SOIL	58	3	580	85	200	19	660	1200		DUMP
OS-BMS-VE-02-01	vegetation	1.4	0.19	1	25	46.0	3.2	<0.4	130.0		Wild Rye
OS-BMS-SW-03-01	surface water	0.0025	<0.0025	0.0006	<0.00013	0.034	0.007	0.001	0.15	1752	Seep (weak flow)
OS-BMS-SW-03-02	surface water	0.0025	<0.0025	0.0007	<0.00013	0.032	0.018	0.002	0.15	1761	DUPLICATE
OS-BMS-VE-04-01	vegetation	1	0.49	17	18	14.0	75.0	6.8	89.0		NA
OS-BMS-S0-05-01	SOIL	25	5.8	710	71	200	81	360	850		DUMP
OS-BMS-S0-06-01	SOIL	17	6.4	410	48	120	11	190	590		SOIL

6.5 Risk Evaluation

The Bennington Canyon Mine does present some concern due to potential migration to adjacent properties. There is an active seep flowing from a waste shale dump. While the surface water sample does not indicate the action level for terrestrial receptor and domestic animal exposures, the surrounding soils and vegetation do exceed action levels. It also appears that the dump soils are eroding onto an adjacent field resulting in exceedances of soil action levels at the confluence of the field and adit seep flow. High levels of selenium were observed in the vegetation on the central waste dump.

6.6 Recommendations

Due to the completed exposure pathway to the adjacent cultivated field, the Agencies are recommending additional actions at the Bennington Canyon Mine. These actions should consist of additional waste consolidation, erosion controls, and reclamation improvements for the waste dumps to prevent deposition on developed agricultural lands, and elimination of seep waters as a potential irrigation source. The appropriate Agencies will pursue necessary funding and initiate discussions with the current site owner on these issues.

7.0 HOME CANYON MINE

7.1 Site History

The Home Canyon Mine is located in Bear Lake County, Idaho in Section 31 of Township 12 South, Range 45 East. The site is located on private ground surrounded by Forest Service lands. Historic operations started on patented lode claims, owned by San Francisco Chemical Company, in 1916. The mine had a number of short adits; one, 190 feet long, used primarily to support a high ore bin and loading facility. In 1920, Nibley, Nibley, Newhouse, Stimpson, and Reed of Salt Lake City, Utah created the American Phosphate Company and acquired a 10-year lease for five of the Home Canyon mine claims. At this time, 64 to 72 tons of ore were being shipped to California per day, henceforth, construction of a mill was started in 1920.

By the end of 1922, there were approximately 2,000 feet of underground workings. Production continued until 1925 with a total production of approximately 20,000 tons. In 1926, the American Phosphate Company forfeited its right to do business in Idaho and the property was returned to San Francisco Chemical Co.

In an attempt to increase reserves at the Waterloo Mine, San Francisco Chemical returned to Home Canyon Mine and drove a new crosscut in 1953. No production from this drift was recorded. The mill and ancillary facilities were removed and no activities have been recorded since.

7.2 Site Description

The mine is located approximately 4 miles east of Montpelier, Idaho on the south-facing slope of Montpelier Canyon along Highway 89. It lies less than ¼ mile north of the Waterloo Mine, directly along the strike. All mining operations were from underground development. There are

two significant areas of production referred to as the "main area" and the "west area". The main area, located on the Cumberland lode, consists of: a partially collapsed adit; a main ramp area where the ore was shuttled to a concrete load out (still visible); and two or three adjoining waste piles. About 600 feet west, the "west area" contains two adits, three waste dumps and the remains of two cement building foundations. There is no surface water associated with the mine features; however, Montpelier Creek flows down the canyon several hundred feet to the southeast.

In the main area, the primary adit is located at the top of the main waste dump at the end of a dirt access road approximately 200 feet from of Highway 89. The adit appears to have been dozed closed at one time; however, the top of the portal has been reopened enough for human entry. Evidence suggests a great deal of recreational activity in the area. West of the adit, a semi-circular, truck ramp leads to the truck load out. The ramp is constructed on a black shale, waste dump. The load out structure still remains. It is a cement, tunnel-shaped, structure constructed such that empty trucks back into the structure and are loaded from above through a slot in the ceiling. East of the primary adit, a linear dump or ramp of limestone and chert, approximately 300 feet long, leads to a black shale waste dump approximately ¼ the size of the primary waste dump. A 50-foot long dozer cut lies along the northeast end of the linear ramp.

The west area has three tiers of waste dumps. The lowest dump, poorly visible from the road, is composed mostly of limestone. At the top surface elevation of the dump is an open adit, with a metal door in place. The door is open and allows for human access. Many of the original timbers and metal work is scattered around the area. Also, located on this elevation is a cement building foundation. Upslope from the open adit is the middle waste dump. This dump is much larger than the first, and contains moderately oxidized tan shales. On the top surface of this dump lies the third tier of waste dump. This dump is composed of black waste shales and is poorly vegetated. It is about 30 feet across and 30 feet tall. The uppermost adit is collapsed.

Approximately 10 feet from the road, below all of the waste dumps, are two concrete foundations, most likely remnants of the mill facilities that have survived through the years.

7.3 Site Evaluation/ Sampling Locations

Seven samples were taken at the Home Canyon Mine site: five soil samples and two vegetation samples. In the main area, the first sample (OS-HCM-SO-01-01) was of soil taken from the truck ramp on the primary waste dump of the main area. The second sample (OS-HCM-VE-02-01) is a vegetation sample (Snowberry) from below the dump toe in the small, but most significant drainage area. The third sample (OS-HCM-SO-03-01) and a QA duplicate (OS-HCM-SO-03-02) were collected from the soil sample in the same location. These samples consisted of brown to black, highly organic soil with very little rock.

The next sample (OS-HCM-SO-04-01), in the west area, was of black shales eroding from the toe of the uppermost waste dump. A vegetation sample (OS-HCM-VE-05-01) of Big Sage was also collected from this location. The final sample (OS-HCM-SO-06-01) was as soil sample taken from an undisturbed area west of the mines as a background sample. The soil consisted of brown and tan chert and cherty shales.

7.4 Analytical Results

Table 7.1 Home Canyon Mine Analytical Results in ppm

SAMPLE ID	MEDIA	Cd	Co	Cr	Cu	Ni	Se	V	Zn	Hardness	Species/Type
OS-HCM-SO-01-01	SOIL	86	4.1	1100	130	330	69	1100	2200		DUMP
OS-HCM-VE-02-01	vegetation	0.76	0.49	2.1	16	4.8	15.0	1.8	59.0		Snowberry
OS-HCM-SO-03-01	SOIL	23	5	470	56	140	12	280	650		Soil
OS-HCM-SO-03-02	SOIL	24	4.9	490	58	140	8.9	300	670		DUPLICATE
OS-HCM-SO-04-01	SOIL	50	4	700	91	210	38	540	1100		DUMP
OS-HCM-VE-05-01	vegetation	-	-	-	-	-	-	-	-		Big Sage
OS-HCM-SO-06-01	SOIL	0.78	14	80	36	51	0.78	74	140		Soil

NOTE: Sample OS-HCM-VE-05-01 was collected, but was not recorded on the chain of custody/sample submittal sheet. This sample was apparently misplaced in the field and no data is available.

7.5 Risk Evaluation

The Home Canyon Mine appears to present a potential contaminant migration risk due to the number of waste piles and lack of erosion control measures. As expected, the waste dump soils exceed the soil action levels, however, intermediate soils at the toe of dumps also exhibit elevated concentrations. The proximity of Montpelier Creek and associated riparian areas are also considered to present potential transport and fate concerns.

7.6 Recommendations

The Agencies will conduct additional sampling of surface waters for Montpelier Creek and the associated riparian areas during the spring of 2004. The Agencies do recommend additional activities at the Home Canyon Mine, in the form of waste consolidation, erosion controls, and reclamation improvements. The appropriate Agencies will investigate the solvency of past owners and potential for alternative funding.

Additionally, the Home Canyon Mine site is apparently used on a frequent basis for recreational purposes and has several open adits. For safety purposes, the appropriate minerals management Agency will be notifies, and should take the necessary actions to close the adits and prevent future public access.

8.0 WATERLOO MINE

8.1 Site History

The Waterloo Mine is located in Bear Lake County, Idaho in Sections 6 and 7 of Township 13 South, Range 45 East. The site is located on private land owned by Bear Lake County and surrounded by BLM land. The site is the current location of the Bear Lake County landfill. The southern most pit is being used as a public rifle range. Historic mining operations included underground workings from 1903 through 1929, and open pit operations from 1945 through 1960.

In early1903, Charles Colcock Jones identified that Thomas Glenn was mining phosphate rock east of Montpelier, Idaho. Mr. Glenn had sunk a 250-foot decline while possibly exploring for coal. Charles Jones and associates recorded the first claim, the Wellington Claim, in October of 1903. The claimants quit claim deeded the mine to Iron Mountain Investment Company in January 1904. The Iron Mountain Investment Company, in turn, deeded the property to employees of the San Francisco Chemical Company (SFCC) on July 8, 1904, and changed the name to the Waterloo Mine. In 1909, 735 tons of phosphate rock was shipped to San Francisco. By 1911, the Waterloo mine was shipping approximately 500 tons of phosphate rock annually to SFCC's chemical plant. By 1916, that number had increased to about 100 tons/day. Operations were suspended in 1918 because of an overabundance of ore at the chemical plant. The mine operated briefly from 1919-1920, and then operations were suspended again until 1929, at which time the underground operation was permanently closed. By the end of underground mining, there were about 3,000 feet of tunnels and drifts accessed by three adits.

In 1945, SFCC reopened the mine as an open pit operation. Operations lasted from 1945 through 1947, producing approximately 675,000 tons of ore. The mine briefly reopened and closed in 1960. During the life of the mine, about 212 acres were disturbed and 1.25 million tons of ore were produced.

In 1971, the mine consisting of approximately 400 acres of patented claims was donated to the Idaho of Fish and Game Department, who optioned a portion of the mine to the city of Montpelier for its landfill. This site was previously subject to an extensive sampling effort by the BLM and is subject to ongoing monitoring through the Idaho solid waste program.

8.2 Site Description

The Interagency sampling team conducted site inspection activities under a limited site access agreement signed by the Bear Lake County Commissioners on March 11th, 2002.

Disturbances at the Waterloo Mine cover approximately 200 acres. The site is being used as a landfill by the city of Montpelier, as well as a shooting range in the south pit. There appeared to be sediment control measures in place, but little reclamation. Although vegetation was returning, most waste dumps were not shaped or contoured to 3:1 slopes. The investigation team attempted to avoid areas of disturbance associated with recent landfill activity.

The south pit is approximately 300 meters long with bedding dipping moderately to the west. The east highwall is the dip-slope from which the phosphate was removed. No reclamation has been done. This pit is currently being used as a rifle range with all of the necessary facilities. At the northwest edge of the pit is a waste pile that is approximately 50 feet wide and runs down the face of the hill approximately 200 meters.

The investigation team did not enter the main pit area, to the north. It is surrounded by a series of waste dumps. The dumps are revegetating at different rates based on age and black shale content.

After a comprehensive review of the area, there appears to be no surface water visible at the Waterloo mine. Montpelier Creek runs within a few hundred feet of a 2,500 foot section of the Mine.

8.3 Site Evaluation/Sampling Locations

Seven samples were taken at the Waterloo Mine. The first sample (OS-WLM-SO-01-01) was collected from a waste dump on the north end of the south pit. It was composed of a mixture of black shale and tan shale. The next pair of samples were taken from the same location on a stable slope, 15 to 20 feet below a waste dump toe, on the southwest side of the main pit area. Sample number OS-WLM-SO-02-01 is a soil sample composed of red-brown soil, with moderate clay content mixed with minor limestone gravel. Sample number OS-WLM-VE-03-01 is rabbit brush vegetation collected from the same location as the previous sample. The next sample (OS-WLM-SO-04-01) is a soil sample collected approximately 50 feet below the toe of an older generation waste dump. The sample site was 30 to 40 feet down slope from monitoring well MN-2. It was composed of brown clay-rich soil, with little or no rock material.

The last three samples were all taken in the same location; 150 to 200 feet down slope from monitoring well MN-2. They were taken much closer to, or in the floodplain of Montpelier Creek, in an area of undisturbed soil and vegetation. Sample number OS-WLM-SO-05-01 was a soil sample, sample OS-WLM-VE-06-01 was a vegetation sample of snowberry, and sample number OS-WLM-VE-07-01 was a vegetation sample of grass.

Lucinda Eslick of the BLM, previously sampled the site in 2000. Montpelier Creek has also exhibited some occasional exceedances of surface water criteria during the Area Wide Investigation process, however, the source has not yet been identified.

8.4 Analytical Results

Table 8.1 Waterloo Mine Analytical Results in ppm

SAMPLE ID	MEDIA	Cd	Co	Cr	Cu	Ni	Se	V	Zn	Hardness	Species/Type
OS-WLM-SO-01-01	SOIL	75	2.7	390	53	140	23	680	1200		DUMP
OS-WLM-SO-02-01	SOIL	1	10	41	26	27	0.44	62	92		SOIL
OS-WLM-VE-03-01	vegetation	<0.4	<0.12	0.94	7.6	<2.0	1.0	1.2	22.0		Rabbit Brush
OS-WLM-SO-04-01	SOIL	4.2	8.4	54	37	29	0.81	71	150		SOIL
OS-WLM-SO-05-01	SOIL	46	7.8	410	54	130	6.6	560	880		SOIL
OS-WLM-VE-06-01	vegetation	1.9	0.48	0.6	14	<2.0	8.8	0.7	58.0		snow berry
OS-WLM-VE-07-01	vegetation	2.8	3.9	0.97	14	2.5	5.6	1.0	95.0		grass

8.5 Risk Evaluation

The Waterloo Mine site is currently owned and operated as a landfill by Bear Lake County. The site supported significant mining operations as evidenced by a number of large waste rock piles. However, the samples collected to date indicate little migration and the land use restrictions associated with the landfill operations restrict free access to the site. The waste materials are used to provide cover material for the landfill and are slowing being returned to the mine pits.

8.6 Conclusion and Recommendations

The Agencies will conduct additional surface water sampling of Montpelier Creek during the spring of 2004 to evaluate potential site releases. Because the site is currently regulated by the DEQ under Subtitle D of RCRA, sampling results and recommendations will be provided to the appropriate program manager for future monitoring and administration.

9.0 HOT SPRINGS MINE

9.1 Site History

The Hot Springs Mine is located in Bear Lake County, Idaho in Sections 1, 12, 13 and 24 of Township 15 South, Range 44 East. Discovered by Morse Duffield and Lewis Jeffs, work was well underway by 1911 including construction of a mill. The original claims were staked between 1907 and 1911, and patented between 1911 and 1917. On the south end of the mountain are two former adits; the Nashville tunnel originally owned by Duffield and Jeffs, and the Rich Placer tunnel originally owned by the Union Phosphate Company. These two tunnels are located only about 75 feet apart, and each owner individually worked their tunnel. In 1911, the Union Phosphate Company sold their claim to Duffield and Jeffs, and by 1916, over 700 feet of underground workings existed. On the west side of the ridge, the North Lake tunnel was just under construction in 1911. The tunnel was abandoned in 1912 at 220 feet. It was later reopened and extended to the ore.

By 1921, the exploration work was deserted and the property sold to the San Francisco Chemical Company (SFCC). In 1954, the SFCC started working the mine again, but found that the ore was too hard and caused damage to the rods at the mill. Thus, in 1956, work at the Hot Springs mine was suspended indefinitely.

In 1969 the SFCC reorganized into the Stauffer Chemical Company, who held the claims until 1987, when Rhone-Poulenc Basic Chemicals Company acquired them. In 1998, Rhone-Poulenc reorganized and formed Rhodia, Inc., who still owns the mining claims to the Hot Springs mine.

9.2 Site Description

The Interagency sampling team inspected the site under a limited access agreement with Rhodia Inc. dated May 6th, 2002.

The Hot Springs mine is located on a hill on the east side of Bear Lake National Wildlife Refuge. The mountain runs north/south, parallel to the strike of the beds. Stratigraphy is overturned and dipping steeply (70^{o}-80^{o}) to the west. The adit located on the west face, the North Lake tunnel, lies approximately 65 feet up the face of the mountain. The adit was partially filled in last year by Rhodia, Inc. Correspondence with a former Rhodia employee indicates that the adit runs 1700 feet due east to the lower ore (Wendell Johnson, 2002). It drifts about 300 feet north along the lower ore horizon and about 150 feet south along the same horizon. At the east end of the adit, there is a 1,200 foot rise to the surface of the east side of the mountain. The surface opening of the rise is said to be sealed. Located at the foot of the adit is evidence of a foundation. A number of old rail car tracks lead out of the adit.

A large waste dump lies between the adit and Bear Lake Road. The dump is approximately 300 feet long north to south, and 50 feet from east to west. About 25 percent of the dump lies north of the adit and is comprised almost completely of limestone. The remaining portion of the dump, south of the adit, is said to be mainly limestone with thin veneer of black shale.

The discovery area lies south of the North Lake tunnel on the west-facing side of the ridge. Access to the area requires access through private property and four-wheel drive vehicles. There are two production adits; the Nashville tunnel on the west and the Rich Placer tunnel on the east. They are located about 50 feet up slope from the valley floor and are approximately 100 feet apart. Below each tunnel is a waste dump. Each dump is about 25 feet wide and about 20 feet in depth. The dumps are mostly black shale and are vegetated on the flat tops, but not on the side slopes. The original discovery adit, now collapsed shut, lies up slope to the northeast of the Rich Placer tunnel.

Below the two tunnels lies a dry streambed. It runs downhill to the west, winding eventually to Bear Lake. The U.S. Fish and Wildlife Service has expressed concern with the Hot Springs Mine due to its potential to release runoff constituents to the Bear Lake Refuge.

9.3 Site Evaluation/Sampling Locations

Nine samples were collected at the Hot Springs Mine: four and a duplicate at the North Lake tunnel and four in the discovery area. The first two samples were taken at the same location on the top surface of the black shale waste dump. Sample OS-HSM-SO-01-01 is a soil sample composed of almost all black shale. A duplicate (OS-HSM-SO-01-02) soil sample was also collocated. Sample OS-HSM-VE-02-01 is vegetation sample rabbit brush from the same location. The next two samples were taken in a low, moist area, which appears to be a water collection basin for the disturbed area. Sample OS-HSM-SO-03-01 is a soil sample composed of 90% brown soil and 10% black shale. The vegetation sample (OS-HSM-VE-04-01) is of Great Basin rye.

The next four samples were collected in the discovery area of the Hot Springs Mine. They were located in the potential migration path down gradient of the discovery area. Sample OS-HSM-SO-05-01 is a soil sample collected about 2 feet below the Rich Placer [eastern] black shale waste dump. It is composed of a mix of black soil and black shale. The next two samples were collected about 60 feet down the dry stream channel from the Nashville [western] waste dump. Sample OS-HSM-SO-06-01 is a soil sample composed of mostly brown soil from a pea gravel streambed. Sample OS-HSM-VE-07-01 is a collocated vegetation sample of Great Basin rye. The last sample, OS-HSM-SO-08-01, is a soil sample collected another 100 feet downgradient of the previous sample. It is composed of 50% brown soil, 40% pea gravel, and 10% tan shale.

9.4 Analytical Results

Table 9.1 Hot Springs Mine Analytical Results in ppm

SAMPLE ID	MEDIA	Cd	Co	Cr	Cu	Ni	Se	V	Zn	Hardness	Species/Type
OS-HSM-SO-01-01	SOIL	190	3.9	880	120	370	74	2000	2900		Dump
OS-HSM-SO-01-02	SOIL	150	3.1	760	100	320	72	2000	2800		DUPLICATE
OS-HSM-VE-02-01	vegetation	6.5	0.2	0.52	17	2.9	8.3	0.75	89		Rabbit Brush
OS-HSM-S0-03-01	SOIL	25	4	180	30	90	6.2	310	520		Soil
OS-HSM-VE-04-01	vegetation	<0.4	1.1	<0.4	15	<2.0	1.2	<0.4	26		Great Basin Rye
OS-HSM-SO-05-01	SOIL	75	3.2	700	87	180	460	970	1200		Soil
OS-HSM-SO-06-01	SOIL	52	4.3	470	61	130	160	610	880		Soil
OS-HSM-VE-07-01	vegetation	<0.4	0.26	<0.4	16	<2.0	260	<0.4	28		Great Basin Rye
OS-HSM-SO-08-01	SOIL	34	6	280	47	100	88	370	560		Soil

9.5 Risk Evaluation

The Hot Springs Mine is currently owned by Rhodia, Inc. and supports small waste volumes. However, sampling results indicate significant pathways of migration originated from the waste materials. The site is located adjacent to the Bear Lake Wildlife Refuge and sediment samples at the refuge boundary have also indicated the presence of active releases.

9.6 Conclusion and Recommendations

The Agencies are recommending additional actions at the site in the form of further site investigation, waste consolidation, erosion controls, and reclamation improvements. The implementing Agencies will meet with Rhodia to develop a Spring 2004 sampling plan and to implement necessary site improvements under Agency oversight.

10.0 CONSOLIDATED MINE

10.1 Site History

The Consolidated Mine site is located in Bear Lake County, Idaho in Section 8 of Township 14 South, Range 43 East. In October 1903, Charles C. Jones and Elizabeth Jones, along with six other prospectors, located a placer mining claim on the site. The claim was soon abrogated due to inactivity, and no interest was shown in the area until 1908 when Joseph Oakey, G. W. Nebeker, and G. Spongberg explored the area for phosphate rock and located three lode claims. They did extensive work in the area through 1915. In early 1915, the claims were sold to the United States Phosphate Company of Michigan and the three claims were patented in 1917. The company unsuccessfully attempted to mine the area. By 1930, the mine had become property of Solar Development Company, Ltd. Because the ore contained a high concentration of vanadium. The Solar Development Company did extensive mining, totaling about 3500 feet of underground working with the ore being shipped to the Consolidated Mining Company's mill in British Columbia. The mine closed in early February 1932.

10.2 Site Description

The site is located on private land in Little Canyon, a north branch of Bloomington Canyon. It is about ½ mile north of the Bloomington Canyon road. The mine area consists of one production adit, two small test adits, one exploration trench, three waste dumps, and a wooden building. An intermittent stream channel runs through the site. The stream is dry through the mine area, but begins to flow about a quarter mile downstream. There is a sediment trap across the channel about 50 feet above where surface flow begins comprised of a small weir across the channel capable of holding about two feet of water. The strata in the mine area are overturned and dip 55^{o} westward, as the west limb of a syncline. They strike close to N45^{o} West.

A wood building, possibly from the 30's, stands at the end of the access road. About 150 feet up slope from the building lies an open portal to the production adit/decline. It is located at the Phosphoria-Wells contact and the surrounding rock is strongly oxidized. At the base of the portal is an approximate 15 feet wide and 35 feet long excavated area leading to a well vegetated waste dump composed mostly of oxidized limestone. The dump is approximately 20 feet wide and 10 to 15 feet high.

The majority of the waste rock on the site is located to both sides of the canyon bottom. The intermittent stream bisects the waste. Approximately 80% of the waste is strongly vegetated while the remaining 20% has very little vegetation. Most of the unvegetated material is black shale and most of the vegetated waste is a mixture of lithologies composed mostly of limestone and tan, oxidized shale. The combined waste dump size is approximately 200 long, 150 feet wide and about 10 to 20 feet high. The Course of the intermittent stream channel appears to be cutting into and washing the waste material down stream with evident erosion occurring.

An exploration trench is located approximately 50 feet upslope, to the northwest of the main portal. The trench is about 50 feet long, 10 feet wide and 10 feet deep. It is almost completely covered in grass and runs perpendicular to the strike.

Two small exploration adits are located about 2,000 feet down the canyon (along the strike) from the main portal. They are situated about 175 feet and 350 feet up slope from the canyon bottom. Each adit has very small associated waste dumps, less than 3 cubic yards, and are composed of a mix of oxidized and unoxidized shales. They are poor to moderately vegetated.

10.3 Site Evaluation/Sampling Locations

Ten samples were taken at the site: five soil, two vegetation, one surface water, and two duplicates. The first sample, OS-CMS-SO-01-01, was a background soil sample taken up gradient from the mining activity. It was composed of dark brown to black, dry, "fluffy", organic soil with very little rock material. It was collected in an area of thick sagebrush.

The next sample, OS-CMS-SO-02-01, and its duplicate were taken on the side of a well stratified, eroding black shale waste dump in the stream channel. The sample was collected about 1 foot above the stream channel elevation. The sample was composed of black, high carbon, high sulfide shale.

The next two samples were collected in the dry stream channel approximately 200 feet down gradient of the building site. Sample OS-CMS-SO-03-01 is a soil sample composed of approximately 60% black shale, 20% Quartzite cobbles, and 20% sand. Vegetation sample, OS-CMS-VE-04-01, was taken in the same location of an abundant unidentified grass species.

Three additional samples were collected approximately 200 feet downgradient at the sediment trap. Sample OS-CMS-SO-05-01 is a soil sample from above, but within the sediment trap. It is composed of approximately 90% transported black shale, 5% rounded limestone gravel and 5% sand. Sample OS-CMS-SW-06-01 and OS-CMS-SW-06-02, a duplicate, are surface water samples collected about 60 feet downstream from the sediment trap. The temperature of the water was 6.2°C and the pH was 7.0.

The last two samples were taken approximately 150 feet above the water tank at the confluence of the canyons. Sample OS-CMS-SO-07-01 is a soil sample composed of 20% transported black shale and 80% mix of sandstone and quartzite cobbles. OS-CMS-SO-07-01 was a vegetation sample of an unidentified grass species.

10.4 Analytical Results

Table 10.1 Consolidated Mine Analytical Results in ppm

SAMPLE ID	MEDIA	Cd	Co	Cr	Cu	Ni	Se	V	Zn	Hardness	Species/Type
OS-CMS-SO-01-01	soil	<0.75	9.9	35	20	19	0.49	48	75		Soil
OS-CMS-SO-02-01	soil	390	2.7	1600	200	340	200	6000	3300		Dump
OS-CMS-SO-02-02	soil	380	2.8	1500	200	350	230	6000	3300		DUPLICATE
OS-CMS-SO-03-01	soil	120	2.9	480	60	130	120	1400	1400		Soil
OS-CMS-VE-04-01	vegetation	5.4	<0.12	0.43	14	9	37	0.52	470		Grass
OS-CMS-SO-05-01	SOIL	73	4.4	510	48	100	61	1400	990		Soil
OS-CMS-SW-06-02	surface water	0.001	<.0025	<.0005	<.00013	0.0068	0.024	0.017	0.089	54	Stream
OS-CMS-SW-06-02	surface water	0.0009	<.0025	<.0005	<.00013	0.007	0.021	0.017	0.087	54	DUPLICATE
OS-CMS-SO-07-01	SOIL	410	9.5	1600	220	390	15	6100	3700		Soil
OS-CMS-VE-08-01	vegetation	4.8	0.24	1.2	14	7	27	4.2	410		Grass

10.5 Risk Evaluation

The Consolidated Mine supports moderate volumes of waste and exhibits significant erosion problems. Shales were visibly present in the swales and creek bed leading to Bloomington Creek. Surface water, soil and vegetation samples all show exceedances of the Area Wide action levels.

10.6 Conclusion and Recommendations

The Agencies will conduct surface water sampling of Little Canyon Creek and Bloomington Creek during the spring of 2004 to evaluate site releases. The Agencies are recommending additional actions at the site in the form of further site investigation, waste consolidation, erosion controls, and reclamation improvements. The appropriate mineral extraction Agency will investigate funding mechanisms for implementing further actions.

Consolidated Mine also has an open adit and several buildings that may present public risks and should be addressed by the managing Agency.

11.0 BLOOMINGTON CANYON MINE

11.1 Site History

Bloomington Canyon Mine is located in Bear Lake County, Idaho in Section 21 of Township 14 South, Range 43 East. The site is located on private land owned by Earth Sciences, Inc. and leased by Ray McKay Bateman. ESI and the Bateman family granted site access for the screening activity.

Initially described in 1911 by Richards and Mansfield, there were several small prospects in the phosphatic shales. The site saw little activity, even during operations in the 1930's at the Consolidated Mine about a mile away. Several declines to the ore bearing zones were opened during Wyodak Coal's vanadium exploration in 1942 and 1943. Their T14S decline was approximately 741 in length.

In November 1961, the Ruby Company (Simplot Co.) applied for and was later granted a phosphate mining lease (I-012982). Little was done until 1972, when Earth Sciences, Inc. (ESI) did some preliminary exploration work. The Ruby Company sold their lease to ESI in 1973. In 1973 and 1974, the exploration tunnels were extended for production and in 1975 a new decline was constructed. Approximately 2,700 feet of drift were constructed by the project's end. From 1973 through 1975, the high vanadium, phosphate ore was being shipped to a plant in Wyoming.

In 1984, the federal mining lease was sold to the Conda Partnership. They did no work on the property and the lease was returned to ESI in 1993, at which point ESI reclaimed the portal area.

11.2 Site Description

The interagency sampling team conducted a site inspection under a limited access agreement with Earth Sciences Inc. signed April 1st, 2002. The site inspection also required a limited access agreement from Ray McKay Bateman signed on April 7th, 2002 for trespass rights on surrounding privately owned properties.

The Bloomington Canyon Mine is located on the south-facing slope of Bloomington Canyon about one mile west of Bloomington, Idaho. The solely underground operation consists mainly of two open declines about 200 feet apart, one large contoured waste dump and a reclaimed road. Bloomington Creek flows from west to east within about 200 feet of the waste dump.

The waste dump is large; several hundred feet from east to west and about 200 feet from north to south. The thickness is difficult to determine but is estimated to be relatively thin; less than 15 feet. The waste dump has been contoured to the slope. The access road from the west has also been contoured to slope. The east half of the waste dump is moderately vegetated and composed of a mixture of Phosphoria Formation lithologies. The west half of the dump has almost no vegetation and is composed of mainly black shale. The majority of this area is being strongly eroded.

A stone and earth berm separates the waste dump from the Bloomington Canyon Road. Migration of black shale washing over the berm and into the road is evident.

There are three declines at the mine: the centrally located T14S vanadium tunnel, the 1974 tunnel, and the 1975 tunnel. The T14S tunnel has been dozed closed and is no longer evident. It appears that at one time, both the 1974 and 1975 tunnels had been closed, although both tunnels are currently open enough for human entry. The 1974 tunnel opening is about 2 feet in circumference and the 1975 tunnel opening is about 4 feet in circumference.

East of the site comprises a small drainage that runs past the site and into Bloomington Creek. Directly south of the site, there is a culvert that runs under the road and into Bloomington Creek.

11.3 Site Evaluation/Sampling Locations

Eight samples were collected at the Bloomington Canyon Mine Site; four soil samples, three vegetation samples, and one duplicate soil sample. A soil and vegetation sample were taken at the top of the dump. The soil sample, OS-BLO-SO-01-01, was composed of about 70% black shale and 30% tan sandstone and limestone. The vegetation sample, OS-BLO-VE -02-01, was of Bitter Brush.

Samples OS-BLO-SO-03-01 and OS-BLO-VE -04-01 were taken southwest of the dump, between the berm and Bloomington Canyon Road. The area was highly vegetated with sagebrush. The soil sample was composed of brown, dry, "fluffy", organic soil with about 10% rounded gravel. Western Yarrow was collected for the vegetation sample.

The next two samples were collected in the drainage east of the waste dump and below the berm. The soil sample, OS-BLO-SO-05-01, was composed of 30% brown soil, 20% brown clay, and 50% well rounded carbonate gravel. A duplicate sample, OS-BLO-SO-05-02, was also collected. Wild Geranium was collected as vegetation sample OS-BLO-VE -06-01.

The final sample was a soil sample taken from across the road at the mouth of the culvert, approximately thirty feet north of the stream edge. The soil sample, OS-BLO-SO-07-01, was composed of dark brown to black, highly organic, clay rich soil.

11.4 Analytical Results

Table 11.1 Bloomington Canyon Mine Analytical Results in ppm

SAMPLE ID	MEDIA	Cd	Co	Cr	Cu	Ni	Se	V	Zn	Hardness	Species/Type
OS-BLO-SO-01-01	SOIL	77	5.6	790	84	93	14	1000	590		Dump
OS-BLO-VE-02-01	vegetation	2.7	0.38	13	9.2	8.4	7.6	17	98		Bitter Brush
OS-BLO-SO-03-01	SOIL	7	10	140	27	28	1	100	110		soil
OS-BLO-VE-04-01	vegetation	0.99	0.3	1.3	16	<2.0	0.77	1.2	22		Western Yarrow
OS-BLO-SO-05-01	SOIL	14	9.3	140	24	55	2.8	130	330		soil
OS-BLO-SO-05-02	SOIL	13	8.6	130	22	51	4.3	130	290		DUPLICATE
OS-BLO-VE-06-01	vegetation	0.42	0.26	1.8	13	3.4	4.2	2.3	39		Geranium
OS-BLO-SO-07-01	SOIL	130	4	830	93	140	59	1500	1200		soil

11.5 Risk Evaluation

Bloomington Canyon supports moderate volumes of mining wastes and exhibits significant erosion problems. Sampling indicates transport of contaminants to soil and vegetation, which exceed Area Wide action levels, and the site drains to Bloomington Creek and its associated riparian areas.

11.6 Conclusion and Recommendations

The Agencies will conduct surface water sampling of Bloomington Creek during the Spring of 2004 to evaluate site releases. The Agencies are recommending additional actions at the site in the form of waste consolidation, erosion controls, and reclamation improvements. The appropriate mineral extraction Agency will contact the site owners and investigate funding mechanisms for implementing further actions. Bloomington Canyon also has two open adits that may present public risks and should be addressed by the appropriate land management agency.

PARIS CANYON MINE

12.1 Site History

The Paris Canyon Mine is located in Bear Lake County, Idaho in Section 8 of Township 14 South, Range 43 East. The site is located on private lands. Originally discovered because of erosion caused by a breached ditch in 1913, the phosphate bed laid on property owned by Margarette Grandi. Leo W. Bach opened three prospects, and by 1915 ore was being shipped to Los Angeles and the Anaconda Copper Company for testing purposes. The development of the mine started in 1917 by the newly formed Western Phosphate Mining and Manufacturing Company who was shipping ore to fertilizer companies in Hawaii, Japan, and California in 1918. About 60,000 tons of phosphate ore had been produced at the mine by the end of 1919.

The operation grew to the point of requiring a mill on-site. The mill could facilitate 300 tons of ore/day; it is unclear if it was ever used to its full capacity. There was also a bunkhouse and mess hall, and the mine employed several hundred people. By the end of 1920 the mine was reported to be 2,000 feet long with 53 different stopes.

After 1920, the phosphate market began to fluctuate and the mine opened and closed with the demands of the market. In 1921 the Western Phosphate Company went bankrupt and the Paris Canyon Mine was sold to the Idaho Phosphate Company. It operated intermittently through the 1920s and 1930s, but in 1942, the Metals Reserve Company confiscated much of the rail workings for the war effort and the mine permanently closed, however, additional site activities were conducted at the site under the auspices of the Wyodak Coal Mining site described in Section13.0.

In 1957, after the Wyodak site explorations, Potash Company of America did further experimental work though no production occurred. The current owner, Earth Sciences Incorporated (ESI), acquired the site in 1973. Apparently, a special use permit was applied for in 1994 for the shipment of 50 loads of phosphate ore to Carlson Food, LTD. of Canada for testing and market studies. However, it is reported that the work and ore shipments never occurred.

12.2 Site Description

The Interagency sampling team inspected the site under a limited access agreement with Earth Sciences Inc. signed on April 1, 2002 with special instructions to notify Eric Madsen, grazing lessee, for site access 48 hours prior.

Paris Canyon Mine is located on both slopes of Paris Canyon approximately 2 ¼ miles west of Paris, Idaho. The stratigraphy strikes to the north, is overturned, and dips moderately to the west. The south side of the canyon, from the mine westward, is covered in glacial till.

The mine consists of: two production adits, one north of Paris Creek and one to the south; approximately five waste dumps; and a large complex of platforms and foundations. Both adits are still open to entry. The south portal/adit is approximately thirty feet up slope from the canyon road. Brickwork and concrete foundation material abound just below the portal. Historically there was a large mill and tram system in this location. Approximately 15 feet down slope from the adit is the largest waste dump. The toe of the dump runs almost to the east bank of the Paris Creek, stopping approximately three feet short. It is composed of various Phosphoria Formation lithologies.

Approximately 200 feet north of the adit, there are two small black shale waste dumps. The first, south of the road, is cut by and is eroding into the Paris Canyon Road. It is approximately 15 feet wide and 20 feet tall. On the north side of the road is the second waste pile. It is conical in shape, approximately thirty feet in diameter and 15 feet tall. It runs to within 20 feet of Paris Creek. There is no vegetation growing on northern waste dump, and vegetation only on the flat surfaces of the southern waste dump.

On the north side of Paris Creek, through a cow corral, is the second production portal/adit. The adit is approximately 100 yards up slope and to the west of the creek. It is partially collapsed, but still easily accessible for human entry. Below the portal, there are two terraces that appear to be made partially of wastes, or just cut into the slope. There is ample evidence of foundations, wood and iron workings on the terraces. There is a small, black shale waste dump approximately fifty feet to the north, down slope from a dozer cut. The cut appears to be exploratory in nature. The entire mine area is on a plateau where the historical buildings once stood.

About 100 yards south of the main portals, on the north-facing slope, there are several platform areas cut into the hill. They appear to be building sites related to the mine.

12.3 Site Evaluation/Sampling Locations

Seventeen samples were collected at the Paris Canyon Mine site: six surface water samples, four soil samples, three stream sediment samples, two vegetation samples, one rinseate sample, and one duplicate surface water sample. The first sample, OS-PAR-SO-01-01, was a soil sample collected from the riparian zone between the main waste pile (south portal) and Paris Creek. The area was highly vegetated and located in the Paris Creek flood plain.

The next sample was taken about 200 feet north of the south portal. A surface water sample, OS-PAR-SW-02-01, was collected from runoff that had apparently run through or off of a black

shale waste dump and collected in the roadway. The pH of the water was 7.8 and the water temperature was 11°C.

The next two samples were collected between a small black shale dump and Paris Creek. They were located about 15 feet south of, and within the floodplain and riparian zone of the creek. Sample, OS-PAR-SO-03-01, was a soil sample composed of black, organic soil. Dandelions were collected for the vegetation sample, OS-PAR-VE-04-01.

Sample number OS-PAR-SO-05-01 is a soil sample taken directly from the side of the same waste dump as 03-01. It was composed of nearly 100% coarse and fine black shale material.

The next two samples were taken from Paris Creek about 100 feet down stream from the mining activity. Sample OS-PAR-SW-06-01 was a surface water sample taken from the Paris Creek. The pH of the water was 8.6 and the temperature was 7.5°C. Sample number OS-PAR-SE-07-01 was a sediment sample from the bed of Paris Creek at the same location as the water sample. It was pulled from the upper end of a gravel bar in the middle of the creek. The gravel and sand consisted of quartzite, chert, and limestone.

Sample number OS-PAR-SW-08-01 was a surface water sample taken from the Paris Creek at the Caribou National Forest Service boundary, approximately 2 miles upstream from the mine site. The purpose of sampling at the forest boundary was to determine baseline levels above the mining activity. The pH of the water was 8.4 and the temperature was 6.0°C. Sample number OS-PAR-SE-09-01 is a sediment sample from the bed of Paris Creek at the same location as the water sample.

The next four samples were collected from a spring/seep area between the north portal and Paris Creek. The springs emerge two terraces below the portal at the creek level. Sample number OS-PAR-SW-10-01 was a surface water sample taken from a spring with a pH of 7.3 and temperature of 6.2°C. Sample number OS-PAR-SW-11-01 was a surface water sample taken from another spring located about 30 feet south. The pH of the water was 7.3 and the temperature was 6.6°C. Sample number OS-PAR-SW-11-02 is a duplicate water sample of 11-01. Sample number OS-PAR-SO-12-01 is a soil sample taken at the same location as sample number 11-01. The sample was composed of rocky brown soil with the mineralized portion consisting of approximately 80% chert, 15% quartzite, and 5% shale. Indian Rice Grass was collected as vegetation sample number OS-PAR-VE-13-01 from the same area.

Sample number OS-PAR-SW-14-01 is a QA rinseate water sample collected from the sampling equipment. Sample number OS-PAR-SW-15-01 is a surface water sample taken from Paris Creek approximately 1/3 of a mile downstream from the mine and 75 feet upstream from the powerhouse. The pH of the water was 8.5 and the temperature was 5.0°C. A sediment sample, OS-PAR-SE-16-01, was taken from the same location. The sample location was 90% quartzite boulders and gravel, and no shale was observed.

12.4 Analytical Results

When the lab results were received, there were analyses in the package for OS-CMS-VE-13-01. There were only 8 samples taken at the Consolidated Mine. No results were returned for Paris vegetation sample OS-PAR-VE-13-01, which was on the chain of custody sheet. This was concluded to be a clerical error, therefore, the CMS results for VE-13-01 were transcribed to the appropriate PAR result.

Three sediment samples were taken at the Paris Canyon Mine: OS-PAR-SE-07-01, OS-PAR-SE-09-01, OS-PAR-SE-16-01. Analytical results were received for OS-PAR-SE-01-01, OS-PAR-SE-016-01, OS-PAR-SE-17-01. In the labeling system, slashes were used through zeros so they would not be confused with the "O"s. Thus, the results for "17" were assumed to be the results for "07". Based on review of the chain of custody legibility, the results for "01" were assumed to be the results for "09".

Table 12.1 Paris Canyon Mine Analytical Results in ppm

SAMPLE ID	MEDIA	Cd	Co	Cr	Cu	Ni	Se	V	Zn	Hardness	Species/Type
OS-PAR-SO-01-01	Soil	3.5	7.9	93	25	33	0.94	63	170		Soil
OS-PAR-SW-02-01	surface water	0.11	<.0025	0.0015	0.0002	0.021	0.11	0.74	0.42	398	Small Pond
OS-PAR-SO-03-01	Soil	25	7.7	140	27	61	6.4	240	570		Soil
OS-PAR-VE-04-01	vegetation	4.6	0.45	2	16	3	3.2	2.7	120		Dandelion
OS-PAR-SO-05-01	Soil	300	4.5	1500	180	660	75	3700	6600		Dump
OS-PAR-SW-06-01	surface water	<.00013	<.0025	<.0005	<.00013	<.00013	<.001	0.00052	0.011	133	Stream
OS-PAR-SE-07-01	stream sedim.	2.5	2.4	30	5.1	13	0.57	30	68		Stream Sediment
OS-PAR-SW-08-01	surface water	<.00013	<.0025	<.0005	<.00013	<.00013	0.002	0.00047	0.006	147	Stream
OS-PAR-SE-09-01	stream sedim.	<0.75	1.7	14	8.4	28	0.52	22	22		stream sediment
OS-PAR-SW-10-01	surface water	0.0005	<.0025	0.0006	0.0003	<.00013	<.001	0.0016	0.008	51	Spring/Stream
OS-PAR-SW-11-01	surface water	0.0001	<.0025	<.0005	<.00013	<.00013	<.001	0.0012	0.008	41	Spring/Stream
OS-PAR-SW-11-02	surface water	<.00013	<.0025	<.0005	<.00013	<.00013	<.001	0.0008	0.007	41	DUPLICATE
OS-PAR-SO-12-01	Soil	1	6.5	27	13	15	0.43	33	67		Soil
OS-PAR-VE-13-01	vegetation	<0.4	0.2	0.54	9.7	<2.0	0.24	0.57	27		Indian Rice Grass
OS-PAR-SW-14-01	rinseate	0.0004	<.0025	<.0005	0.22	0.0004	<.001	0.0007	0.075	1	Quality Assurance
OS-PAR-SW-15-01	surface water	<.00013	<.0025	<.0005	<.00013	<.00013	0.003	0.0003	0.006	139	Stream
OS-PAR-SE-16-01	stream sedim.	2.6	2.7	36	6.2	16	1.1	34	56		Stream Sediment

12.5 Risk Evaluation

Paris Canyon supports small volumes of mine waste but shows significant erosion and disturbances, including a road cut through an existing waste rock dump. Sampling indicated a minimal amount of migration to surrounding surface water features although waste deposition is evident.

12.6 Conclusions and Recommendations

The Agencies will conduct surface water sampling of Paris Creek during the Spring of 2004 to evaluate site releases. The Agencies are recommending additional actions at the site in the form of waste consolidation, erosion controls, and reclamation improvements. The appropriate mineral extraction Agency will contact the current owner and investigate funding mechanisms for implementing further actions.

Paris Canyon Mine also has an open adit that may present public risks and should be addressed by the managing Agency.

13.0 WYODAK COAL

13.1 Site History

Wyodak Coal's exploration activity is located in sections 5, 8, 9, 16, 17, 21, and 22 of Township 14 South and Range 43 East and encompasses some of the area of other regional mine activities. Metals Reserve Company, a subsidiary of Reconstruction Finance Corporation, was organized in 1940, and in 1942, contracted Wyodak Coal & Manufacturing Company, a subsidiary of Homestake Mining Inc., to explore, develop and operate a vanadium mine in the Phosphoria Formation in the Paris-Bloomington area. By the end of 1942, Wyodak Coal had either purchased or leased approximately 2,000 acres of land in the area.

Exploration began early in the spring of 1943 and consisted of trenching, extending current underground workings, and driving an exploration adit located at what is now the Bloomington Mine. At the Paris Canyon discovery area, a new adit was driven parallel to the original for geologic sampling. The Consolidated Mine area was re-sampled and the main decline was extended. The Paris Canyon Mine was significantly advanced and trenches were constructed along the strike of the Phosphoria Formation. By the end of exploration efforts, there were over 3,000 feet of exploration drifts driven and thirty new trenches were constructed.

A comprehensive exploration and development report was delivered to the Metals Reserve Company in January of 1944. No subsequent vanadium production took place and the Metals Reserve Company was dissolved in 1945. Reconstruction Finance Corporation was subsequently dissolved in 1957.

13.2 Site Description

Wyodak Coal's exploration activity is located along the strike of the Phosphoria Formation from about ½ mile north of Sleight Canyon through to the north wall of Bloomington Canyon. The surface work consisted of various trenches 3 to 18 feet wide, 5 to 165 feet long, and 5 to 22 feet deep. Trenching identification was difficult due to the inclement weather of early spring and the thick cover of Tertiary and Quaternary deposits.

The majority of the trenches were inspected and logged in other site inspections. Trench 11N was part of the Bear Lake Mine assessment. Trenches 1, 2, and 3 North are part of the Paris Canyon Mine assessment. Trenches 1 and 2 South were also part of the Paris Canyon Mine assessment. Trenches 7 and 8 South are part of the Consolidated Mine assessment. Trenches 12,

13, and 14 were part of the Bloomington Mine assessment. Only Trenches 3, 4, 5, and 6 South were included in this [Wyodak Coal Exploration] assessment.

13.3 Site Evaluation/Sample Locations

Two samples were taken from the Wyodak Coal exploration trenches. Both samples were located between the Paris Mine and the top of the ridge to the south. Sample OS-WYO-SW-01-01 was a surface water sample from a water filled trench [pond]. The water had a pH 8.68 and a temperature of 7.8^{o}C. This trench was excavated in a reddish-brown sandy glacial till material.

The second sample, OS-WYO-SO-02-01, was of soil composed of sandy oxidized glacial till material taken from a local trench that drains a large, 125 feet by 200 feet, excavated area where the Quaternary deposits were removed with a dozer or other equipment. This excavated area contains two parallel trenches that cut the base of the Rex Chert and are just 1-2 feet deep and about 80 feet long. The soft, unconsolidated sands of this excavated area are eroding rather easily.

With the exception of the above-mentioned excavated area, most of the trenches observed were well vegetated and very stable. Overall, erosion is not a problem with the trenches.

13.4 Analytical Results

Table 13.1 Wyodak Coal Analytical Results in ppm

SAMPLE ID	MEDIA	Cd	Co	Cr	Cu	Ni	Se	V	Zn	Hardness	Species/Type
OS-WYO-SW-01-01	Surface water	<.00013	<.0025	<.0005	<.00013	0.0013	<.001	0.00089	0.008	19	Pond
OS-WYO-SO-02-01	soil	<0.75	3.8	15	5.5	7	0.14	14	13		Soil

13.5 Risk Evaluation

The Wyodak Coal site operations consisted primarily of exploratory trenching that generated little waste material and no observable shales. The site is very stable and appears not to present any ecological risks. Soil and surface water samples are below the Area Wide action levels.

13.6 Recommendations

Based on site inspection and sampling results, the Agencies recommend no further action at the Wyodak Coal site at this time.

14.0 GEORGETOWN CANYON MINE (RIGHT FORK)

14.1 Site History

This mine is located in section 12 of Township 11 South and Range 44 East and is on private, patented land. There is little historic data currently available on this site and no record of lease operations. Carl Stoddard of Georgetown gave the following brief historic overview to Boyd Cook of the Idaho Department of Lands.

> "In 1908, Robert Sheilds of Salt Lake City opened up the phosphate mine in the Righthand Fork of Georgetown Canyon for the Utah Fertilizer Company. Later, they sold to a Syndicate Phosphate Company of Los Angeles. Wilford Hayes worked for these companies from 1911 to 1920 as a caretaker. Then Central Farmers bought the land in 1947."

This site may have been developed in conjunction with the Georgetown Canyon Mine exploration activities.

14.2 Site Description

The site is located approximately three miles from the Forest Service boundary in the Righthand fork of Georgetown Canyon. The site is small and heavily timbered. It consists of a collapsed shaft/decline, a black shale waste dump, and a wooden cabin constructed on the waste dump.

The shaft is located in the access road at the base of a road-cut. It is 5 to 6 feet in diameter and maybe 6-8 feet deep. It has collapsed, but may continue further as a decline into the lower Phosphoria Formation.

The waste dump is located down the slope, approximately 50 feet southeast of the shaft. It cannot be easily seen from the road. It is about 40 feet wide and possibly 15-20 feet tall. The dump is composed mostly of black shale and is being revegetated by Douglas Fir and Aspen. The volunteer trees are estimated to be about 20 years old.

A wood cabin with a metal roof is located on top of the dump and at the base of the dump, on the east side, is a small pile of metal cans. The cabin too is difficult to see from the road. It appears to get occasional use, possibly during hunting season.

14.3 Site Evaluation/Sample Locations

Three samples were taken at the mine site. The first sample, OS-GCM-SO-01-01, was a soil sample taken from the side of the waste dump. The sample was composed of almost 100% black shale with very little clay or fine material.

The second two samples were taken from the same location, approximately 25 feet down slope and to the east of the waste dump. The soil sample, OS-GCM-SO-02-01, was composed of brown rocky soil with abundant roots. There was very little clay. Wild strawberry was collected as the vegetation sample, OS-GCM-VE-03-01.

14.4 Analytical Results

Table 14.1 Right Fork Georgetown Canyon Analytical Results in ppm

SAMPLE ID	MEDIA	Cd	Co	Cr	Cu	Ni	Se	V	Zn	Hardness	Species/Type
OS-GCM-SO-01-01	SOIL	110	3.3	670	72	130	16	1300	800		Waste Dump
OS-GCM-SO-02-01	SOIL	31	4.2	490	45	110	10	340	590		Soil
OS-GCM-VE-03-01	vegetation	3.7	0.13	12	8.7	6	4.1	4.5	180		Strawberry

14.5 Risk Evaluation

The Right Fork of Georgetown Canyon Mine Site exhibits small waste volumes and a potential for some migration. However, the small area of impact is not likely to present ecological concerns. The site appears to be located on patented land owned by Nu-West Industries, Inc. A small hunting cabin is located at the site and appears to support frequent recreational visitors.

14.6 Recommendations

The Agencies recommend that this site be evaluated as a component to DEQ's Administrative Order on Consent for Nu-West's Georgetown Canyon site investigation. The site also has a partially open adit that should be addressed as part of that activity.

15.0 SULFUR CANYON EXPLORATION

15.1 Site History

The Sulfur Canyon Exploration area is located in Section 20 of Township 9 South, Range 43 East. The Site is on private, patented land owned by J.R. Simplot Company. No production occurred from the area the assessment team inspected.

15.2 Site Description

The site is accessed via the South Fork of Sulfur Canyon approximately 7 miles east of Soda Springs, Idaho. The site consists of four trenches and three black shale dumps. The local stratigraphy dip gently, about 25^{o}, to the east-northeast. Most of the Phosphoria Formation has been removed and only the basal contact with the Wells Limestone remains. About half of the area is bare limestone outcrop and the other half is well vegetated with grass and sage brush.

The eastern two trenches are in the vegetated portion of the site. The spoils lie along the sides of the trench and are well vegetated. Surfaces appear stable, there are no black shales and there is no evidence of erosion.

The western two trenches are shallow and bottom in limestone. Each has an associated black shale dump less than several cubic yards in volume.

Across the canyon to the north, the next ridge shows the same geology and has one trench visible. This trench was not visited.

15.3 Site Evaluation/Sample Locations

Six samples were taken at the site: three vegetation samples, two soil samples, and one duplicate soil sample. The first two samples were both collected on the north end of the site, down in a drainage, between two black shale dumps. Sample OS-SUL-SO-01-01 was a soil sample composed of dark brown to black, rocky, organic soil. The rock material was a mix of black shale and tan oxidized shale. A bunch grass was collected as vegetation sample OS-SUL-VE-02-01.

The next two samples collected were located on a black shale dump on the southwest corner of the site. The soil sample, OS-SUL-SO-03-01, was composed of almost 100% black shale and

black shale fines. A duplicate of this sample was collected as sample number OS-SUL-SO-03-02. Lupine was collected for the vegetation sample, OS-SUL-VE-04-01.

The last sample was located in the relatively undisturbed central portion of the site. The sample area was covered with grass and sagebrush. A sedge grass was collected for vegetation sample OS-SUL-VE-04-01.

15.4 Analytical Results

Table 15.1 Sulfur Canyon Exploration Analytical Results in ppm

SAMPLE ID	MEDIA	Cd	Co	Cr	Cu	Ni	Se	V	Zn	Hardness	Species/Type
OS-SUL-SO-01-01	Soil	35	5.4	910	110	250	46	400	900		Soil
OS-SUL-VE-02-01	vegetation	0.94	0.18	14	11	30	1.5	4.4	210		Bunch Grass
OS-SUL-SO-03-01	Soil	110	2	740	84	210	13	1800	1200		Ore Dump
OS-SUL-SO-03-02	Soil	120	1.9	850	88	250	14	2000	1300		Duplicate
OS-SUL-VE-04-01	vegetation	2.5	0.21	25	7.1	16	1.3	39	140		Lupine
OS-SUL-VE-05-01	vegetation	1.1	0.17	10	14	7.5	2.4	1.9	50		Sedge Grass

15.5 Risk Evaluation

The Sulfur Canyon Mine site supports small volumes of wastes generated primarily through trenching. The dump is located on a natural outcrop of the Phosphoria Formation and slopes appear to be stable with little evidence of erosion. No surface water is present at the site, although some invasive weeds were observed.

15.6 Recommendations

Based on site inspection and sampling results, the Agencies recommend no further action at Sulfur Canyon Mine site at this time. However, weed control activities may be beneficial.

16.0 CONCLUSIONS AND RECOMMENDATIONS

The DEQ, BLM, USFS and IDL conducted preliminary assessments of orphan mine sites in the Southeast Idaho Phosphate Mining Resource Area. Of the fourteen sites evaluated, five sites resulted in a No Further Action recommendation by the Agencies. The NFA sites were:

- Bear Lake Mine,
- Rattlesnake Canyon Mine,
- Swan Lake Gulch,
- Wyodak Coal site,
- and, Sulfur Canyon Exploration site.

Two sites were recommended for integration into pending site-specific investigation (SI) activities by the Agencies and mining companies. These sites were:

- Diamond Gulch Mine to be included in the USFS/Rhodia Wooley Valley SI,
- and, the Right Fork Georgetown Canyon Mine to be included in the DEQ/Nu-West Georgetown Canyon SI.

The remaining seven sites were recommended for additional sampling, and/or waste consolidation, erosion control and reclamation improvements. These sites were:

- Bennington Canyon Mine,
- Home Canyon Mine,
- Waterloo Mine,
- Hot Springs Mine,
- Consolidated Mine,
- Bloomington Canyon Mine,
- and, Paris Canyon Mine.

Additionally, six sites were identified for safety concerns and recommended for adit, portal, and/or collapsed shaft inspections and closure improvements. These sites were:

- Rattlesnake Canyon Mine,
- Home Canyon Mine,
- Consolidated Mine,
- Bloomington Canyon Mine,
- Paris Canyon Mine,
- and, East Fork Georgetown Canyon Mine.

The Agencies are planning to conduct additional surface water sampling activities during the Spring of 2004 at sites adjacent to perennial streams to assess potential site releases during seasonal runoff. The identified sites are;

- Home Canyon Mine-Montpelier Creek,
- Waterloo Mine-Montpelier Creek,
- Consolidated Mine-Little Canyon and Bloomington Creeks,
- Bloomington Canyon Mine-Bloomington Creek,
- and, Paris Canyon Mine-Paris Creek.
- Hot Springs Mine-Refuge Pathways to be sampled by Rhodia.

Upon completion of the site-specific evaluations, the appropriate Lead Agency representatives will initiate discussions with land managers and site owners, where applicable.

17.0 REFERENCES

1. *Orphan Mine Site Screening; Sampling and Analysis Plan*, Idaho Department of Environmental Quality, April 19, 2002
2. *A History of Phosphate Mining in Southeastern Idaho,* USGS Open File Report 00-425, William H. Lee, 2001
3. *Area Wide Human Health and Ecological Risk Assessment,* TetraTech EMI, 2002
4. *State and Federal Phosphate Leases Databases,* from IDL, BLM and FS as of 2002
5. *Area Wide Investigation Scope of Work; Southeast Idaho Phosphate Mining Resource Area,* Idaho Department of Environmental Quality, March 2001
6. *Draft Field Notes and Analytical Data from Previous Preliminary Assessment Activities in Southeast Idaho,* BLM, Lucinde Eslick, 2000
7. *Area Wide Risk Management Plan,* Idaho Department of Environmental Quality, May 2004

FIGURES

Figure 1: Southeast Idaho Phosphate Mining Resource Area

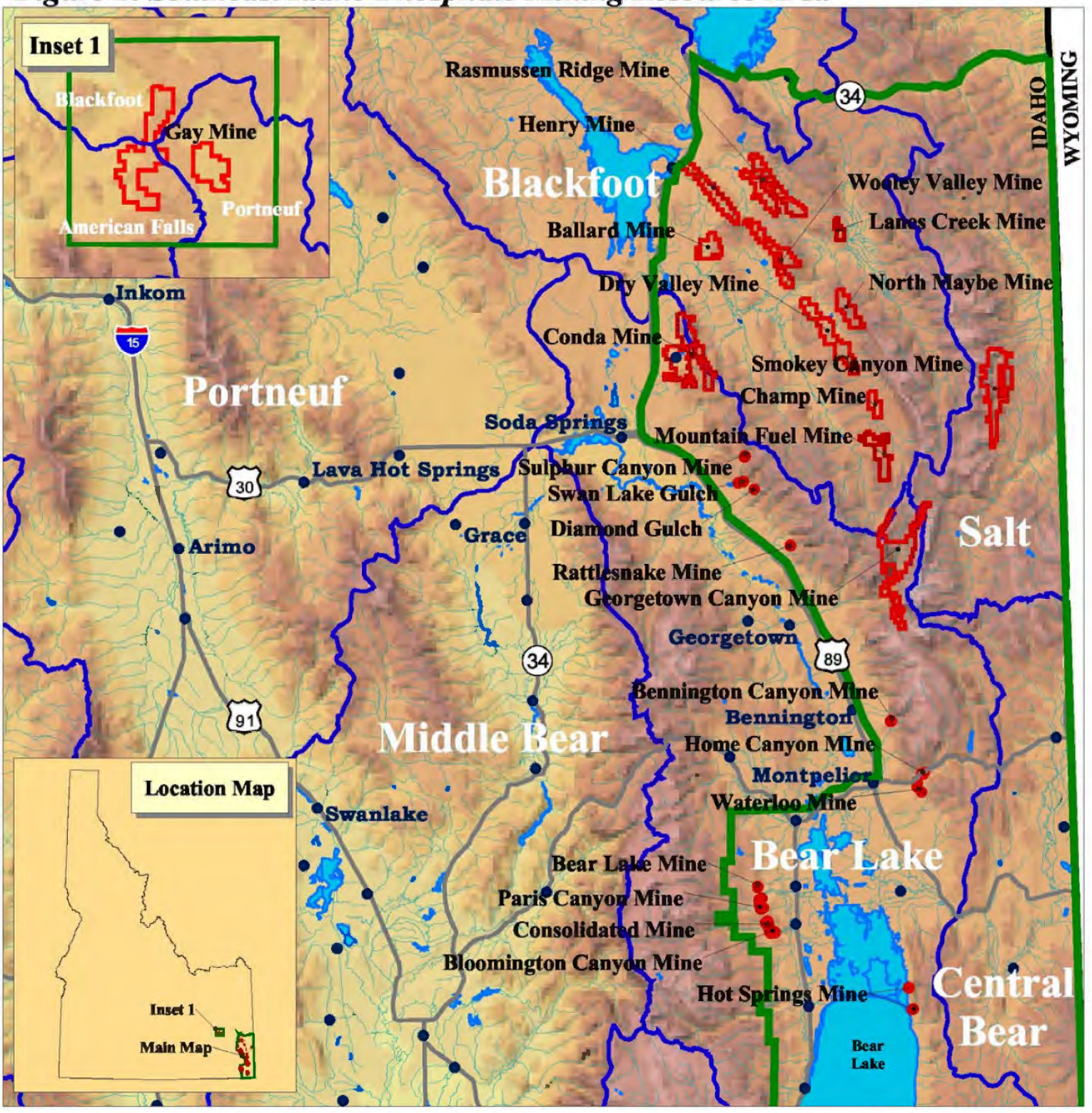

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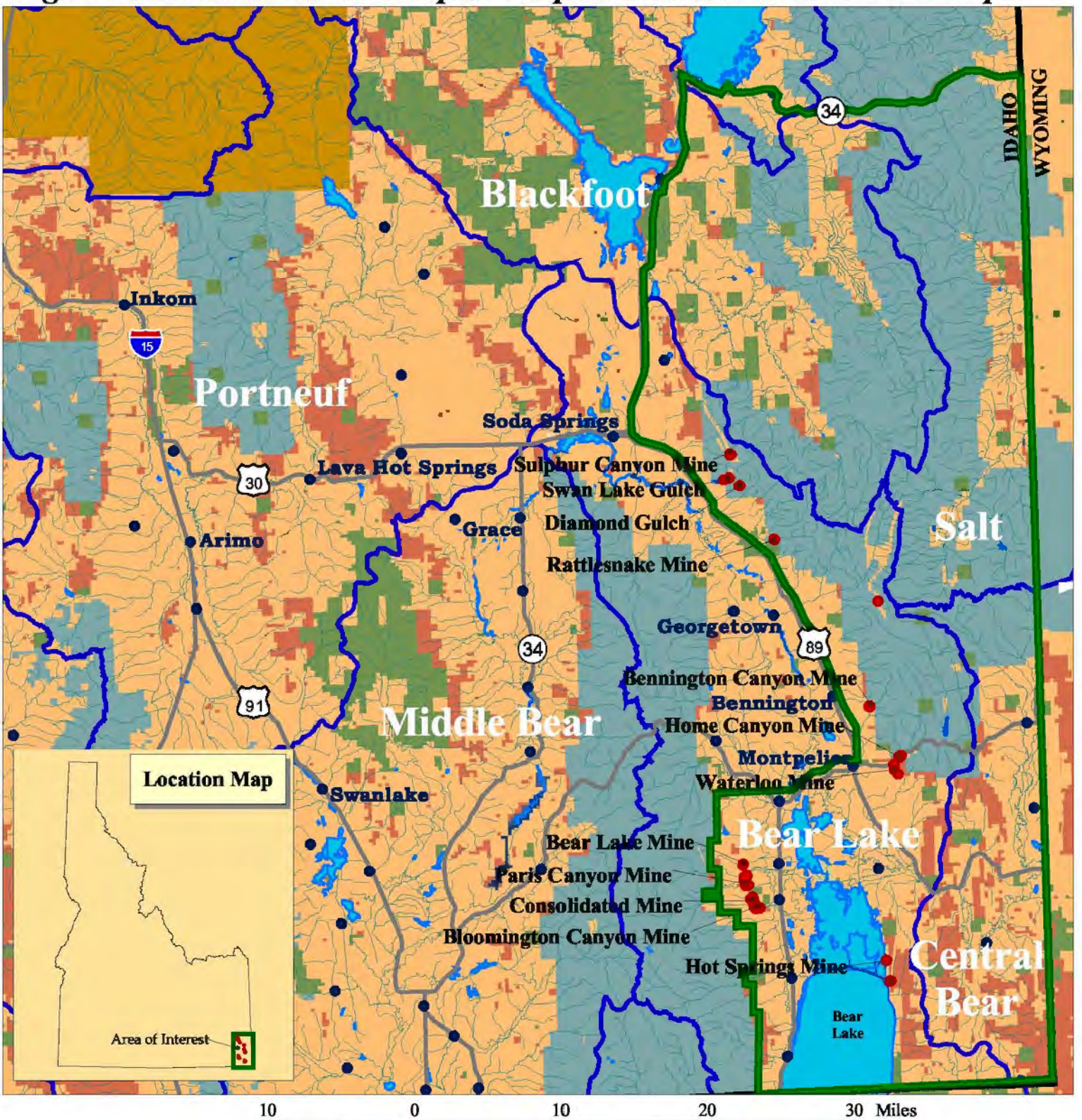
Figure 2: Southeast Idaho Phosphate Orphan Mines and Land Ownership



Explanation

- Resource Area Boundary
- Watershed Boundaries
- Lakes
- Orphan Mine Sites
- Towns
- Streams
- Major Roads

Land Ownership

- BLM
- BOR
- NPS
- Private Land
- State Land
- Tribal Land
- USFWS
- USFS

March 30, 2004

N

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IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY

Appendix 1

GPS LOCATIONS

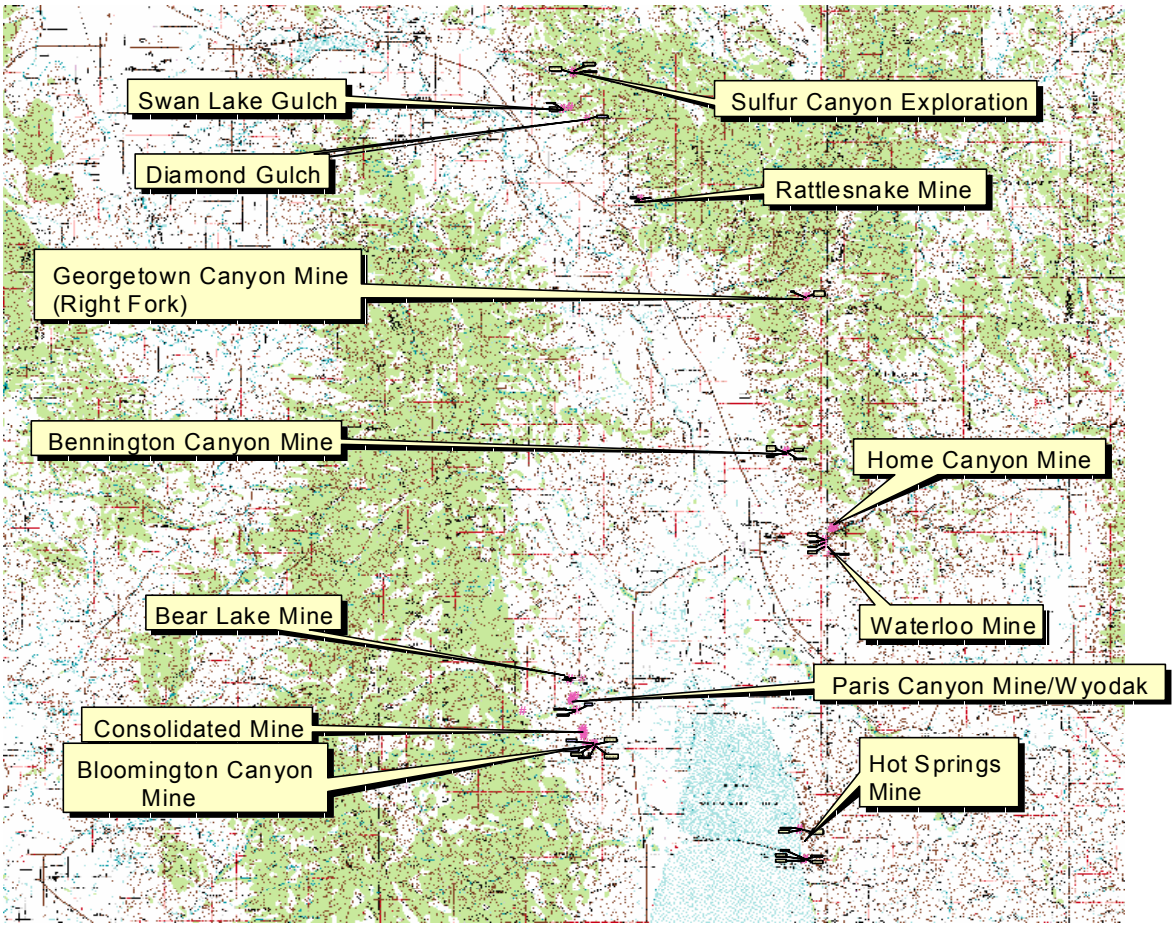

Figure 1.1
Project location map

Table 1.2 Orphan Mine site features with GPS coordinates in UTM

Mine	Feature	Garmin			Trimble Geo 3		
		Easting	Northing	Elev.	Easting	Northing	Elev.
Rattlesnake Mine	OS-RSM-SO-01-01	467584.74	4710687.92	6561			
Rattlesnake Mine	OS-RSM-VE-02-01	467584.74	4710687.92	6561			
Rattlesnake Mine	East Adit	467590.44	4710676.79				
Rattlesnake Mine	Outhouse/Sinkhole	467630.65	4710673.27				
Bear Lake Mine	OS-BLM-SO-01-01	462914.00	4675092.14	6319	462910.94	4675095.09	
Bear Lake Mine	OS-BLM-SO-02-01	462900.69	4675071.12	6280	462898.84	4675065.79	
Bear Lake Mine	Collapsed Portal	462933.30	4675153.11	6346	462931.27	4675151.23	
Bear Lake Mine	Dozer Cut East End	462934.26	4675178.65	6365	462937.26	4675181.76	
Bear Lake Mine	Dozer cut West End	na	4675173.29	6374	462921.69	4675179.58	
Swan Lake Gulch	OS-SLG-SO-01-01	462378.89	4717379.07				
Swan Lake Gulch	OS-SLG-VE-02-01	462378.89	4717379.07				
Swan Lake Gulch	OS-SLG-SW-03-01	462378.89	4717379.07				
Swan Lake Gulch	OS-SLG-SO-04-01	462378.89	4717379.07				
Swan Lake Gulch	OS-SLG-SO-05-01	462950.68	4717549.20				
Swan Lake Gulch	OS-SLG-SO-05-02	462950.68	4717549.20				
Swan Lake Gulch	Waste Dump (main area)	462383.00	4717382.37	6244			
Swan Lake Gulch	Waste Dump (east area)	462950.68	4717549.20				
Diamond Gulch Mine	OS-DIG-VE-01-01	464027.13	4716665.16				
Diamond Gulch Mine	OS-DIG-SO-02-01	464027.13	4716665.16				
Bennington Canyon Mine	OS-BMS-SO-01-01	477425.45	4692008.79		477430.89	4691996.37	
Bennington Canyon Mine	OS-BMS-VE-02-01	477425.45	4692008.79		477430.89	4691996.37	
Bennington Canyon Mine	OS-BMS-SW-03-01	477420.41	4691977.71		477424.27	4691974.99	
Bennington Canyon Mine	OS-BMS-SW-03-02	477420.41	4691977.71		477424.27	4691974.99	
Bennington Canyon Mine	OS-BMS-VE-04-01	477420.41	4691977.71				
Bennington Canyon Mine	OS-BMS-S0-05-01	477420.41	4691977.71				
Bennington Canyon Mine	OS-BMS-S0-06-01	477389.90	4691962.27		477391.80	4691961.53	
Bennington Canyon Mine	road cut SE corner of site	477494.37	4691936.39		477501.48	4691938.65	
Bennington Canyon Mine	se end bennington cut				477491.14	4691962.80	
Bennington Canyon Mine	nw end bennington cut				477459.18	4692016.21	
Home Canyon Mine	OS-HCM-SO-01-01	480606.12	4686321.92		480610.55	4686325.65	
Home Canyon Mine	OS-HCM-VE-02-01	480615.15	4686311.91		480622.42	4686310.10	
Home Canyon Mine	OS-HCM-SO-03-01	480615.15	4686311.91				
Home Canyon Mine	OS-HCM-SO-03-02	480615.15	4686311.91				
Home Canyon Mine	OS-HCM-SO-04-01	480450.45	4686336.79				
Home Canyon Mine	OS-HCM-VE-05-01	480450.45	4686336.79				
Home Canyon Mine	West Adit	480450.46	4686339.02		480457.66	4686339.11	
Home Canyon Mine	Main (East) Adit				480655.86	4686386.47	
Home Canyon Mine	Dozer Cut	480725.95	4686455.95		480735.44	4686453.25	
Home Canyon Mine	OS-HCM-SO-06-01				480428.90	4686329.79	

Home Canyon Mine	home cyn mine waste pile				480740.37	4686440.23	
Waterloo Mine	OS-WLM-SO-01-01	480351.16	4684427.27	6529	480352.01	4684427.23	
Waterloo Mine	OS-WLM-SO-02-01	479938.15	4684952.53	6335	479939.83	4684948.85	
Waterloo Mine	OS-WLM-VE-03-01	479938.15	4684952.53	6335	479942.20	4684946.58	
Waterloo Mine	OS-WLM-SO-04-01	479936.53	4685250.11	6239	479937.54	4685248.05	
Waterloo Mine	OS-WLM-SO-05-01	479904.35	4685518.91	6147			
Waterloo Mine	OS-WLM-VE-06-01	479904.35	4685518.91	6147	479907.04	4685514.99	
Waterloo Mine	OS-WLM-VE-07-01	479904.35	4685518.91	6147	479907.04	4685514.99	
Waterloo Mine	XRF-Only sample	479958.65	4685489.88	6200	479959.76	4685490.09	
Hot Springs Mine	OS-HSM-SO-01-01	478313.03	4664065.07	6125	478328.69	4664058.69	
Hot Springs Mine	OS-HSM-SO-01-02	478313.03	4664065.07	6125	478328.69	4664058.69	
Hot Springs Mine	OS-HSM-VE-02-01	478313.03	4664065.07	6125	478328.69	4664058.69	
Hot Springs Mine	OS-HSM-S0-03-01	478299.64	4664012.93	5997	478309.54	4664005.71	
Hot Springs Mine	OS-HSM-VE-04-01	478299.64	4664012.93	5997	478309.54	4664005.71	
Hot Springs Mine	OS-HSM-SO-05-01	478735.10	4661784.26	6134	478732.37	4661800.28	
Hot Springs Mine	OS-HSM-SO-06-01	478684.65	4661778.86	6151	478685.79	4661781.42	
Hot Springs Mine	OS-HSM-VE-07-01	478684.65	4661778.86	6151	478685.79	4661781.42	
Hot Springs Mine	OS-HSM-SO-08-01	478623.29	4661719.09	6126	478623.11	4661719.56	
Hot Springs Mine	North Lake Portal	478327.16	4664093.90	6149	478342.42	4664095.06	
Hot Springs Mine	Rich Placer Tunnel	478726.03	4661793.17	6097	478730.42	4661817.83	
Hot Springs Mine	Nashville Tunnel	478708.70	4661803.22	6145	478709.73	4661817.12	
Consolidated Mine	OS-CMS-SO-01-01	463601.13	4671366.57	6407	463605.25	4671366.67	
Consolidated Mine	OS-CMS-SO-02-01	463783.72	4671391.17	6333	463783.23	4671391.45	
Consolidated Mine	OS-CMS-SO-02-02	463783.72	4671391.17	6333	463783.23	4671391.45	
Consolidated Mine	OS-CMS-SO-03-01	463832.54	4671251.01	6307	463830.87	4671250.59	
Consolidated Mine	OS-CMS-VE-04-01	463832.54	4671251.01	6307	463830.87	4671250.59	
Consolidated Mine	OS-CMS-SO-05-01	463890.62	4670984.22	6325	463888.94	4670983.93	
Consolidated Mine	OS-CMS-SW-06-01	463877.18	4670938.77	6305	463891.94	4670952.40	
Consolidated Mine	OS-CMS-SW-06-02	463877.18	4670938.77	6305	463891.94	4670952.40	
Consolidated Mine	OS-CMS-SO-07-01	463982.89	4670459.66	6135	463984.07	4670455.67	
Consolidated Mine	OS-CMS-VE-08-01	463982.89	4670459.66	6135	463984.07	4670455.67	
Consolidated Mine	Main Portal	463829.41	4671444.23	6376	463856.14	4671434.32	
Consolidated Mine	Trench (west end)	463817.23	4671485.38	6505	463824.14	4671489.52	
Consolidated Mine	Trench (east end)	463864.35	4671496.24	6524	463872.93	4671502.39	
Consolidated Mine	Upper Test Adit	463941.44	4671072.79	6388	463937.79	4671070.79	
Consolidated Mine	LowerTest Adit	463897.54	4671045.26	6344	463900.41	4671047.18	
Bloomington Canyon Mine	OS-BLO-SO-01-01	464539.76	4670356.89	6228	464540.46	4670355.49	
Bloomington Canyon Mine	OS-BLO-VE-02-01	464539.76	4670356.89	6228	464540.46	4670355.49	
Bloomington Canyon Mine	OS-BLO-SO-03-01	464446.97	4670295.18	6185	464448.98	4670294.51	
Bloomington Canyon Mine	OS-BLO-VE-04-01	464446.97	4670295.18	6185	464448.98	4670294.51	
Bloomington Canyon Mine	OS-BLO-SO-05-01	464574.80	4670262.33	6159	464581.46	4670256.35	
Bloomington Canyon Mine	OS-BLO-SO-05-02	464574.80	4670262.33	6159	464581.46	4670256.35	
Bloomington Canyon Mine	OS-BLO-VE-06-01	464574.80	4670262.33	6159	464581.46	4670256.35	
Bloomington Canyon Mine	OS-BLO-SO-07-01	464528.50	4670252.57	6081	464528.86	4670252.06	
Bloomington Canyon Mine	West 1974 Adit	464484.49	4670368.27	6279	464478.65	4670383.27	
Bloomington Canyon Mine	Expl. Trench (north end)	464142.75	4670230.10	6158	464140.46	4670228.28	
Bloomington Canyon Mine	East 1975 Adit				464563.76	4670359.77	

Paris Canyon Mine	OS-PAR-SO-01-01	463016.20	4673497.11	6270	463020.10	4673497.53	
Paris Canyon Mine	OS-PAR-SW-02-01	463066.30	4673606.77	6235	463065.67	4673603.41	
Paris Canyon Mine	OS-PAR-SO-03-01	463031.72	4673623.61	6241	463035.32	4673617.22	
Paris Canyon Mine	OS-PAR-VE-04-01	463031.72	4673623.61	6241	463035.32	4673617.22	
Paris Canyon Mine	OS-PAR-SO-05-01	463040.77	4673618.01	6234	463046.72	4673609.31	
Paris Canyon Mine	OS-PAR-SW-06-01	463145.09	4673836.20	6207	463145.39	4673836.58	
Paris Canyon Mine	OS-PAR-SE-07-01	463145.09	4673836.20	6207	463145.39	4673836.58	
Paris Canyon Mine	OS-PAR-SW-08-01	459785.40	4672747.61	6493	459787.80	4672751.85	
Paris Canyon Mine	OS-PAR-SE-09-01	459785.40	4672747.61	6493	459787.80	4672751.85	
Paris Canyon Mine	OS-PAR-SW-10-01	463019.87	4673724.71	6231	463025.55	4673725.62	
Paris Canyon Mine	OS-PAR-SW-11-01	463043.05	4673736.80	6239	463022.15	4673714.25	
Paris Canyon Mine	OS-PAR-SW-11-02	463043.05	4673736.80	6239	463022.15	4673714.25	
Paris Canyon Mine	OS-PAR-SO-12-01	463043.05	4673736.80	6239	463047.14	4673734.41	
Paris Canyon Mine	OS-PAR-VE-13-01	463043.05	4673736.80	6239	463047.14	4673734.41	
Paris Canyon Mine	OS-PAR-SW-15-01	463325.31	4673891.89	6213	463329.82	4673884.54	
Paris Canyon Mine	OS-PAR-SE-16-01	463325.31	4673891.89	6213	463329.82	4673884.54	
Paris Canyon Mine	South Productin Adit	463051.57	4673474.71	6325	463048.90	4673474.26	
Paris Canyon Mine	North Side Black Dump	463061.73	4673837.75	6226	463063.96	4673835.81	
Paris Canyon Mine	North Production Adit	463008.70	4673796.95	6239	463011.97	4673796.73	
Paris Canyon Mine	Dozer Cut end 1				463217.82	4672788.81	
Paris Canyon Mine	Dozer Cut end 2				463152.96	4672800.24	
Wyodak Coal Expl.	OS-WYO-SW-01-01	463212.22	4672784.33	6621			
Wyodak Coal Expl.	OS-WYO-SO-02-01	463218.64	4672906.43	6555	463223.61	4672902.46	
Wyodak Coal Expl.	Expl Trench	463449.76	4672904.11	6578	463308.64	4672903.06	
Wyodak Coal Expl.	excavated area crnr1				463219.33	4672951.51	
Wyodak Coal Expl.	excavated area crnr2				463197.04	4672935.94	
Wyodak Coal Expl.	Excavated area crnr3				463225.01	4672819.32	
Wyodak Coal Expl.	Excavated area crnr4				463260.93	4672817.95	
Wyodak Coal Expl.	Mine collapse/sink hole				463033.38	4673154.96	
Georgetown Canyon (Right Fork)	OS-GCM-SO-01-01				478802.05	4703487.97	7641
Georgetown Canyon (Right Fork)	OS-GCM-SO-02-01				478802.05	4703487.97	7641
Georgetown Canyon (Right Fork)	OS-GCM-VE-03-01				478802.05	4703487.97	7641
Georgetown Canyon (Right Fork)	Shaft				478770.69	4703471.41	7676
Sulfur Canyon Exploration	OS-SUL-SO-01-01				463180.85	4720214.14	7465
Sulfur Canyon Exploration	OS-SUL-VE-02-01				463180.85	4720214.14	7465
Sulfur Canyon Exploration	OS-SUL-SO-03-01				463149.54	4720076.61	7519
Sulfur Canyon Exploration	OS-SUL-SO-03-02				463149.54	4720076.61	7519
Sulfur Canyon Exploration	OS-SUL-VE-04-01				463149.54	4720076.61	7519
Sulfur Canyon Exploration	OS-SUL-VE-05-01				463189.62	4720087.50	7509

.

Appendix 2

Bear Lake Mine

Bear Lake Mine

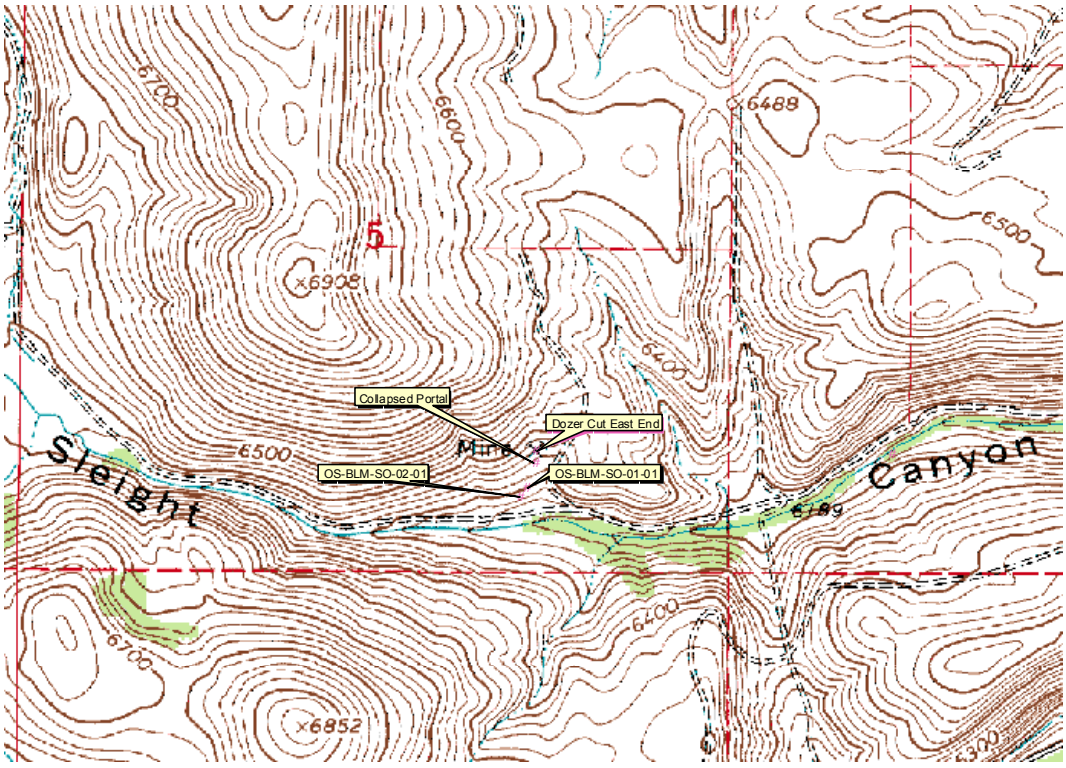

Figure 2.1
Bear Lake Mine site location.

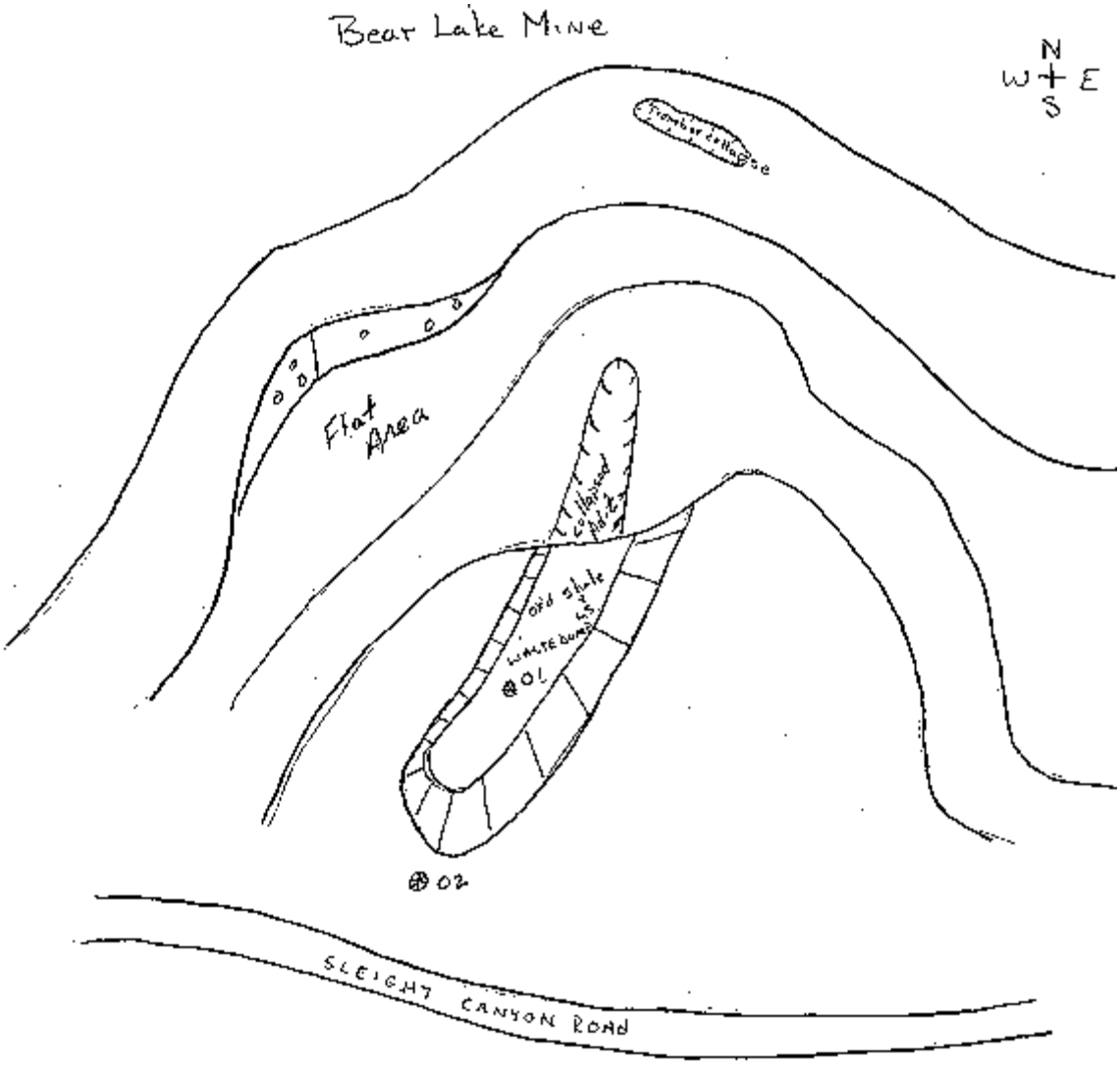

Figure 2.2
Bear Lake Mine Site Sketch

Photo 2.1
View across Bear Lake Mine, across Sleight Canyon, toward the South.

Photo 2.2
Collapse feature north of Bear Lake Mine.

Photo 2.3
Sample site OS-BLM-SO-01-01 on waste dump. View to southwest.

Photo 2.4
Sample site OS-BLM-SO-02-01 between waste dump and canyon road. View to northeast.

Appendix 3

RATTLESNAKE CANYON MINE

Rattlesnake Canyon Mine

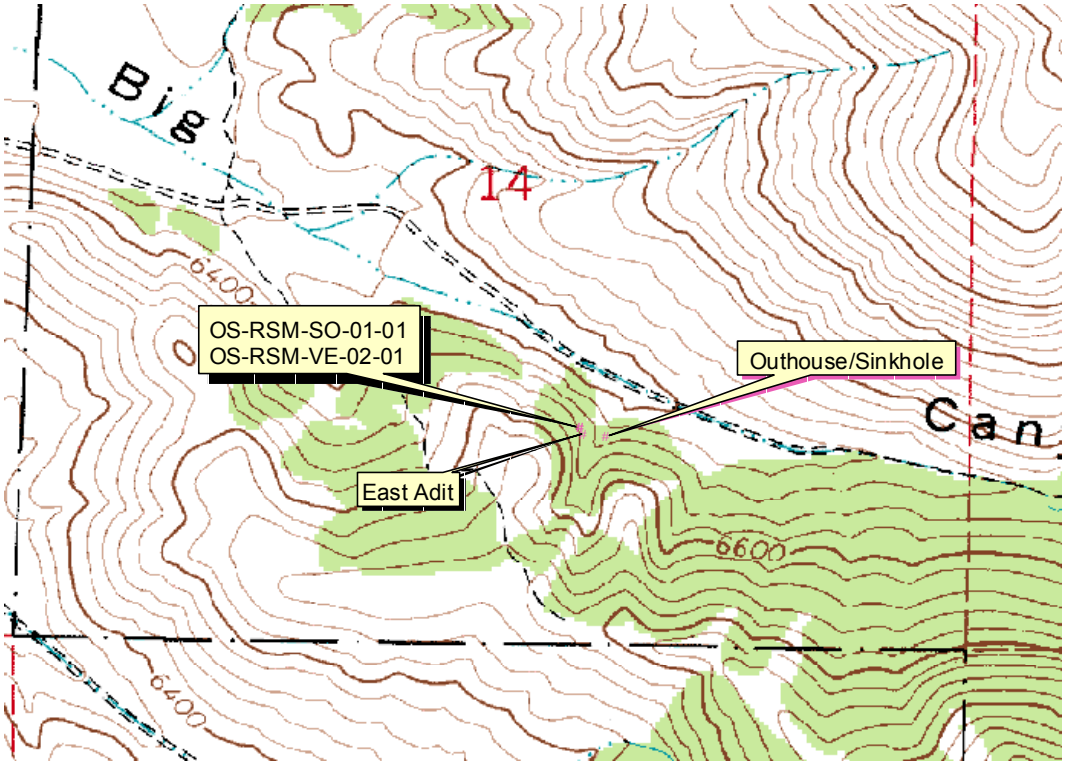

Figure 3.1
Rattlesnake Canyon Mine site location.

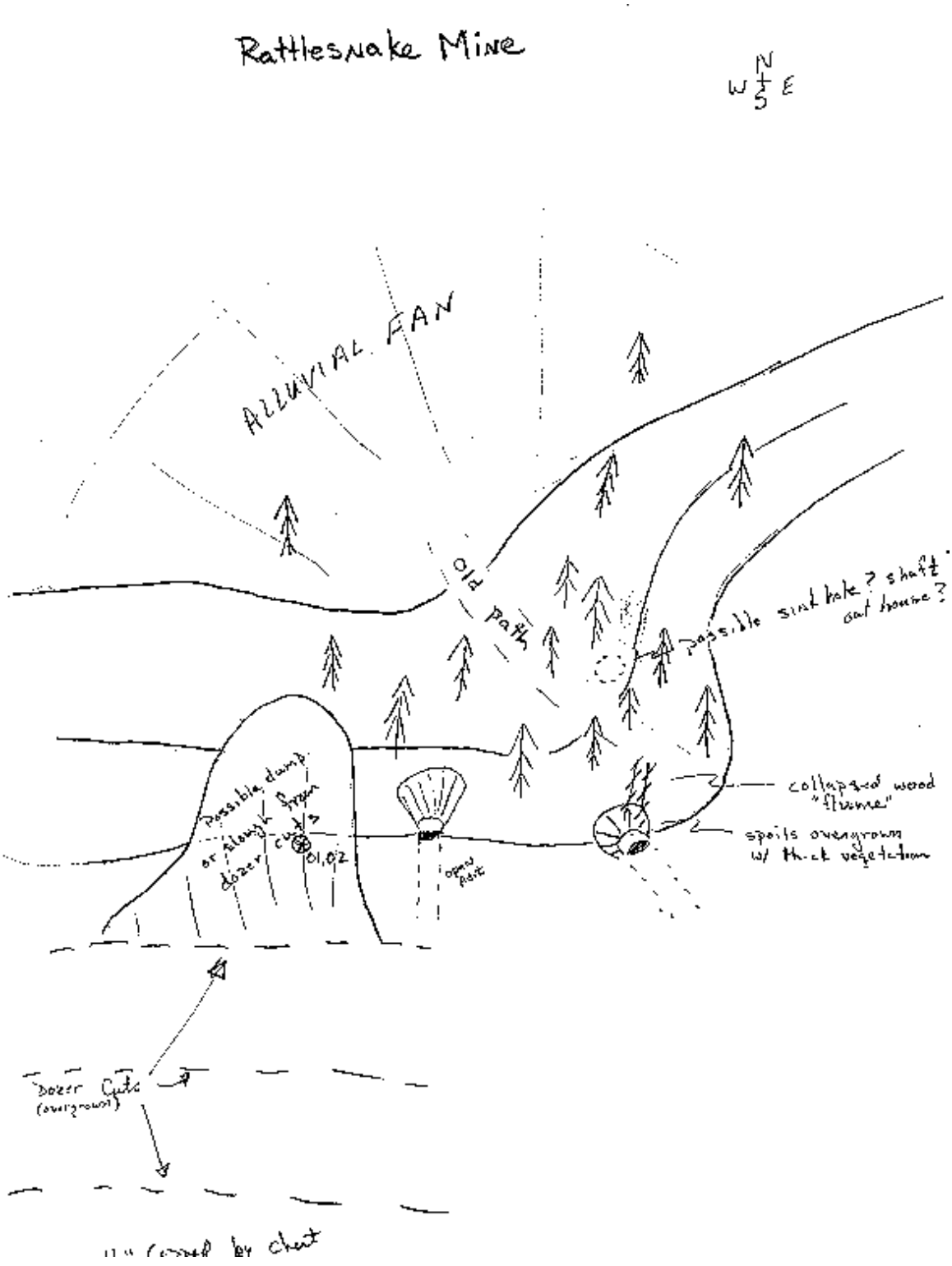

Figure 3.2
Rattlesnake Mine site sketch.

Photo 3.1
Rattlesnake Canyon Mine, East adit looking south.

Photo 3.2
Rattlesnake Canyon Mine, west adit looking south.

Photo 3.3
View to southwest. Rattlesnake Canyon Mine, adits to left, sample area on right in background.

Photo 3.4
Rattlesnake Canyon Mine, Waste dump area. Sample location for samples OS-RSM-SO-01-01 and OS-RSM-VE-02-01. View to west.

Appendix 4

SWAN LAKE GULCH

Swan Lake Gulch

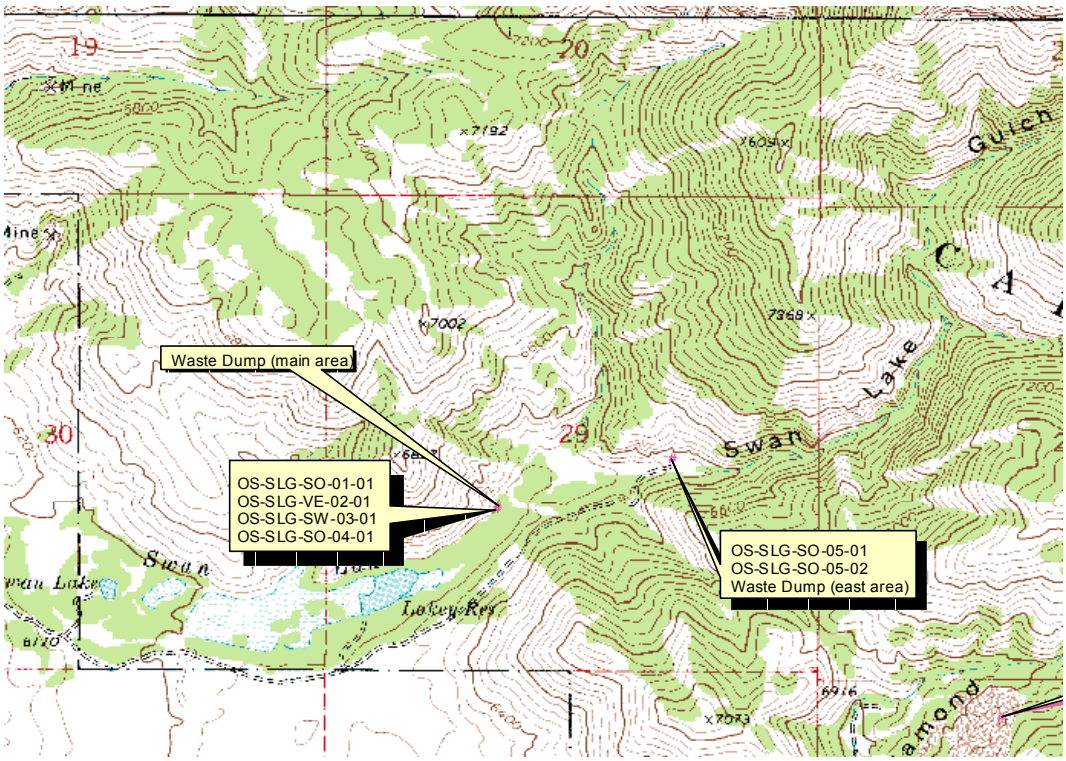

Figure 4.1
Swan Lake Gulch site location.

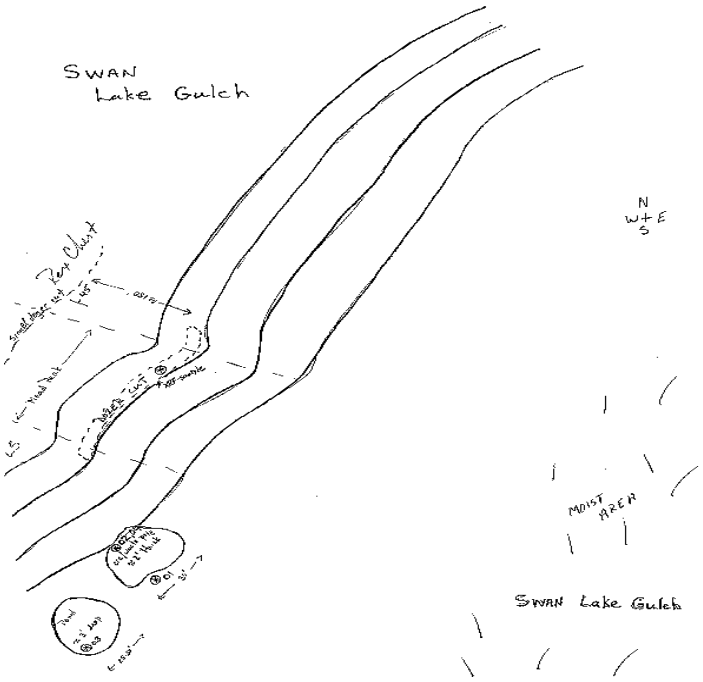

Figure 4.2
Main Swan Lake Gulch site sketch.

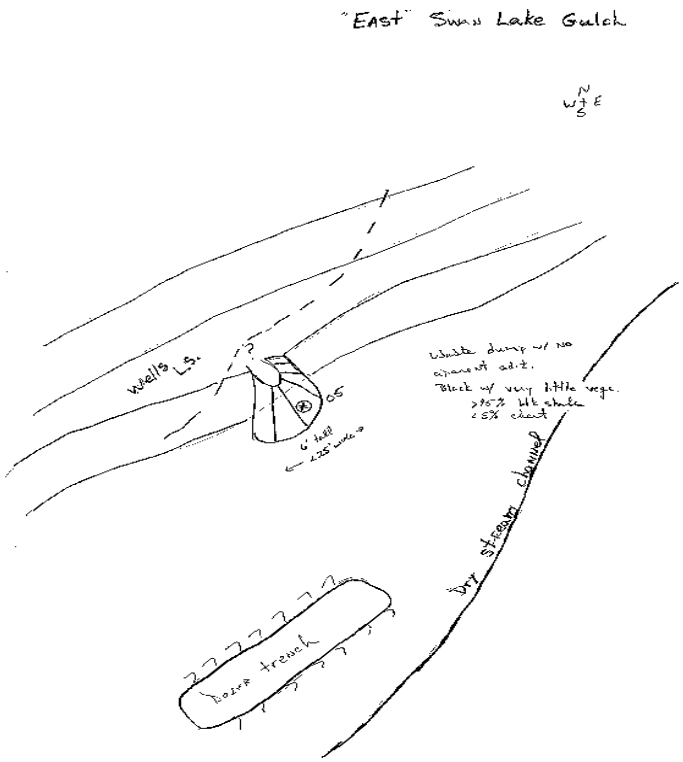

Figure 4.3
"East" Swan Lake Gulch site sketch.

Photo 4.1
Main Swan Lake Gulch area, view to east. Waste dump located between vehicles and pond, surrounded by aspens.

Photo 4.2
Main Swan Lake Gulch, waste dump, view to northwest. Surface marked with many undulate tracks and a few human tracks [from the investigation team].

Photo 4.3
Main Swan Lake Gulch area, sample site OS-SLG-SO-01-01, view to west.

Photo 4.4
"East" Swan Lake Gulch area, view to west. Trench is between the vehicles and the timber, waste dump is between vehicles and sagebrush slope.

Photo 4.4
"East" Swan Lake gulch, waste dump, view to northwest. Cliffs are limestone.

Photo 4.5
"East" Swan Lake Gulch, view to west. Individual on the left looking into dozer trench.

Photo 4.6
“East” Swan Lake Gulch, view to west.

Appendix 5

DIAMOND GULCH MINE

Diamond Gulch Mine

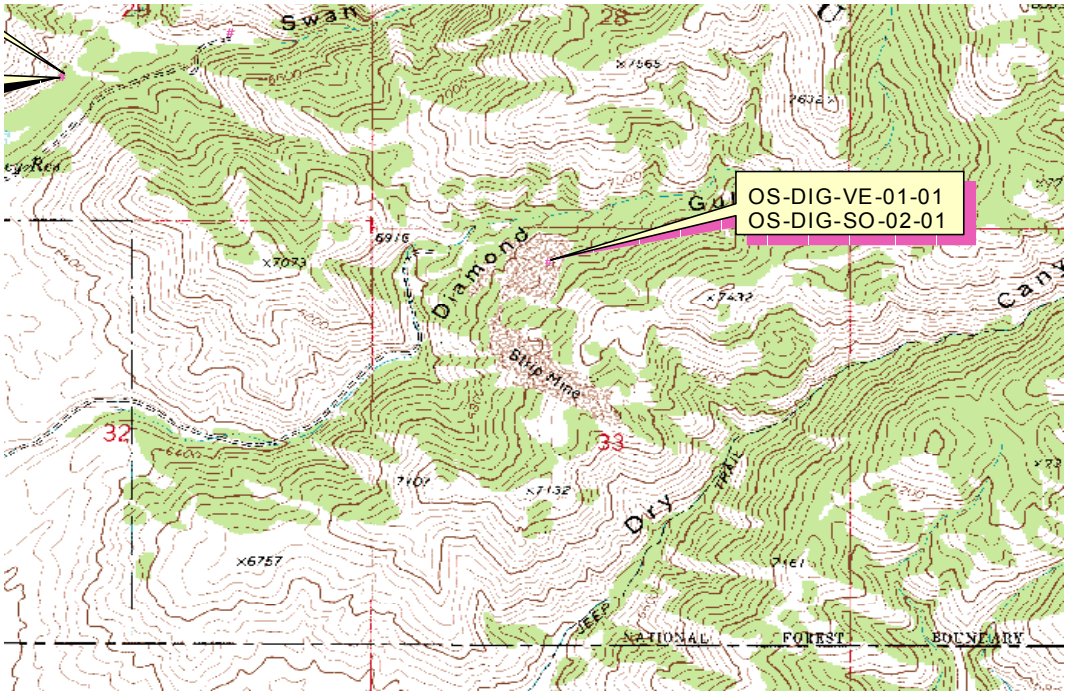

Figure 5.1
Diamond Gulch Mine site location.

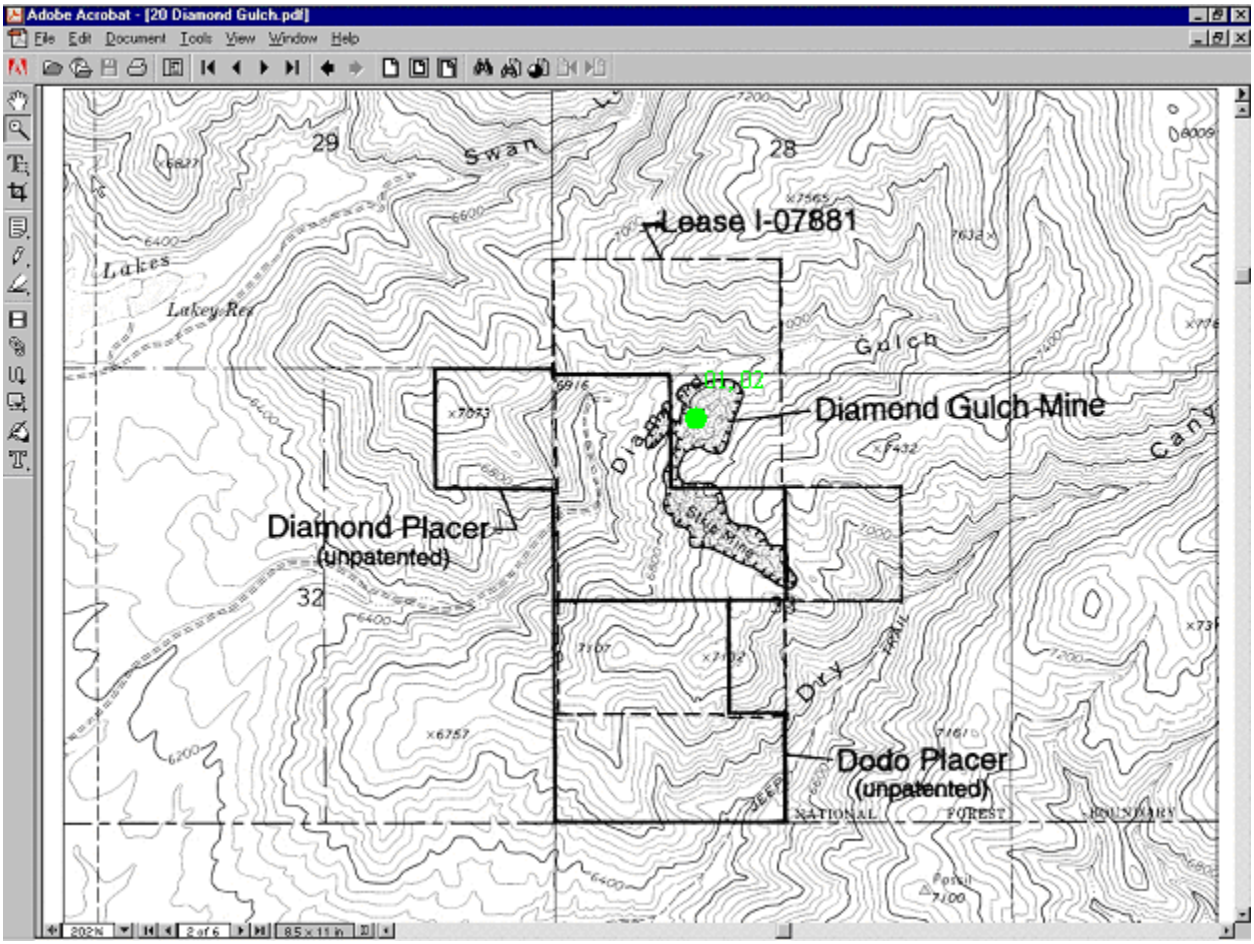

Figure 5.2

Diamond Gulch Mine

Photo 5.1
Diamond Gulch Mine 1960. Photo from USGS OFR 00-425, Lee, 2001.

Appendix 6

BENNINGTON CANYON MINE

Bennington Canyon Mine

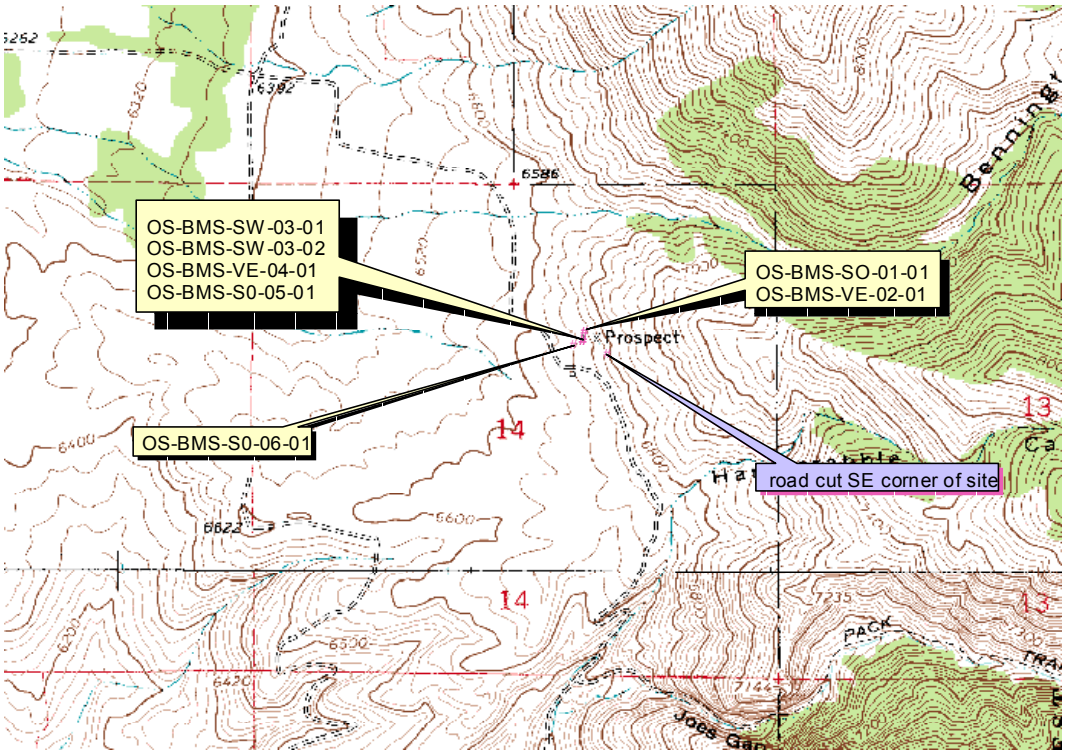

Figure 6.1
Bennington Mine location.

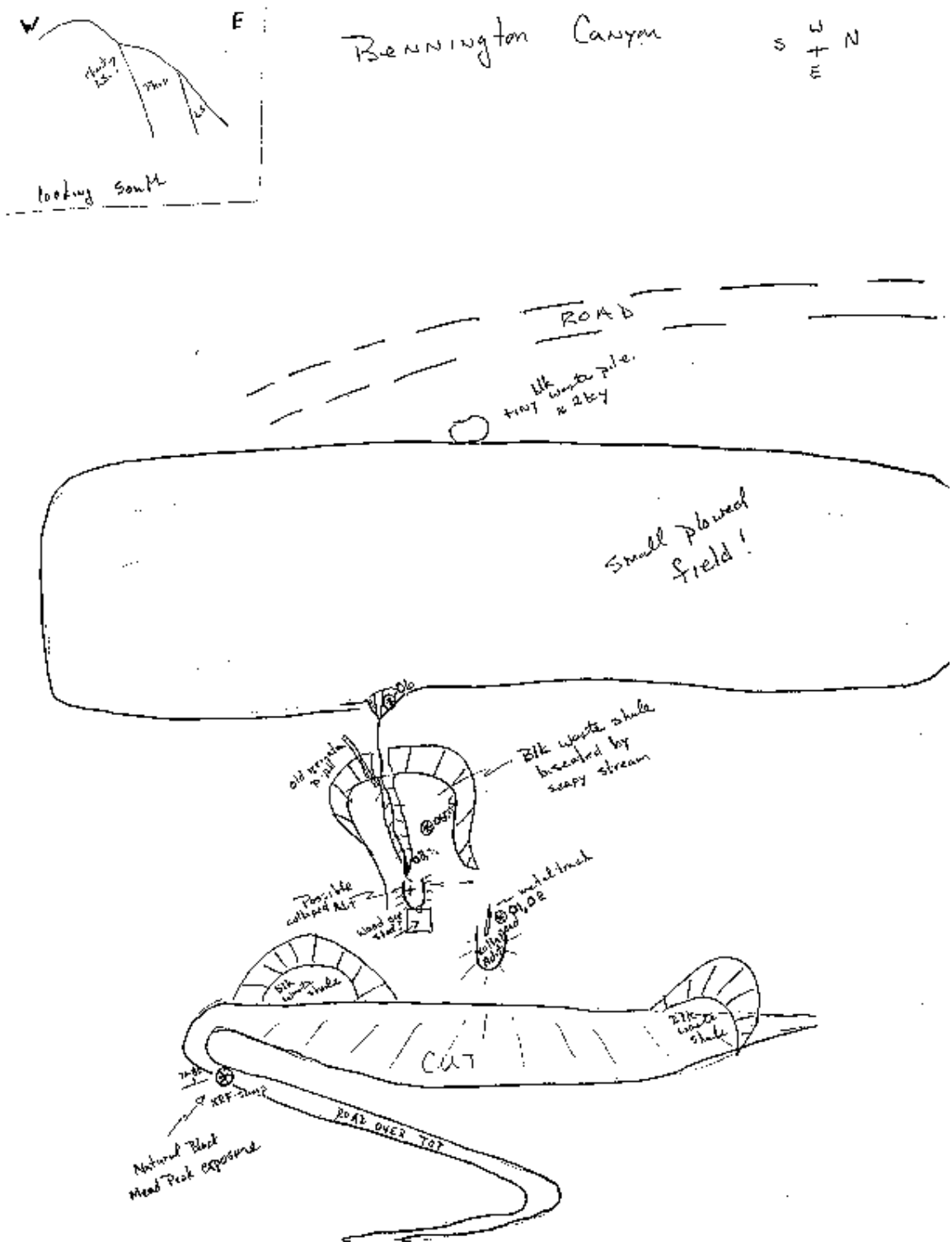

Figure 6.2
Bennington Canyon Mine site sketch.

Photo 6.1
Bennington Canyon Mine looking east. Cultivated field in photo center, small pit highwall above field. Building facility on black shale in photo right-center.

Photo 6.2
View from Bennington Canyon Mine to west northwest, across cultivated field to Bennington, Idaho in background.

Photo 6.3
View from Bennington Canyon Mine to southwest toward Montpelier in background. Building on photo right center is a farm shed.

Photo 6.4
Black shale in roadcut on south end of Bennington Canyon Mine. XRF-only sample location.

Photo 6.5
View toward south of Bennington Canyon Mine. Location for samples OS-BMS-SO-01-01 and OS-BMS-VE-02-01 in center of photo, left of the building.

Photo 6.6
Bennington Canyon Mine seep dissection through black shale waste dump. White irrigation pipe in right center of photo. Pit highwall in background. Sample OS-BMS-SW-03-01 sampled the seep and OS-BMS-SO-05-01 sampled the waste dump. View to east.

Appendix 7

HOME CANYON MINE

Home Canyon Mine

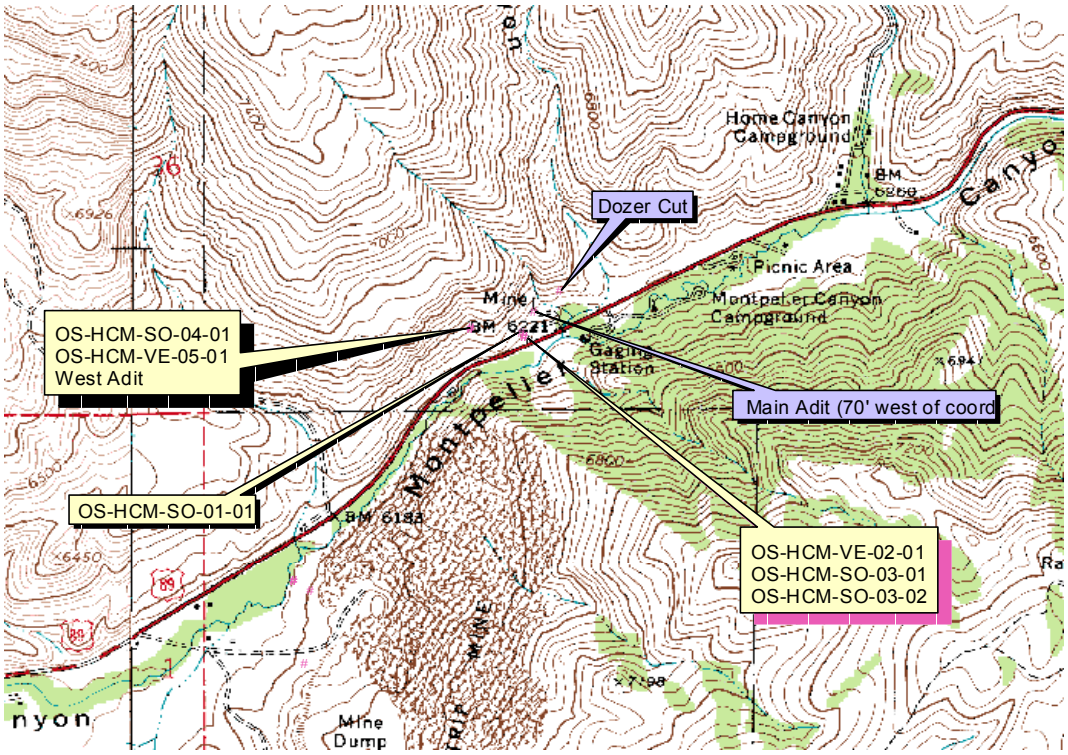

Figure 7.1
Home Canyon Mine

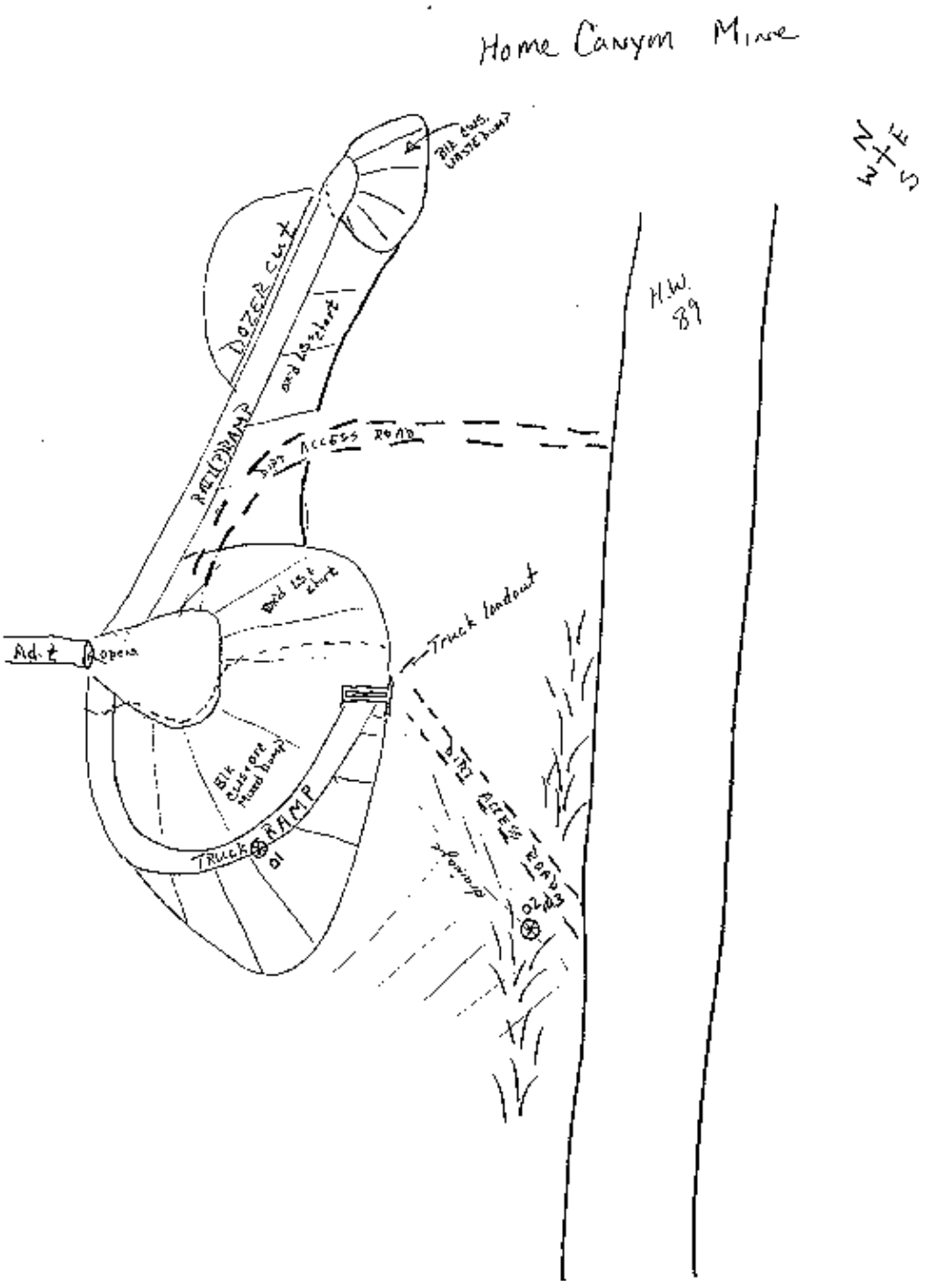

Figure 7.2
Home Canyon Mine site sketch.

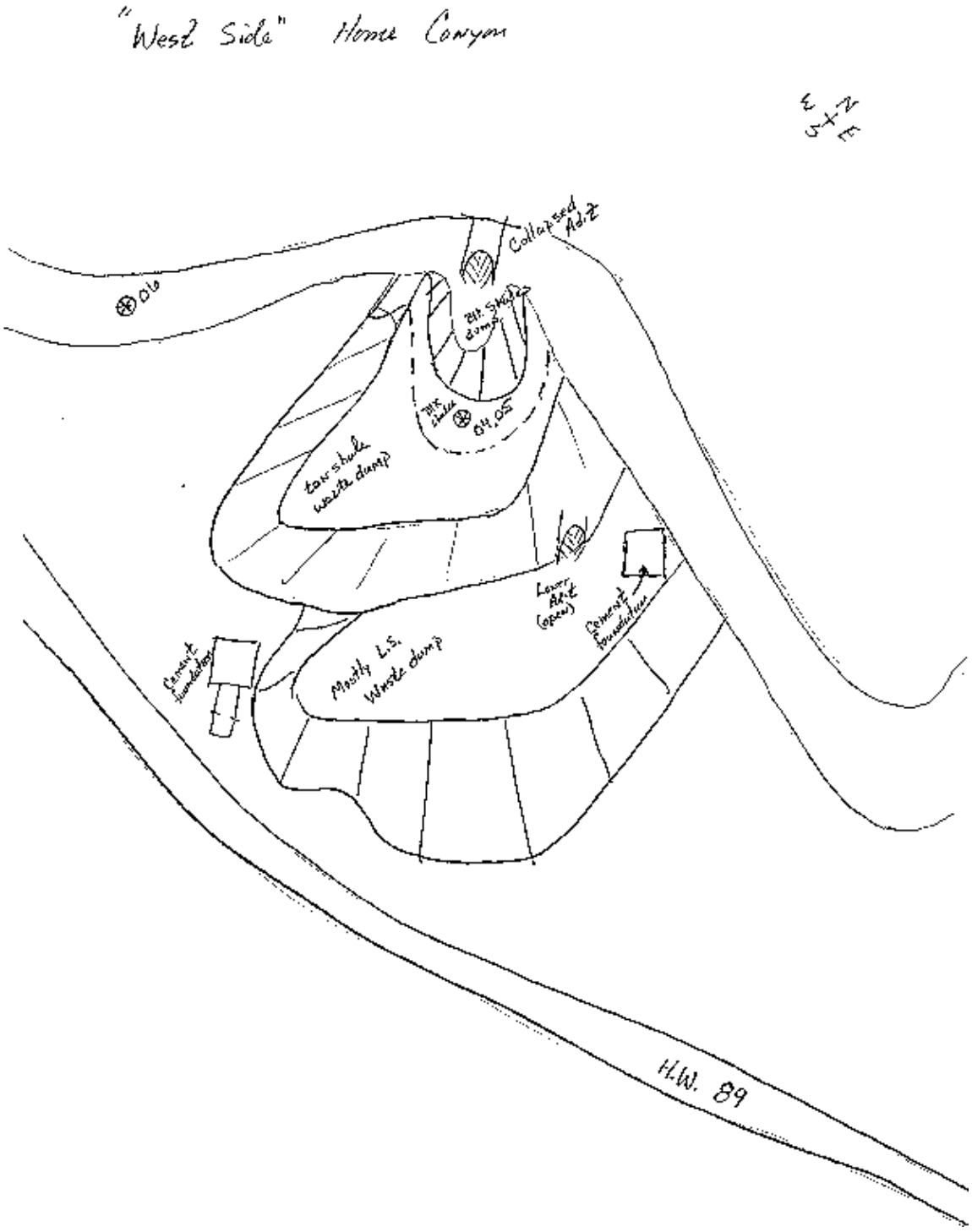

Figure 7.3
"West" Home Canyon Mine site sketch.

Photo 7.1
Home Canyon Mine, truck loadout. View to north. Mine portal to left of photo.

Photo 7.2
Home Canyon Mine, main portal, open for entry. View to northwest.

Photo 7.3
Home Canyon Mine, photo from east end looking west toward portal.

Photo 7.4
Sample location for OS-HCM-VE-02-01 and OS-HCM-SO-03-01. View to northwest. Black shale ramp in background.

Photo 7.5
Sample location for OS-HCM-SO-01-01. View to southwest. Highway 89 and Montpelier Creek riparian area in background.

Photo 7.6
"West" Home Canyon Mine, upper tier. View to northwest. Samples OS-HCM-SO-04-01 and OS-HCM-VE-05-01 were collected between red cooler and the black shale above.

Photo 7.7
"West" Home Canyon Mine, middle tier. View to north. Adit with open metal door.

Appendix 8

WATERLOO MINE

Waterloo Mine

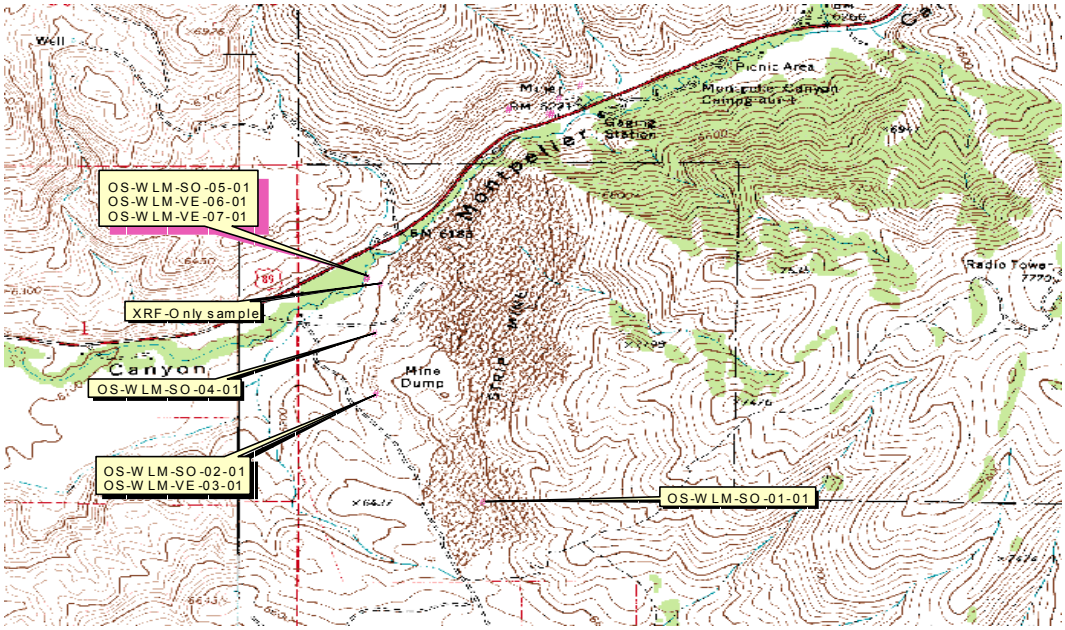

Figure 8.1
Waterloo Mine site location.

Figure 8.2
Waterloo Mine. View to northeast. Photo from USGS OFR 00-425, Lee, 2001.

Photo 8.1
Sample site OS-WLM-S0-01-01. View to north. Black waste shale with grass cover.

Photo 8.2
Waterloo Mine, sample location OS-WLM-SO-02-01 and OS-WLM-VE-03-01. View to north. Sample on stable slope, partially vegetated waste dump above.

Photo 8.3
Waterloo Mine, sample site OS-WLM-SO-04-01. View to southeast. Stable slope with poorly vegetated waste dump in background.

Appendix 9

HOT SPRINGS MINE

Hot Springs Mine

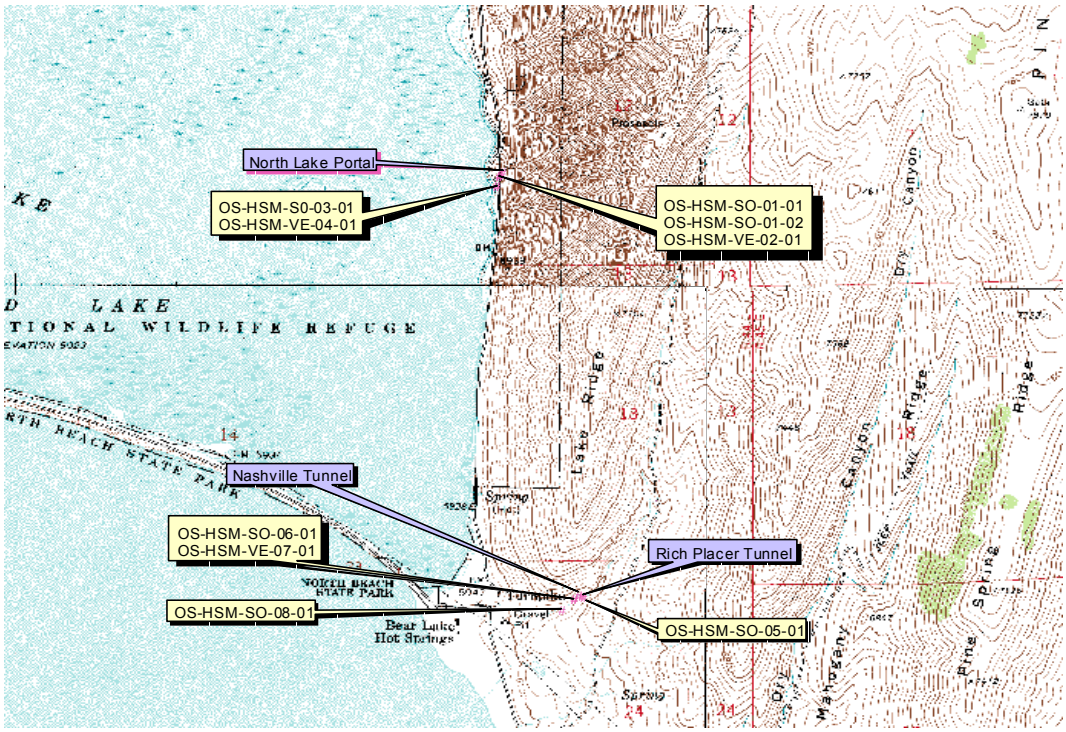

Figure 9.1

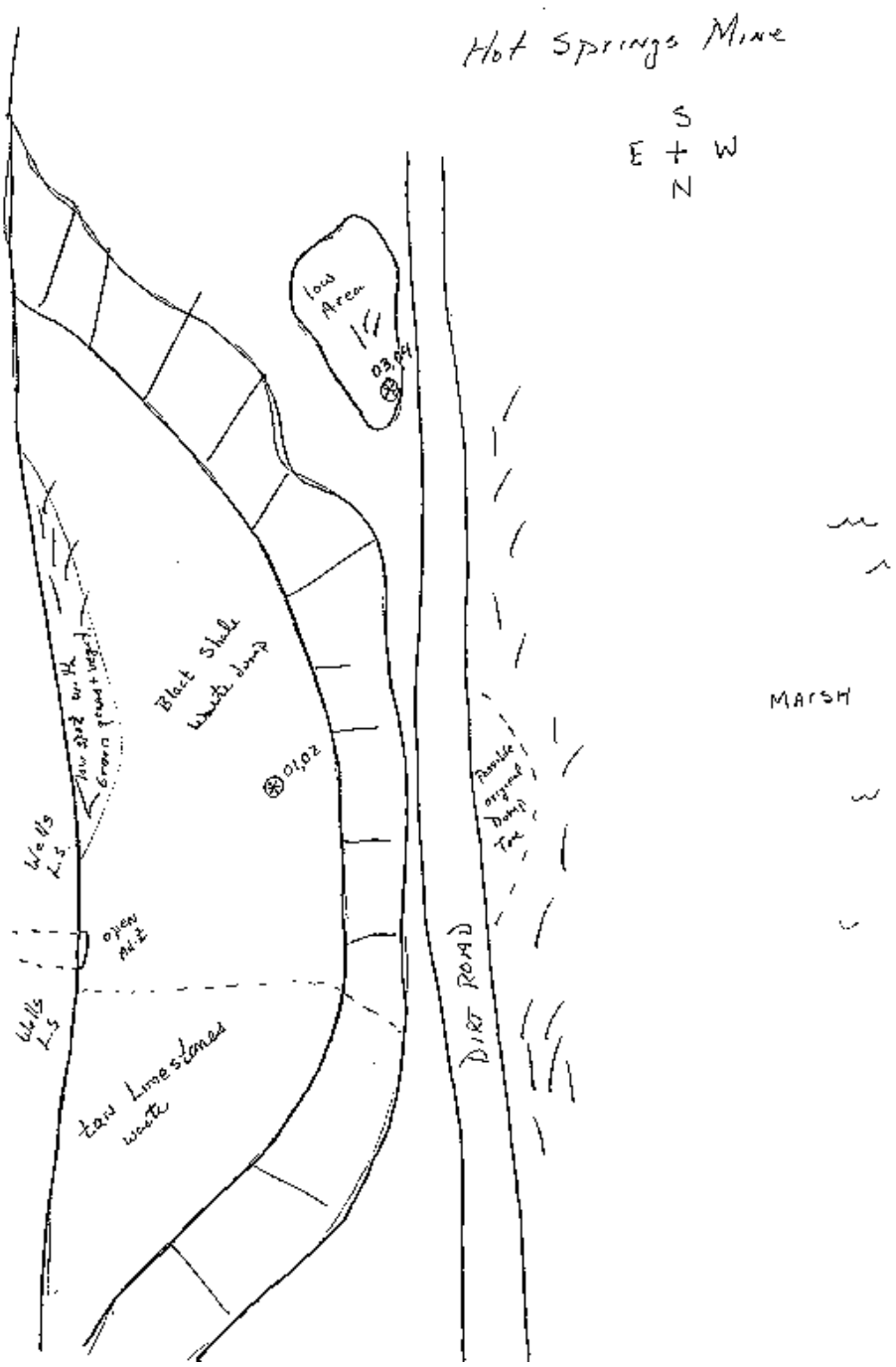

Figure 9.2
Hot Springs Mine, North Lake Tunnel site sketch.

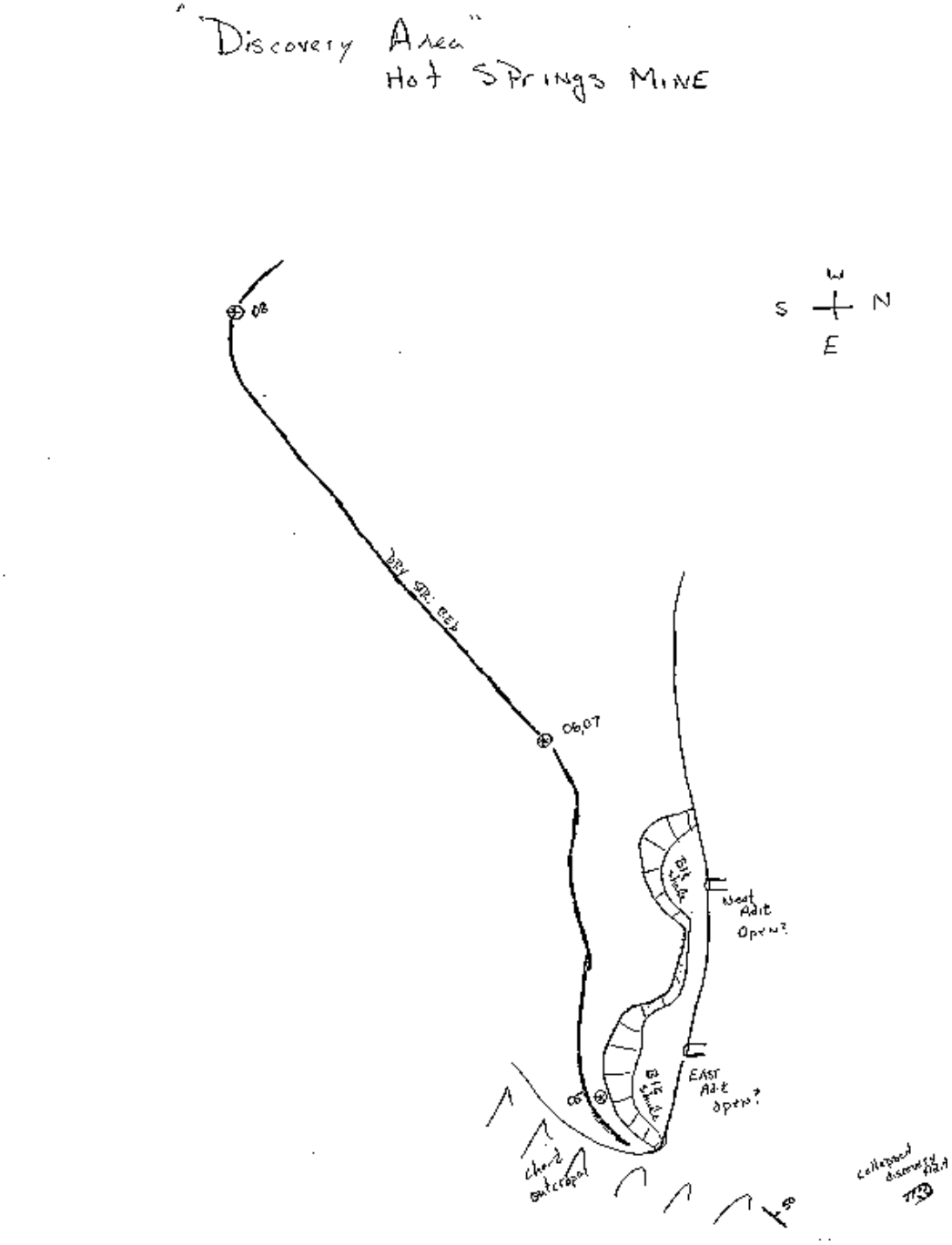

Figure 9.3
"Discovery Area" Hot Springs Mine site sketch.

Photo 9.1
Hot Springs Mine, partially open North Lake Tunnel. View to east.

Photo 9.2
Hot Springs Mine, sample location for OS-HSM-SO-01-01 and OS-HSM-VE-02-01. Black waste shale dump with volunteer vegetation. View to northeast.

Photo 9.3
Hot Springs Mine, sample location for OS-HSM-SO-03-01 and OS-HSM-VE-04-01. Low area below North Lake Tunnel waste dump. View to north.

Photo 9.4
"Discovery Area" at Hot Springs Mine. Bear Lake at left center, twin waste dumps at right center, and overturned chert at top right. View to northwest.

Photo 9.5
Hot Springs Mine, Nashville Tunnel on left and Rich Placer Tunnel on right. View to north.

Photo 9.6
Hot Springs Mine, sample location OS-HSM-SO-05-01, just off toe of Rich Placer waste dump.

Photo 9.7
Hot Springs Mine, sample location for OS-HSM-SO-06-01 and OS-HSM-VE-07-01. Samples from dry streambed, view to southwest.

Appendix 10

CONSOLIDATED MINE

Consolidated Mine

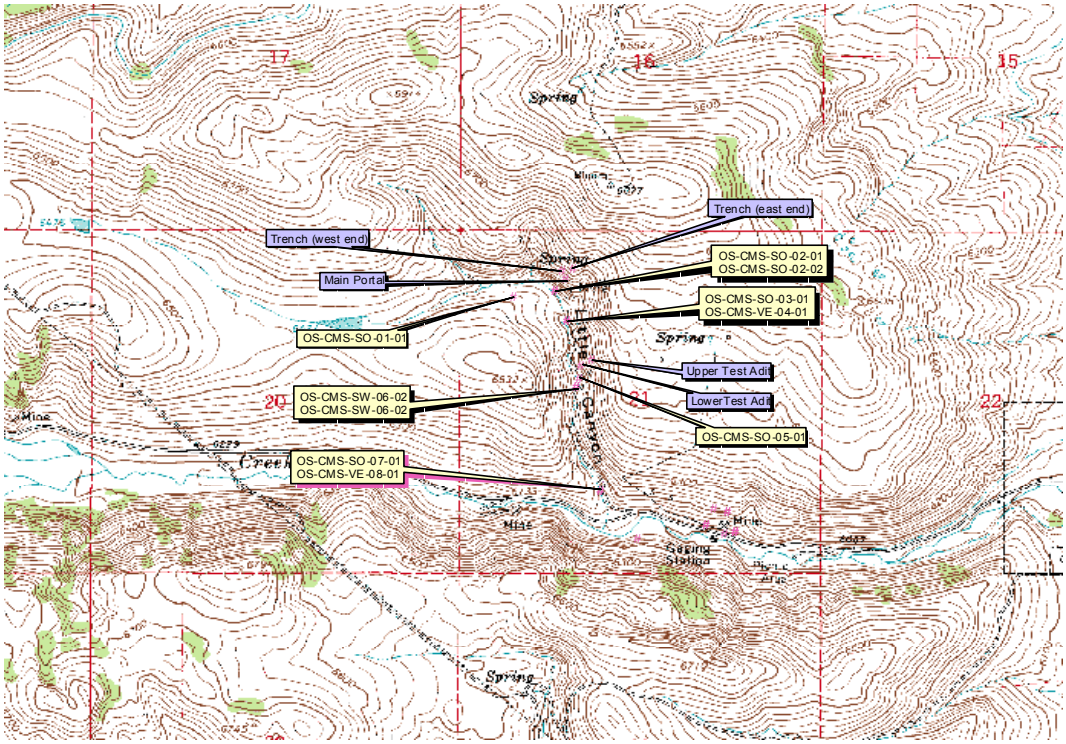

Figure 10.1
Consolidated Mine site location.

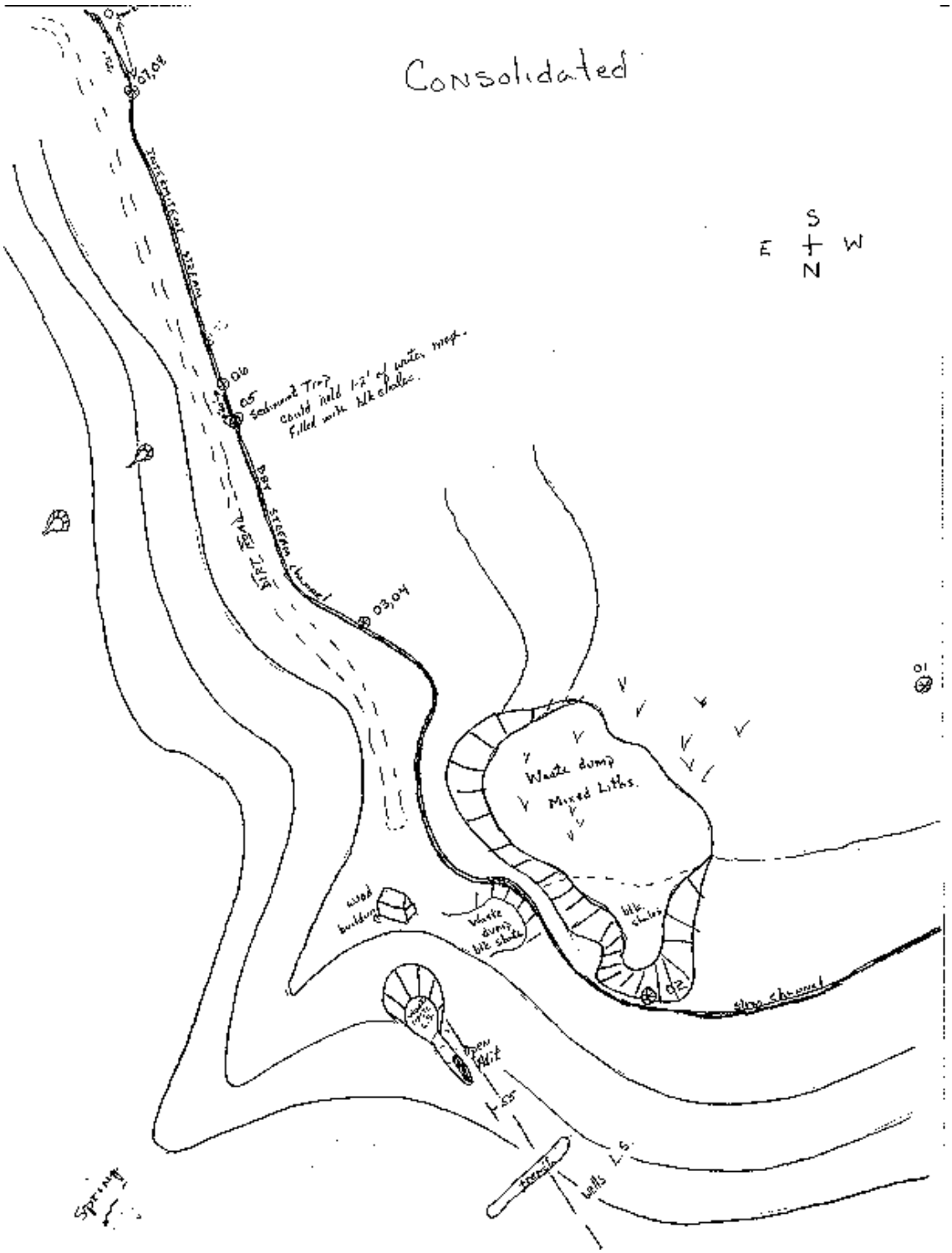

Figure 10.2
Consolidated Mine site sketch.

Photo 10.1
Consolidated Mine, view to south, down Little Canyon.

Photo 10.2
Excavated area below main portal. View to south.

Photo 10.3
Consolidated Mine, main portal, open. View to north.

Photo 10.4
Consolidated Mine, exploration trench [by Wyodak] above portal. View to northeast.

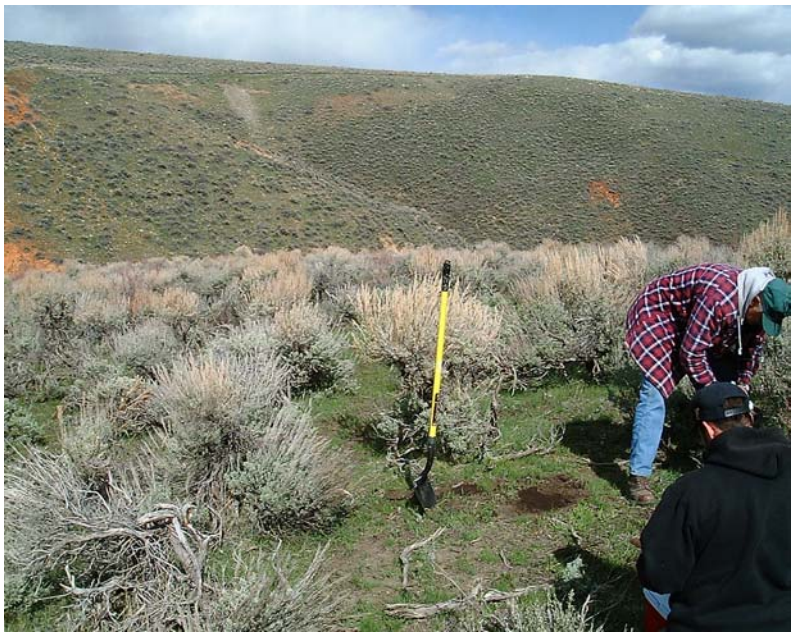

Photo 10.5
Consolidated Mine, sample OS-CMS-SO-01-01. View to east.

Photo 10.6
Consolidated Mine, sample OS-CMS-SO-02-01. Stratified waste dump dissected by intermittent stream. View to southwest.

Photo 10.7
Consolidated Mine, sample location for OS-CMS-SO-03-01 and OS-CMS-VE-04-01. Considerable black shale in stream channel. View to south.

Photo 10.8
Consolidated Mine, sample OS-CMS-SO-05-01. Upstream side of sediment dam. Majority of rock material is black shale. View to south.

Photo 10.9
Consolidated Mine, sample OS-CMS-SW-06-01, about 60 feet below sediment dam. View to south, down stream.

Photo 10.10
Consolidated Mine, upper exploration adit. View to southeast.

Photo 10.11
Consolidated Mine, lower exploration adit. View to southeast. Upper exploration adit located in upper left of photo.

Appendix 11

Bloomington Canyon Mine

Bloomington Canyon Mine

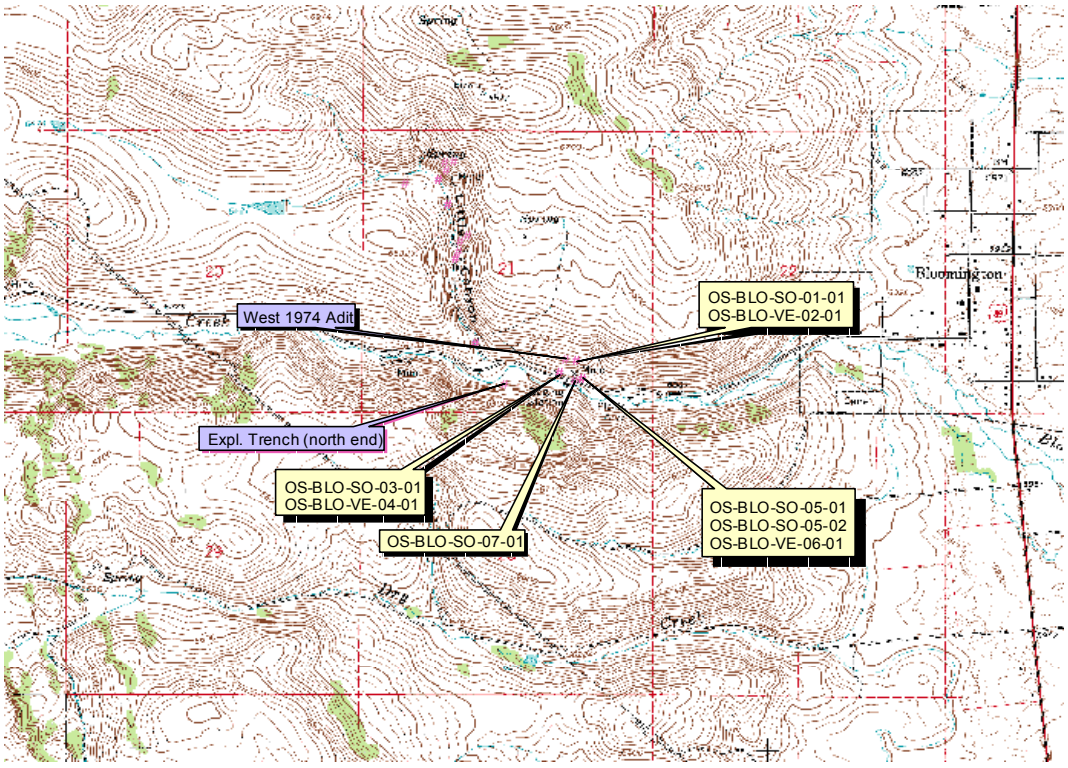

Figure 11.1
Bloomington Canyon Mine site location.

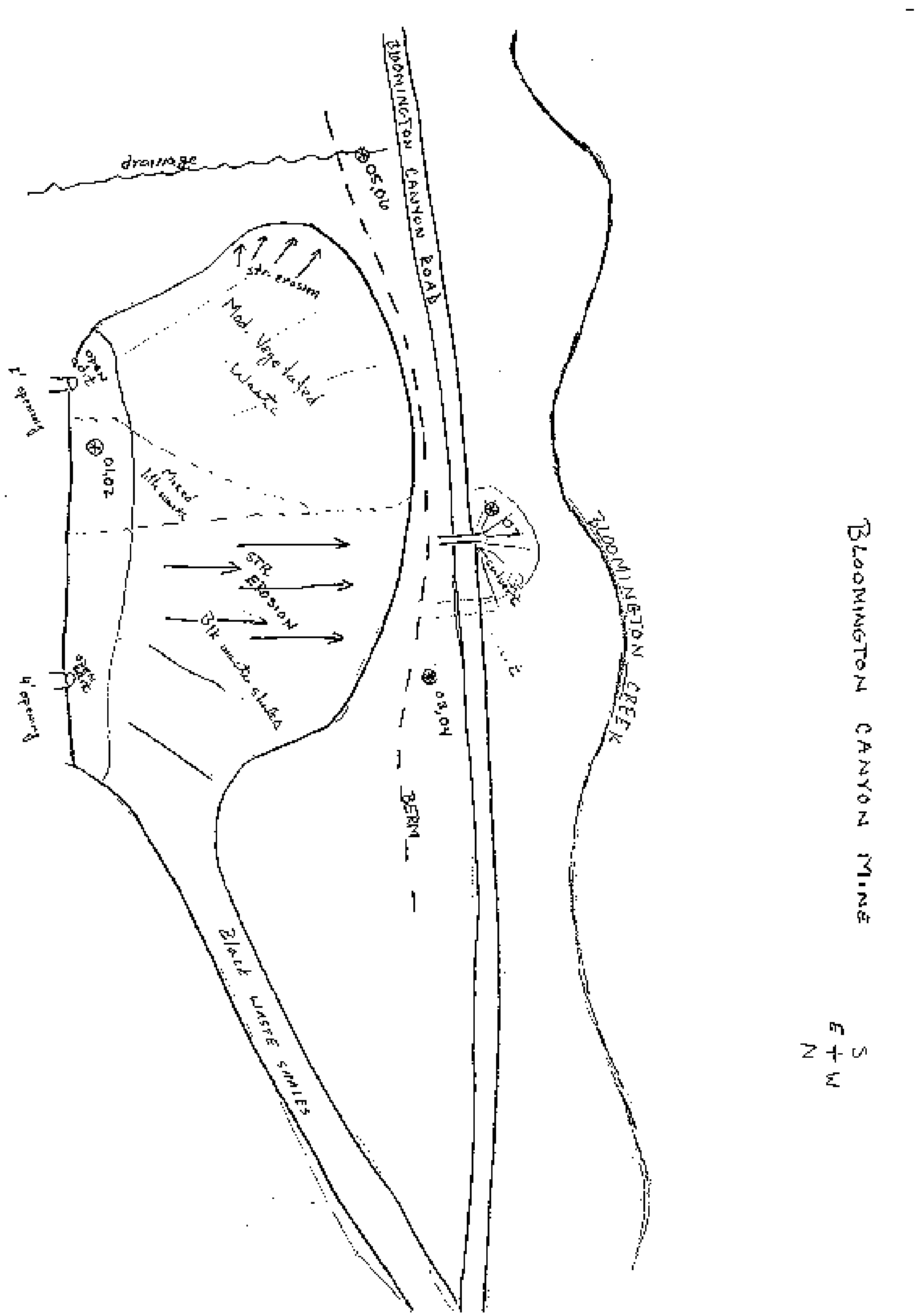

Figure 11.2
Bloomington Canyon Mine site sketch.

Photo 11.1
Bloomington Canyon Mine. View to north.

Photo 11.2
Bloomington Canyon Mine, 1974 Tunnel opening. View to north.

Photo 11.3
Bloomington Canyon Mine, T14S (Wyodak) Tunnel dozed closed. View to north.

Photo 11.4
Bloomington Canyon Mine, 1975 Tunnel opening. View to north.

Photo 11.5
Bloomington Canyon Mine, sample location for OS-BLO-SO-01-01 and OS-BLO-VE-01-01.
View to west.

Photo 11.6
Bloomington Canyon Mine, sample location for OS-BLO-SO-03-01 and OS-BLO-VE-04-01.
Erosion of black shale at the top of photo. View to northeast

Photo 11.7
Bloomington Canyon Mine, sample location for OS-BLO-SO-05-01 and OS-BLO-VE-06-01. Bloomington Canyon road on left side of photo. View to west.

Photo 11.8
Bloomington Canyon Mine, Sample location for OS-BLO-SO-07-01. Sample in Bloomington Creek flood plain. View to northwest.

Appendix 12

PARIS CANYON MINE

Paris Canyon Mine

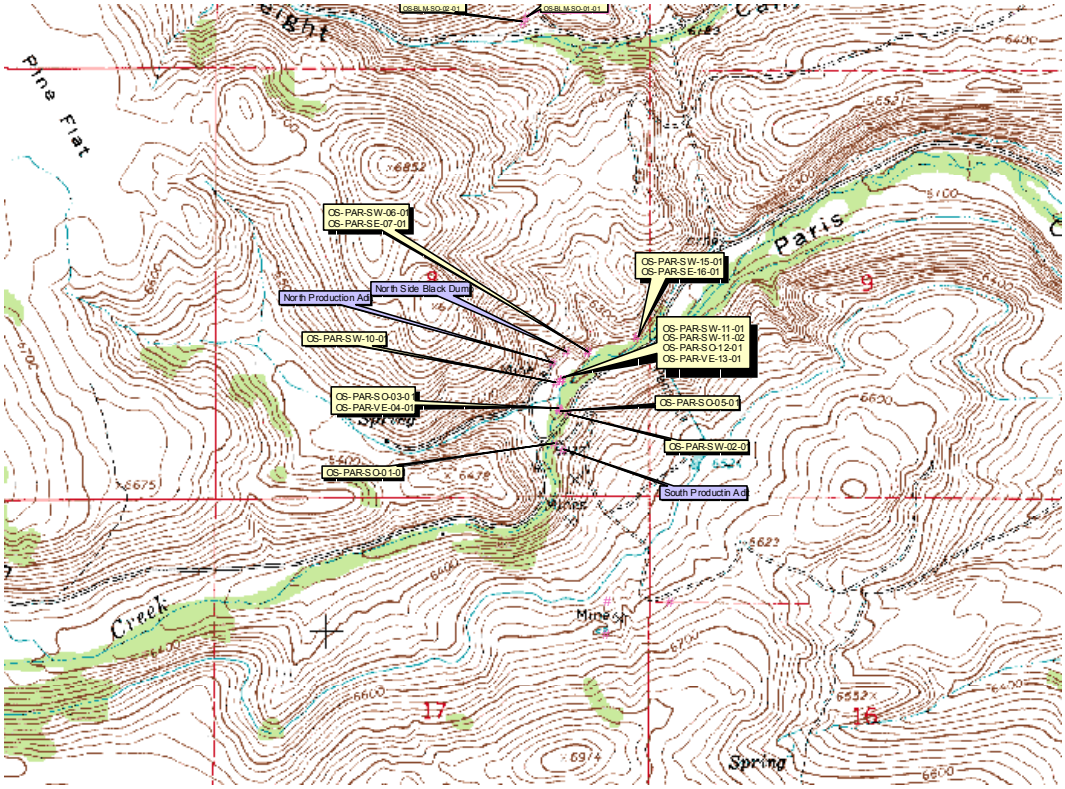

Figure 12.1
Paris Canyon Mine site location.

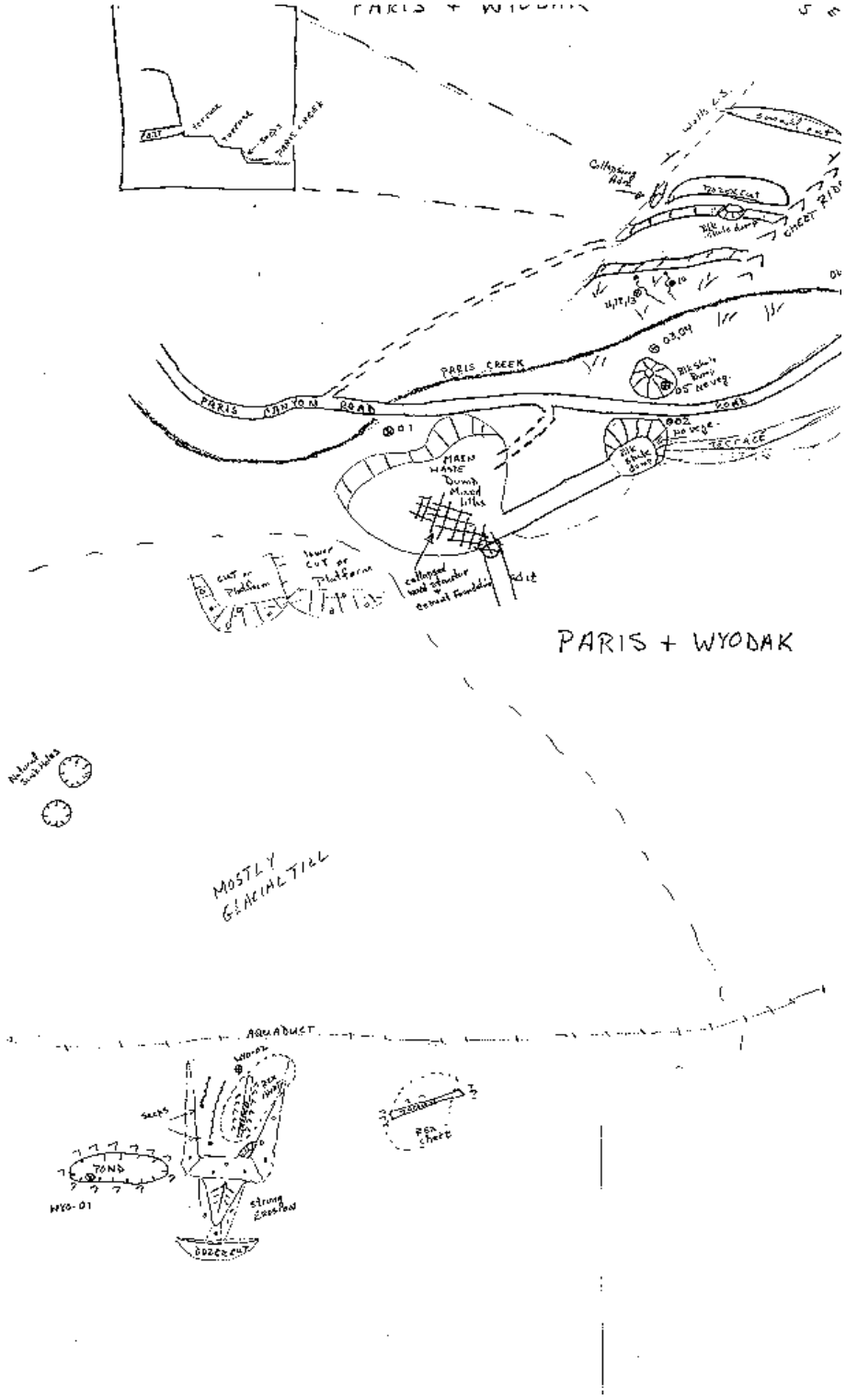

Figure 12.2
Paris Canyon Mine, site sketch.

Photo 12.1
Paris Canyon Mine, south portal. View to south.

Photo 12.2
Paris Canyon Mine, Paris Canyon road. View to west.

Photo 12.3
Paris Canyon Mine, north portal. View to northwest.

Photo 12.4
Paris Canyon Mine, sample OS-PAR-SO-01-01. Located in Paris Creek riparian zone. View to southwest.

Photo 12.5
Paris Canyon Mine, sample OS-PAR-SW-02-01. Ponded runoff in the lower center of photo. View to southwest.

Photo 12.6
Paris Canyon Mine, sample location for OS-PAR-SO-03-01 and OS-PAR-VE-04-01. Paris Creek flood plain and riparian area. View to southeast.

Photo 12.7
Paris Canyon Mine, sample OS-PAR-SO-05-01. View to north.

Photo 12.8
Paris Canyon Mine, sample location for OS-PAR-SW-06-01 and OS-PAR-SE-07-01. Cliff in top center of photo is overturned Rex Chert. View to west. Water flows center to left.

Photo 12.9
Paris Creek, 2 miles upstream from mine. Sample location for OS-PAR-SW-08-01 and OS-PAR-SE-09-01. View to north. Water flows left to right.

Photo 12.10
Paris Canyon Mine, seep below north portal. Sample location for OS-PAR-SW-10-01. View to west.

Photo 12.11
Paris Canyon Mine, second seep below north portal. Sample location for OS-PAR-SW-11-01. View to east.

Photo 12.12
Paris Canyon Mine, sample location OS-PAR-SO-12-01 and OS-PAR-VE-13-01. North portal in background. View to north.

Photo 12.13
Paris Creek, downstream from mine. Sample location for OS-PAR-SW-15-01 and OS-PAR-SE-16-01. View to northeast.

Appendix 13

WYODAK COAL

Wyodak Coal Exploration

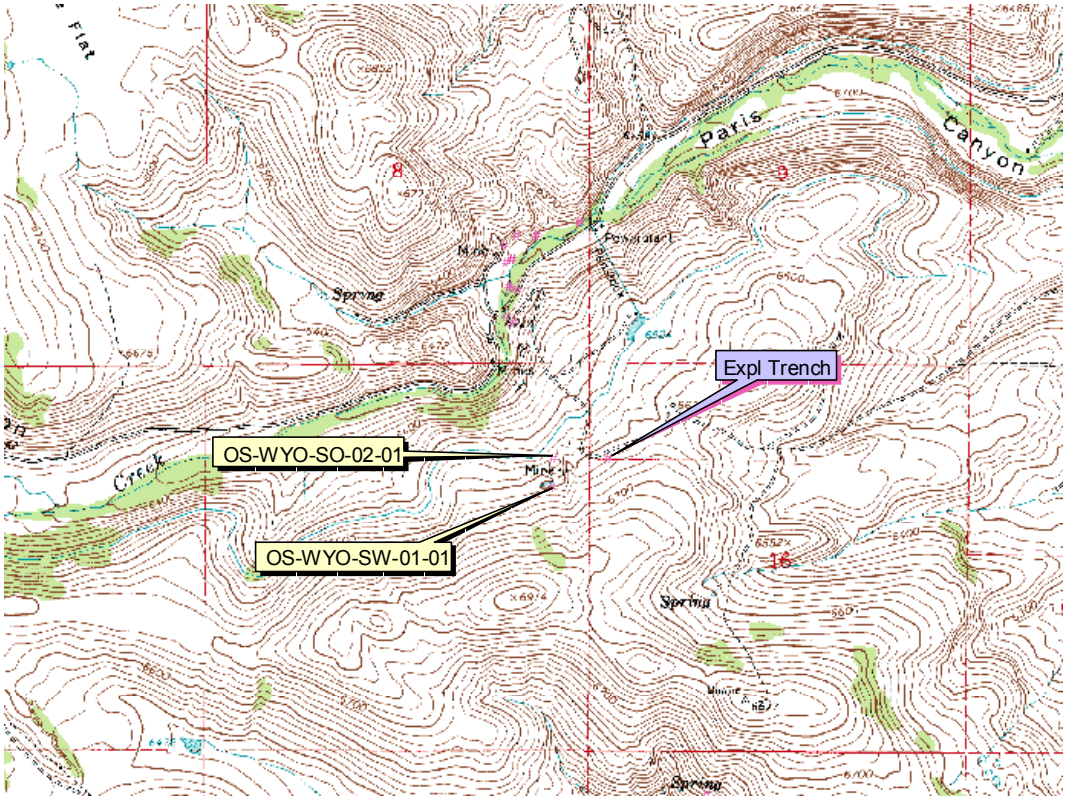

Figure 13.1
Wyodak Coal Exploration sample locations.

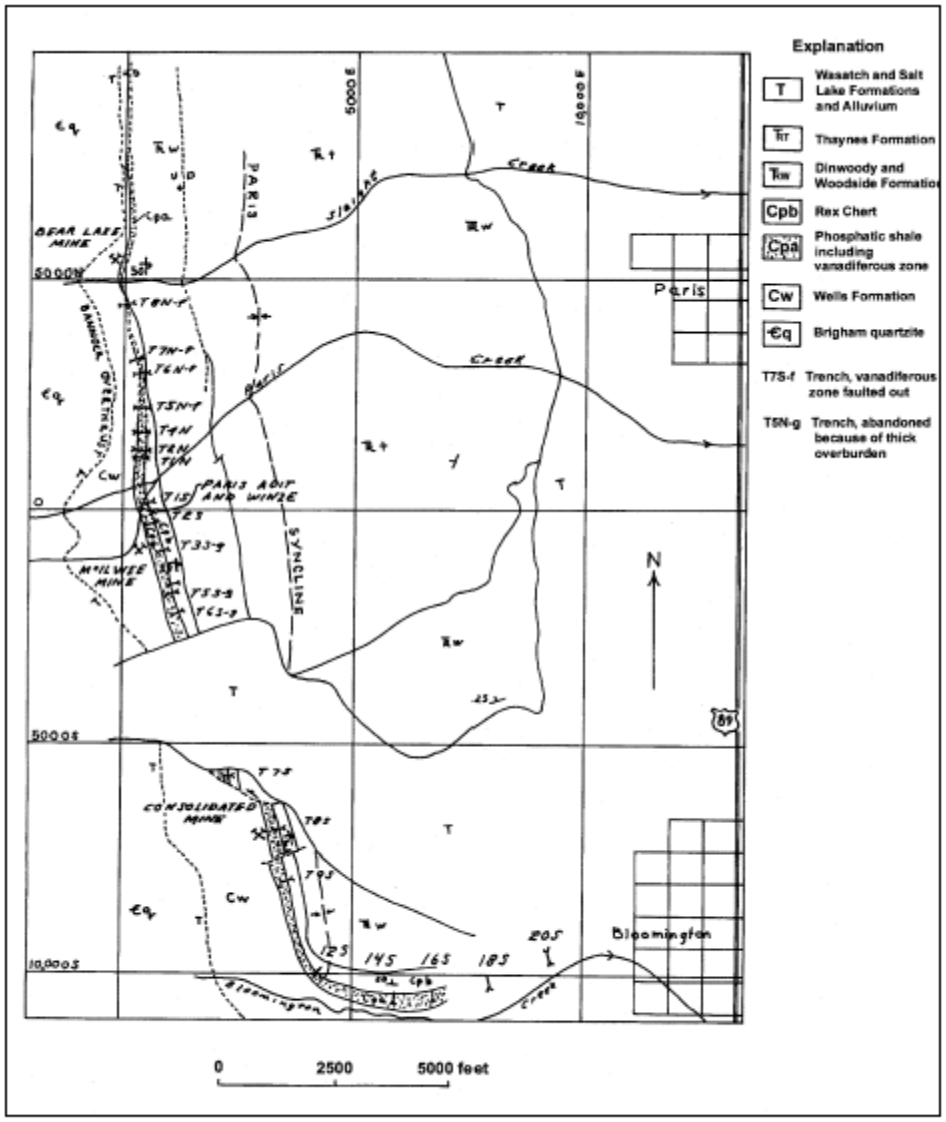

Figure 79. Geologic sketch map of the Paris-Bloomington vanadium area, adapted from Wyodak, 1944. Map by V. E. McKelvey and J. D. Strobell, December 5, 1943.

Figure 13.2
Wyodak Coal Exploration plan.

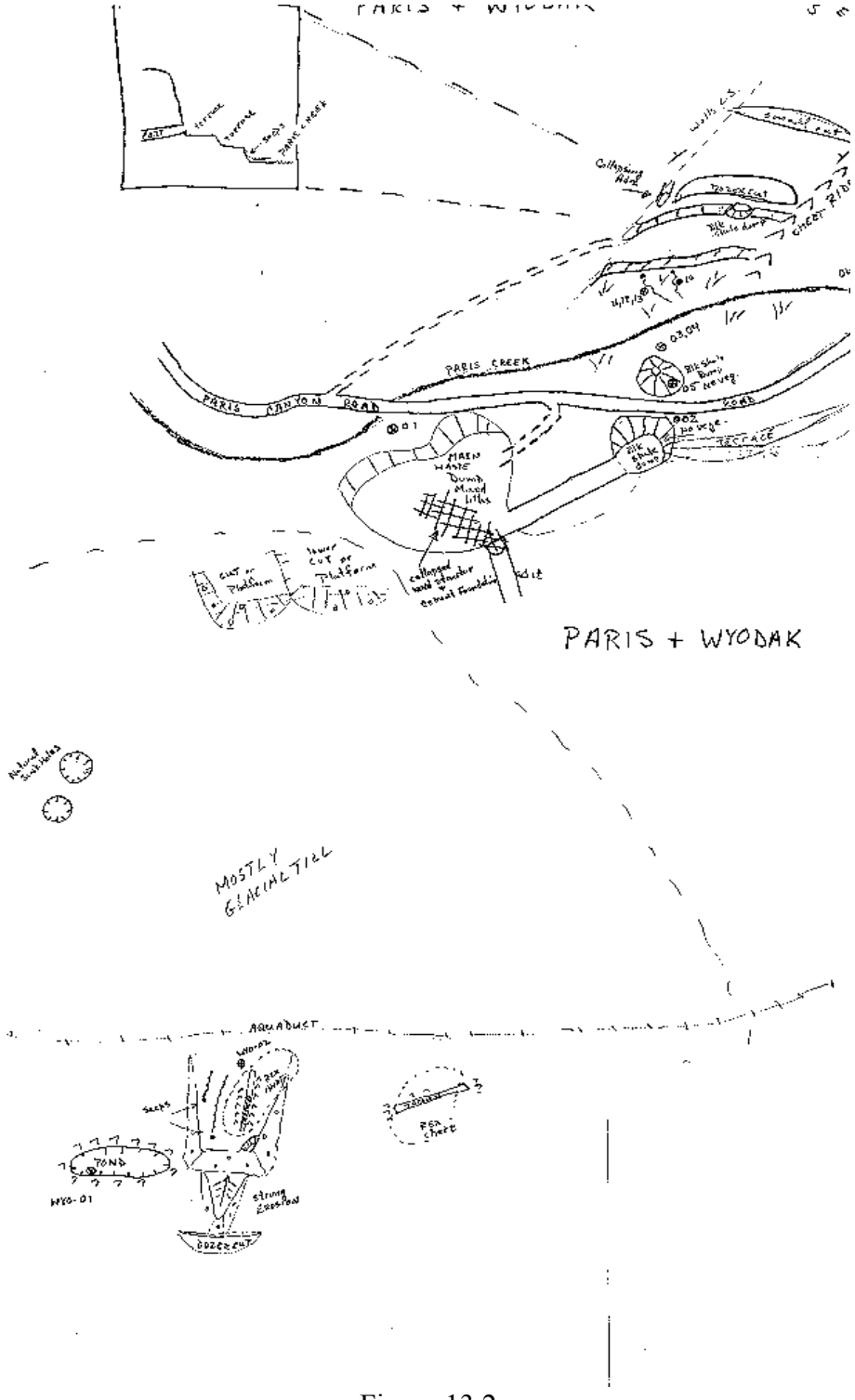

Figure 13.2
Wyodak Coal exploration site sketch.

Photo 13.1
Wyodak Coal Exploration, two trenches in excavated area. View to northwest.

Photo 13.2
Wyodak Coal Exploration, pond. Sample local for OS-WYO-SW-01-01. View to northwest.

Photo 13.3
Wyodak Coal Exploration, sample local for OS-WYO-SO-02-01. Note oxidized sandy soil.

Appendix 14

GEORGETOWN CANYON MINE (RIGHT FORK)

Georgetown Canyon Mine (Right Fork)

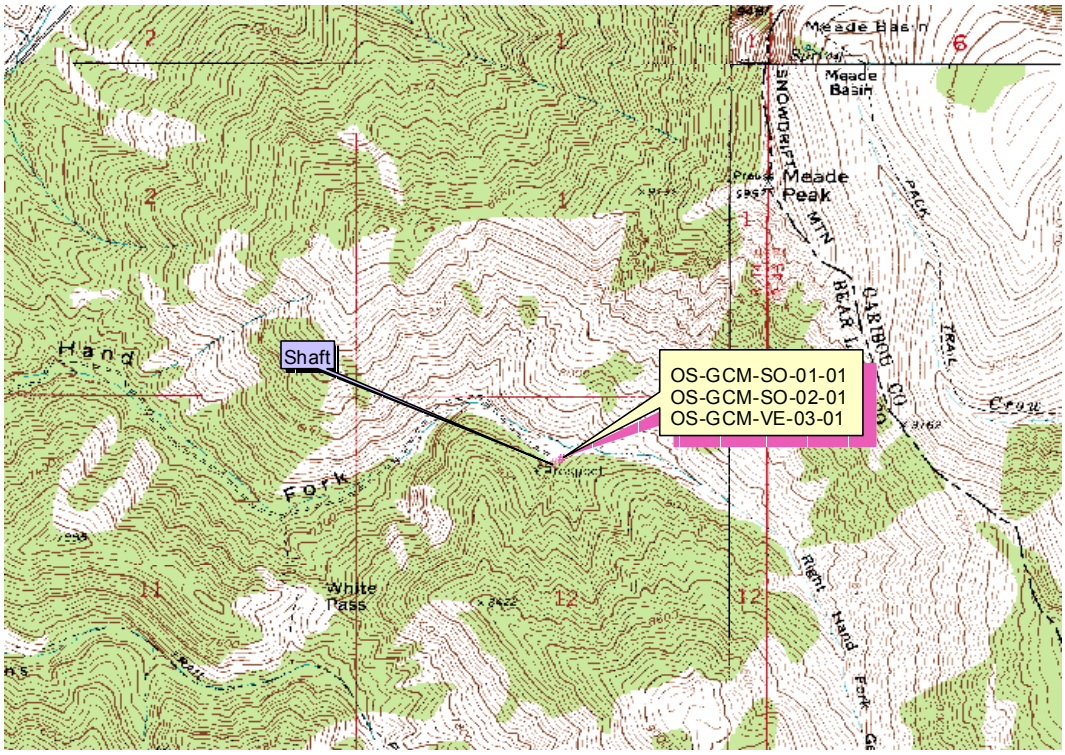

Figure 14.1
Georgetown Canyon Mine (Right Fork) site location.

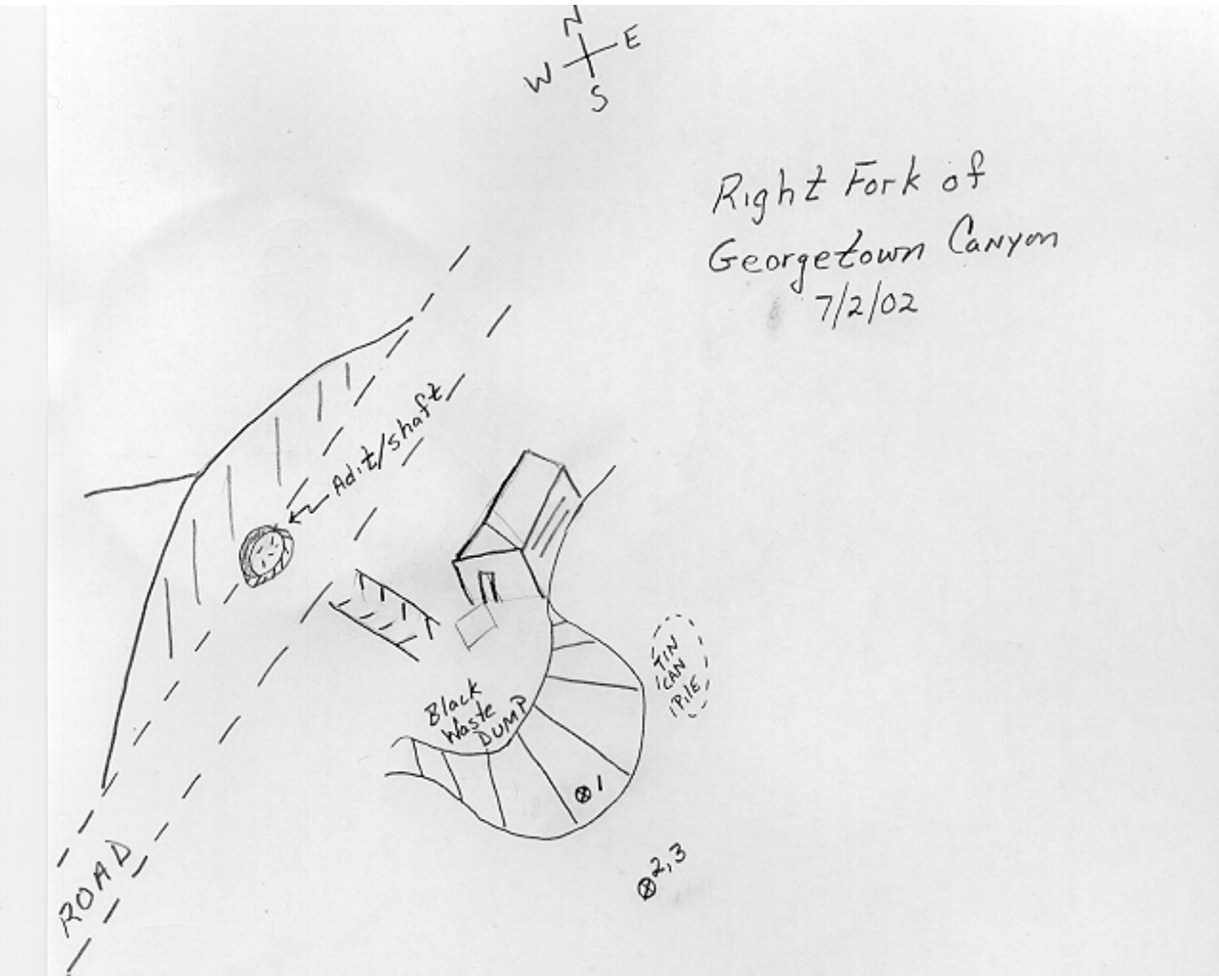

Figure 14.2
Georgetown Canyon Mine (Right Fork) site sketch.

Photo 14.1
Partially collapsed shaft. View to north.

Photo 14.2
Partially collapsed shaft. View to north.

Photo 14.3
Black waste shale dump, cabin in background.

Photo 14.4
Sample location for OS-GCM-SO-01-01.

Photo 14.5
Sample location for OS-GCM-SO-02-01 and OS-GCM-VE-03-01. Waste dump in background.
View to northwest.

Appendix 15

SULFUR CANYON EXPLORATION

Sulfur Canyon Exploration

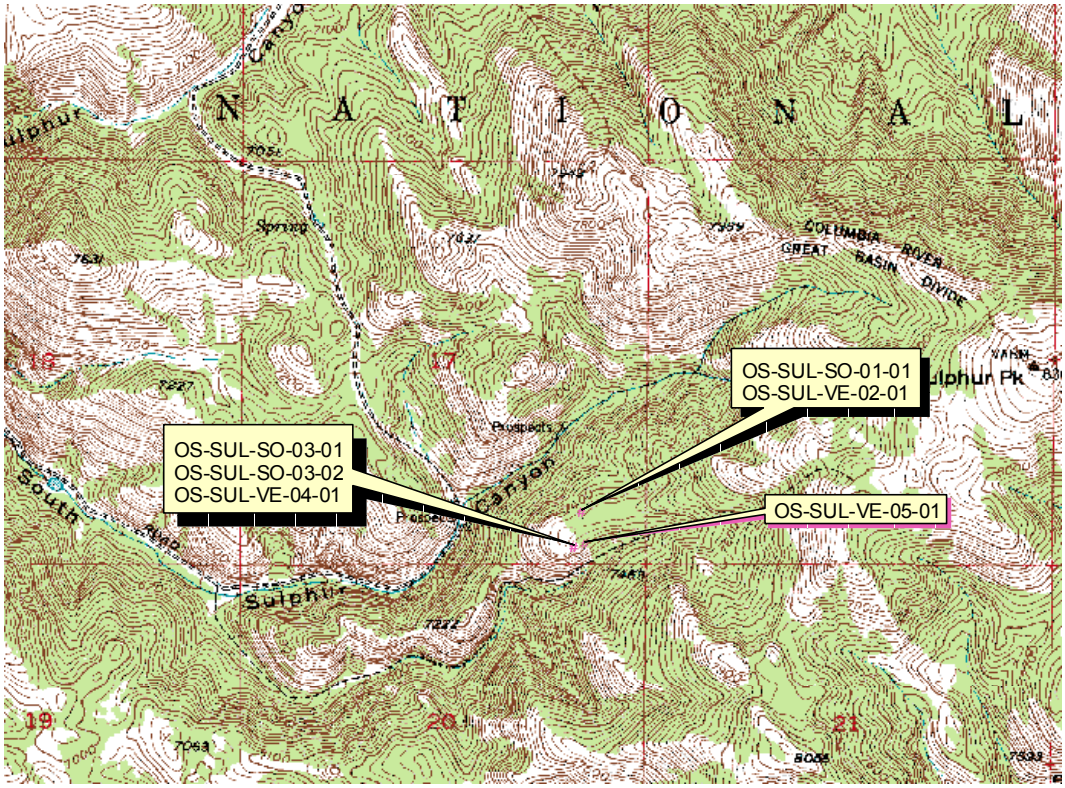

Figure 15.1
Sulfur Canyon Exploration site location.

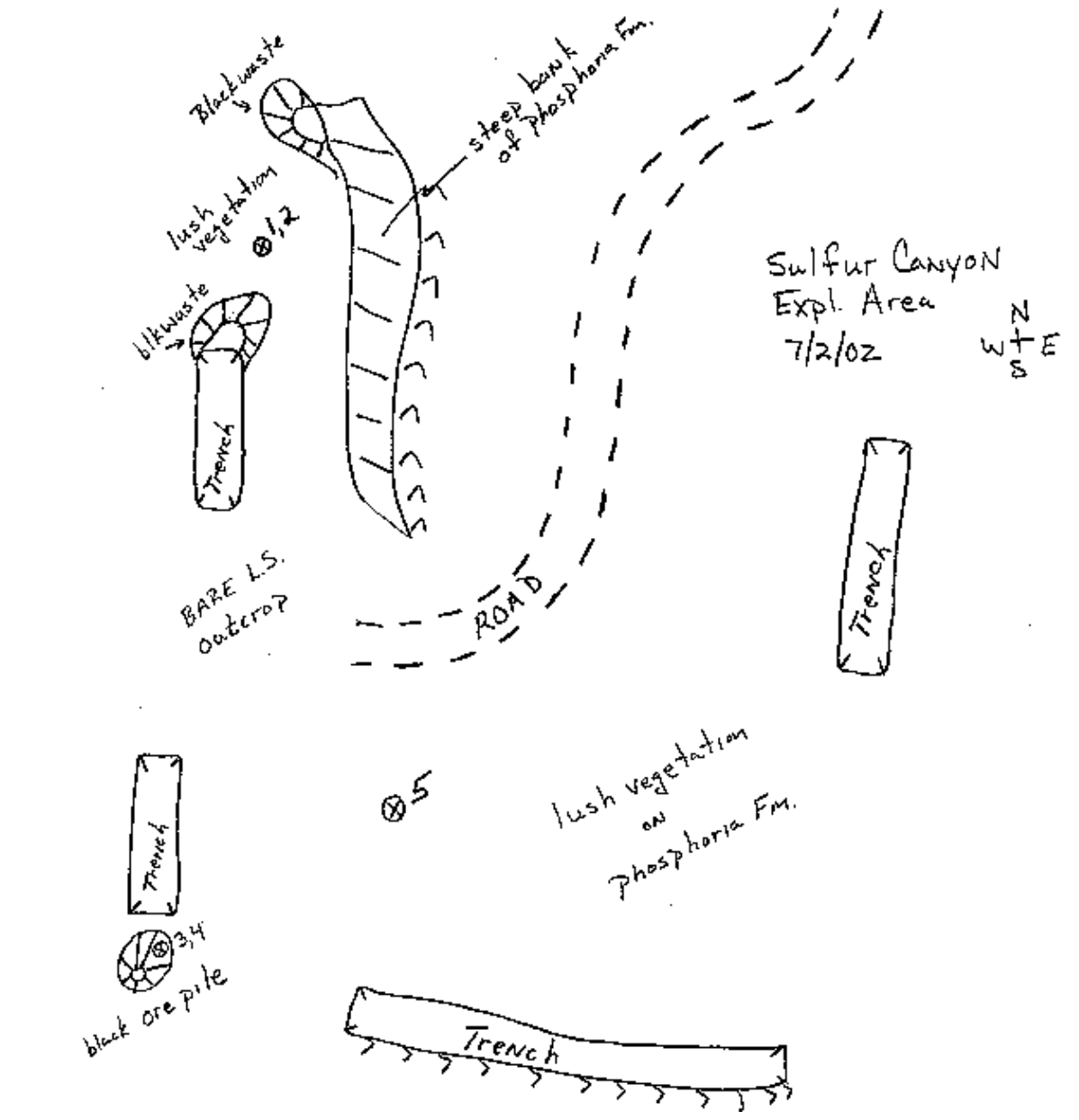

Figure 15.2
Sulfur Canyon Exploration site sketch.

Photo 15.1
Sulfur Canyon Exploration area, veneer of Phoshoria Fm. on cliffs of Wells Limestone. View to north.

Photo 15.2
Sulfur Canyon Mine, sample location for OS-SUL-SO-01-01 and OS-SUL-VE-02-01. View to north.

Photo 15.3
Sulfur Canyon Exploration, sample location for OS-SUL-SO-01-01 and OS-SUL-VE-02-01.
View to south.

Photo 15.4
Sulfur Canyon Exploration, sample location OS-SUL-SO-03-01 and OS-SUL-VE-04-01.
Collected on black shale dump in center of photo. View to south.

Photo 15.5
Sulfur Canyon Mine, sample location OS-SUL-VE-05-01. View to north.