MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

ABANDONED HARDROCK MINE PRIORITY SITES
1994
SUMMARY REPORT

Prepared For:

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Abandoned Mine Reclamation Bureau
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Engineering Services Agreement DSL-AMRB No. 94-006

DECEMBER 1994

The cover photograph is of the Drumlummon Mill Tailings
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1.0 INTRODUCTION

This document is a supplement to the 1993 Hazardous Materials Inventory Summary Report published by the Montana Department of State Lands/Abandoned Mine Reclamation Bureau (MDSL/AMRB). The Hazardous Materials Inventory was implemented to consistently characterize and rank the extent of environmental problems associated with the Abandoned Hardrock Mine Priority Sites. This 1994 supplemental report includes an additional 62 sites to the 270 sites inventoried in 1993.

This report is organized into five sections. Section 1.0 presents the introduction, project objectives, a brief description of the project tasks, and a summary of the findings. Section 2.0 briefly describes field methods used during the inventory. Section 3.0 discusses data evaluation techniques and data management for the project. Section 4.0 presents a brief description of the Abandoned and Inactive Mines Scoring System (AIMSS) which was developed to rank the priority sites. Section 5.0 presents one page summaries for each of the priority sites. The summaries typically provide details about each site, such as volumes of wastes, contaminant concentrations, observed releases to surface water and groundwater, water quality criteria exceedances, and potential safety hazards.

This summary report is supported by several other project documents and databases, including:

- The Sampling and Analysis Plan (SAP) presents the sampling approach for the Abandoned Mines Hazardous Materials Inventory. This SAP also contains instructions on completing the Inventory Form and the Standard Operating Procedures (SOPs) for conducting the field sampling activities (Pioneer, 1994a).

- The Quality Assurance Project Plan (QAPjP) describes quality assurance procedures used for evaluating the filed and lab data for the project (Pioneer, 1994b).

- The Laboratory Analytical Protocol (LAP) describes laboratory requirements for the project (Pioneer, 1994c).

- The Health and Safety Plan (HSP) describes practices and procedures to be followed by field investigators who performed the project to minimize exposure to hazardous materials and to eliminate any possibility of physical injury (Pioneer, 1994d).

- The Abandoned Hardrock Mines Project Report is a compilation of the reports listed above, as well as this Summary Report, the AIMSS Report, the Data Validation/Evaluation Report, and the completed Hazardous Materials Inventory Forms for each site (Pioneer, 1994e).

- The Abandoned Hardrock Mine Priority Sites, Hazardous Materials Inventory Databases.

The complete Abandoned Hardrock Mines Project Report including the 1993 and 1994 inventories can be viewed in Helena, Montana, at the Montana State Library; the MDSL/AMRB office; or the Montana Department of Health and Environmental Sciences/Solid and Hazardous Waste Bureau (MDHES/SHWB) office or in Missoula, Montana, at the United States Department of Agriculture/Forest Service (USFS), Region 1 office.

1.1 PROJECT OBJECTIVES

There are an estimated 6,000 abandoned or inactive hardrock mine and milling sites in Montana. This legacy of Montana's mining past has left a wide range of problems and challenges for the MDSL/AMRB and other state and federal agencies charged with the reclamation and mitigation of these problems.

The problems associated with the abandoned and inactive hardrock mine sites are varied and range from safety hazards caused by hazardous mine openings, dangerous highwalls, and dilapidated structures, to threats to human and non-human life and the environment by mining waste containing elevated levels of heavy metals and other contaminants. To date, the MDSL/AMRB has conducted a great deal of work to eliminate the problems of unsafe openings, highwalls, and structures, and has made over 1,500 of these sites safer.

In 1991, the MDSL/AMRB concluded that substantial progress had been made in eliminating imminent hazards to public health and safety at abandoned hardrock mine sites. However, limited progress was realized with regard to the problems relating to heavy metal and mineral processing reagent contamination of surface water and groundwater. Not only were these sites causing severe environmental degradation, but they were also the sites of highest concern to the public. Additionally, the MDSL/AMRB recognized that there were a number of other state and federal programs that had resources available to address their problems, but there was no coordinated approach to determining which specific sites should be addressed first. As a result, the MDSL/AMRB solicited various state and federal agencies, requesting assistance in the identification of suspected problem sites. The following agencies responded to the MDSL/AMRB request: USFS-Region 1, the United States Department of the Interior/Bureau of Land Management (BLM), MDHES, and the Montana Department of Natural Resources and Conservation (DNRC). A list of the 270 suspect sites was compiled from the input of these agencies supplemented by a review of existing data from the MDSL/AMRB master inventory. This list included the majority of the highest potential hazard sites in Montana. These sites were investigated and inventoried during the 1993 field season. As result of the 1993 inventory activities and continued records searches, 62 additional sites were identified, investigated, and ranked during the 1994 field season by the MDSL/AMRB. This 62-site supplement to the 1993 priority sites list is presented in Table 1-1.

County	*District*	*Site Name*	*PA #*
Beaverhead	Hecla/Vipond Park	True Blue	01-138
Beaverhead	Lemhi	Thorium City	01-500
Broadwater	Indian Creek	Bullion King	04-081
Broadwater	Winston	Custer Millsite	04-006
Broadwater	Winston	Kleinschmidt	04-010
Broadwater	Winston	Golden Age	04-050
Broadwater	Winston	Sunrise/January	04-130
Broadwater	Winston	Aurora Millsite	04-500
Broadwater	Winston	Chartam	04-501
Cascade	Neihart	Broadwater	07-079
Cascade	Neihart	Hartley	07-082
Cassade	Neihart	Queen of the Hills	07-085
Cascade	Neihart	Emma	07-144
Cascade	Neihart	Rebellion Mine (Upper & Lower)	07-157
Cascade	Neihart	Ripple Mines	07-163
Cascade	Neihart	Lexington No. 4	07-167
Cascade	Neihart	Hutchinson	07-177
Cascade	Neihart	Snow Creek Millsite	07-505
Fergus	Warm Springs	Gilt Edge Tailings	14-008
Fergus	Warm Springs	Western Mine/Millsite	14-030
Fergus	Warm Springs	Prester John	14-090
Granite	Alps	Argo	20-081
Granite	Frog Pond	Millers Mine	20-176
Granite	Garnet	Free Coin/Red Cloud	20-134
Granite	Philipsburg	Little Gem	20-071
Granite	Philipsburg	Wenger No. 2	20-073
Jefferson	Basin	Josephine	22-031
Jefferson	Basin	Doris	22-293
Jefferson	Basin	Lady Leith	22-316
Jefferson	Basin	Old Basin Millsite	22-500
Jefferson	Cataract	Cresent/Alsace	22-106
Jefferson	Cataract	Boulder Chief	22-132
Jefferson	Cataract	Rocker/Ada	22-170
Jefferson	Colorado	Crawley Camp	22-028
Jefferson	Elkhorn	Carmody	22-337
Jefferson	Elkhorn	Iron	22-359
Jefferson	Elkhorn	Trumley Heap Leach	22-501
Jefferson	Elkhorn	Elkhorn Creek Tailings	22-502
Judith Basin	Hughesville	Danny T	23-500
Judith Basin	Yogo	Roncor/Amax Sapphire	23-501
Lewis & Clark	Helena	Josyln Street Tailings	25-501
Lewis & Clark	Marysville	Drumlummon Mine/Mill/Tailings	25-024
Lewis & Clark	Rimini	Peerless Jenny/King	25-006
Lewis & Clark	Rimini	Woodrow Wilson	25-258
Lewis & Clark	Rimini	Peter	25-259
Lewis & Clark	Rimini	Queensbury	25-262
Lewis & Clark	Rimini	Monte Cristo	25-275
Lewis & Clark	Rimini	National Extension	25-287
Lewis & Clark	Rimini	Monitor Creek Tailings	25-503
Lewis & Clark	Rimini	Bear Gulch	25-504
Lewis & Clark	Stemple	Jay Gould Mine/Millsite	25-500
Lewis & Clark	Stemple	New Jay Gould Millsite	25-502
Madison	Pony	Garnet Gold Mine	29-035
Madison	Pony	Chicago Mining Corp. Pony Mill	29-500
Madison	Virginia City	U.S. Grant	29-095
Madison	Virginia City	Belle	29-098
Madison	Virginia City	Prospect	29-136
Mineral	St. Regis	Gold Chrome	31-037
Missoula	Clinton	Wallace Creek Millsite	32-019
Missoula	Copper Cliff	Copper Cliff	32-001
Missoula	Copper Cliff	Frogs Diner	32-027
Park	New World	Great Republic Smelter	34-000

TABLE 1-1: 1994 ABANDONED MINE PRIORITY SITES

The agencies previously listed agreed to a cooperative course of action, with MDSL/AMRB designated as the lead agency. The agencies established the following objectives:

- To identify and prioritize those abandoned mine sites that are presently the most serious threats to public health and safety and the environment.

- To collect data on each priority site in a consistent manner to identify problems associated with each site and to directly compare and rank sites. All sampling and analysis methods will strictly follow United States Environmental Protection Agency (EPA) protocols to ensure consistent and accurate results.

- To develop a long-term strategy to utilize statutory and financial resources available to systematically reduce the hazards associated with the prioritized abandoned mine sites.

Upon completion of this report, the first two objectives stated above are fulfilled, and the framework to complete the third objective is in place.

1.2 PROJECT DESCRIPTION

The additional 62 priority sites investigated during the 1994 field season under the Abandoned Mines Hazardous Materials Inventory were located in 12 counties and in 26 out of the 206 mining districts in Montana. Site investigations began June 6, 1994, and were completed on August 17, 1994. One field crew consisting of three to four scientists, engineers, and technicians were in the field for approximately 50 days to complete the data collection effort.

The site investigation conducted at each site involved the following tasks: overall site reconnaissance; mapping; collection of tailings, slag, waste rock, adit discharge, flooded shafts, stream water, and sediment samples; field analysis of solid matrix samples using an X-ray Fluorescence (XRF) Spectrometer; and measurements of field parameters in water, including flow rates, pH, specific conductance, temperature, oxidation reduction potential, and alkalinity. The field team members also photographed sample locations and significant site features, video taped the site, and evaluated safety hazards.

The period during which the field investigations were conducted in 1994 was much drier than the 1993 field season, which was abnormally wet. There were 22 days of measurable precipitation with a total accumulation of only 3.40 inches (measured at Butte, Montana) during the 1994 field investigation period. This compared to 69 days of measurable precipitation with a total accumulation of 11.2 inches during the 1993 field season. The reduced amount of precipitation may have resulted in decrease in the documentation of observed releases to surface water that would have been occurring under 1993 conditions.

The physical setting and topography associated with these sites ranged from gently sloping land in valley bottoms to very steep, high elevation, mountainous areas. Access to sites was often difficult due to poor road conditions or absence of maintained roads. Access to several sites was limited to travel on foot or by helicopter. Ownership of the priority sites is a mix of public lands (USFS, BLM, MDSL, etc.) and patented lands (private ownership). The priority sites consist of primarily inactive/abandoned mine sites; however, exploration activities were in progress at several of the sites.

Significant features at the sites included tailings ponds, impoundments, and piles; waste rock dumps or piles; mine openings, including adits, shafts, glory holes, and exploration trenches; miscellaneous buildings and structures; and roads. Mine opening discharges and streams adjacent to or flowing through the sites were common.

Hazardous materials observed at some of the sites included chemical reagents, solvents, asbestos-containing material, petroleum fuels or lubricating oils storage (barrels or tanks) and miscellaneous power supply items (poles, transformers, lines, etc.). Some of the sites support wildlife, domestic grazing, or aquatic life. Residential occupation of the sites was observed in rare cases, but residences located adjacent to the sites occurred more frequently.

1.3 SUMMARY OF FINDINGS

The following information is provided as an overview of the data compiled during the 1994 supplemental investigation to the Hazardous Materials Inventory.

Laboratory Sampling

- Total number of lab samples: 409 (does not include the QA/QC duplicates), representing approximately 9,000 data points generated by the laboratories.
- Total number of XRF samples: 608 (does not include the QA/QC duplicates), representing approximately 12,800 data points.

Waste Rock Associated with the Priority Sites

- Estimated total volume: 501,950 cubic yards.
- Estimated total area: 2,399,340 square feet (55.1 acres).
- Estimated total unvegetated/uncovered area: 2,156,647 square feet (49.5 acres).

Mill Tailings Associated with the Priority Sites

- Estimated total volume: 597,692 cubic yards.
- Estimated total area: 3,018,335 square feet (69.3 acres).
- Estimated unvegetated/uncovered area: 1,496,230 square feet (34.3 acres).

Adit Discharges Associated with the Priority Sites

- Total number of discharging adits: 47.
- Number of adit discharges with pH ≤ 5.00: 10.
- Number of adit discharges with pH ≤ 6.00: 14.

Flooded Shafts Associated with the Priority Sites

- Total number of open shafts with water: 4.
- Shafts with pH ≤ 5.00: 0.
- Shafts with pH ≤ 6.00: 2.

Water Quality Criteria

- Number of discharges exceeding Safe Drinking Water Act MCL/MCLGs: 28.
  27 adits
  1 shaft
- Number of adit discharges exceeding acute aquatic life criteria: 33.
- Number of observed releases to surface water/sediment directly attributable: 28.
- Number of observed releases to groundwater directly attributable: 1.
- Acute aquatic life exceedances in surface water attributable to the site: 22.
- MCL exceedances in surface water attributable to the site: 12.

2.0 INVESTIGATION METHODS

2.1 DATABASE AND LITERATURE SEARCH

Data collected in the field was supplemented by an extensive literature search and the use of several computer databases. This supplemental information was used to complete the inventory forms and fulfill receptor information requirements for the AIMSS. The computer databases used to collect this information were:

- The Montana Bureau of Mines and Geology (MBMG) Well Logs Database, which was compiled by the MBMG and the DNRC. This database was used to estimate the number of wells within a one-and four-mile radius of each site.

- The Montana Rivers Information System (MRIS), Version 2.0, compiled by the Montana State Library for the Montana Department of Fish, Wildlife, and Parks (MDFWP). This database was used to assign classifications relating to riparian habitat quality, wetlands frontage, fisheries habitat and species classification, and sport fisheries classification for stream reaches potentially impacted by each site, where applicable.

- The MDHES/Water Quality Bureau (WQB) - Community Water Supplies Database. The MDHES/WQB provided a list of surface water resources presently used for drinking water supplies in Montana.

Addition information was obtained from the following sources:

- Peak and average stream flow estimates were obtained from United States Department of Interior/Geological Survey (USGS) flow monitoring reports on gaged streams.

- Population estimates were obtained by counting buildings delineated on the USGS quadrangle maps and USFS Forest Visitors Maps. Field observations supplemented this source of information.

- Land ownership was determined from USFS Forest Visitor Maps, unless more accurate records were available.

- Historic mine/millsite operations, mineralogy, and geology were obtained from several sources, including: United States Bureau of Mines (USBM) Circulars, USGS Bulletins and Professional Papers, and MBMG Memoirs, Bulletins, and Circulars.

- Historic analytical data were obtained from the MDSL/AMRB project files, the MDHES/SHWB project files, the MDHES/WQB, USFS project files, and MBMG data collected for the USFS. This data was reviewed prior to site visits to provide the investigators with background information on potential hazards associated with each site.

2.2 FIELD METHODS

A detailed discussion of specific investigation methodologies is found in the MDSL/AMRB Hazardous Materials Inventory SAP (Pioneer, 1994a). The purpose of this section is to describe some of the unique details of the investigative methods used to fulfill the project objectives.

The inventory form used during the 1994 investigation was almost identical to the 1993 form with minor modifications to remove redundancies and streamline decision-making processes. The inventory form was used during the investigation to guide and focus the investigative tasks to ensure consistent evaluation of each site. Literature and database searches were performed prior to the field investigations to provide investigators with background information on each site.

Sampling was performed on waste rock dumps, mill tailings, streams, ponds, adit discharges, flooded shafts, and from domestic groundwater wells or monitoring wells, when present.

Each tailing's feature was characterized both spatially and vertically by hand-auguring to determine accurate depths and delineate stratification or differences in metals concentrations between the upper oxidized zone(s) and the lower reduced zones. Subsamples were collected from each visually different strata.

Typically, several subsamples were collected from each waste rock dump in order to better characterize very heterogeneous waste sources. Subsamples from the tailings and waste rock were analyzed in the field using XRF Spectrometers. The field screening data allowed the investigators to make informed decisions on the number of samples required for laboratory analyses and indicated how best to composite the subsamples from the potential sources in order to send representative samples to the laboratory, while minimizing the number of samples to achieve this end. The XRF analyses also provided an increased number of valid and discrete data points per site achieving a more thorough understanding of the problems associated with each site. Solids were characterized additionally by measurement of pH and radioactivity.

Stream sediment samples were also analyzed in the field with the XRF in order to assist in the assessment the extent of contamination and migration from the waste sources.

Surface water sampling was often conducted to characterize impacts to drainage basins, as well as contributions from individual sites, when multiple sources were present. Waters were additionally characterized in the field by measuring flow rates, pH, specific conductance, alkalinity, and temperature.

Site mapping was conducted using a Global Positioning System supplemented with standard "Chain and Compass" surveying techniques when necessary. The primary purpose of mapping was to estimate volume and area of waste sources and record sample locations. Other significant site features, such as streams or drainages, roads, mine openings, and structures, were also recorded on the site sketches. Sample locations and other significant site features were documented on photographic slides and video tape to assist the resource managers in their evaluation of the priority sites.

3.0 DATA EVALUATION AND COMPARISONS

The purpose of this section is to discuss data quality validation and evaluations, as well as comparisons of the data to pertinent criteria.

3.1 DATA VALIDATION AND EVALUATION

3.1.1 Laboratory Data Validation and Evaluation

The laboratory utilized during this investigation complied all of the QA/QC performance requirements defined in the Contract Laboratory Program (CLP) Statement of Work (SOW, March 1990). The data packages provided by the laboratory allowed comprehensive data validation and evaluation procedures to be completed. Laboratory data validation and evaluation were performed according to guidelines developed by the EPA.

The laboratory data were validated in accordance with the document Laboratory Data Validation Functional Guidelines for Evaluating Inorganics (EPA, 1988). The data validation procedures were performed partially by laboratory chemists and partially by a data reviewer from Pioneer Technical Services, Inc. The data validation procedure included an evaluation of the following:

- holding times;
- initial and continuing calibrations;
- calibration and preparation blanks;
- inductively coupled plasma (ICP) interference check samples;
- laboratory control samples (LCS);
- laboratory duplicate sample analyses (precision assessment);
- matrix spike sample analyses (accuracy assessment);
- furnace atomic absorption (AA) quality control;
- ICP serial dilutions;
- sample result verification;
- field duplicate analyses (precision assessment);
- field blank analyses; and
- overall assessment of data for the case.

Data evaluation occurred after the data validation process was completed and the appropriate qualifiers had been applied to the data. The data evaluation process involved a statistical analysis of the data to identify outliers and assess the quality of the data overall. Data evaluation was performed on the laboratory data which met the Data Quality Objectives (DQOs) outlined in the QAPjP for the Abandoned Mines Hazardous Materials Inventory (Pioneer, 1994b).

Although numerous qualifications (flags) were applied to the laboratory data compiled during this investigation, and a small portion of the data were evaluated as outliers, none of the data were flagged "R" or were otherwise considered unusable. Consequently, 100 percent of the laboratory data (soil and water) collected during this investigation are considered valid and useable for all of the objectives of this project.

The limitations of the data should be considered when making interpretations. Please refer to the document entitled Data Validation and Evaluation Report for the Abandoned Mines Hazardous Materials Inventory for a detailed description of the procedures followed and results provided by the overall data assessments.

3.1.2 X-Ray Fluorescence Spectrometer Data Validation

Data provided by the field portable XRF Spectrometer were also validated; the XRF data were validated according to manufacturer specifications. The validation procedures for XRF data were not nearly as rigorous as for laboratory data; consequently, additional procedures, utilizing standard statistical techniques, were employed to evaluate the overall quality of the XRF data. These additional procedures included assessment of XRF duplicate data to quantify precision, as well as comparing XRF data to corresponding laboratory data to assess inter-method precision and correlation.

3.1.3 Other Field Measurements

Field parameter measurements, such as pH, Eh, and specific conductance, were not evaluated for data quality. Standard operating procedures (Pioneer, 1994a) were carefully followed in the field to achieve a consistent and acceptable level of quality.

3.2 DATA INTERPRETATION

The analytical data collected was compared to site-specific background or upgradient concentrations, as well as drinking water standards and aquatic life criteria. The following sections explain how these comparisons were made.

3.2.1 Background Soil Comparison

Background soil samples were collected to establish the extent to which metals concentrations were elevated in comparison to the local background. Background samples were typically applied to groups of sites in close proximity to one another and within similar geologic units. Occasionally, background samples collected during the 1993 investigation were used.

3.2.2 Observed Releases to Groundwater, Surface Water, and Sediment

An observed release to surface water is defined as a downstream surface water or stream sediment concentration at more than three times the upstream surface water or

sediment concentration, for any constituent that can be attributed to the site. Groundwater, surface water, and stream sediment analytical data was used to document observed releases from the priority sites.

3.2.3 MCL/MCLG, Aquatic Life Criteria Comparisons

Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) are drinking water standards promulgated under the federal Safe Drinking Water Act (SDWA), (40 CFR Parts 141, 143). MCLs, and MCLGs apply to public water systems; however, they may be relevant and appropriate to surface or groundwater if those waters are used as drinking water. Groundwater and surface water metals concentrations observed in samples collected were evaluated against these standards. The current SDWA MCLs and MCLGs expressed in micrograms per liter (ug/L) are:

Arsenic: 50 ug/L	Barium: 2,000 ug/L	Cadmium: 5 ug/L
Copper: 1,300 ug/L	Chromium: 100 ug/L	Mercury: 2 ug/L
Nickel: 100 ug/L	Antimony: 6 ug/L	Lead: 15 ug/L
Cyanide: 200 ug/L		

Surface water and mine discharge analytical results were also evaluated against the freshwater acute and chronic aquatic life criteria as presented in the Montana Numeric Water Quality Standards, Circular WQB-7, July 15, 1994. Some of these criteria are expressed as a function of total hardness and were corrected for the hardness measured in each sample, when applicable.

3.3 DATA MANAGEMENT

The data collected under this project has been input into the data manager dBase IV, Version 2.0. Four files were created to contain the data and aid in any manipulation of the data that may be desired. These files are summarized briefly below.

- PTSDATA.DBF contains field data collected for each sample during the Hazardous Materials Inventory;
- XRFDATA.DBF contains all the XRF analytical results generated in the field during the Hazardous Materials Inventory;
- LABDATA.DBF contains the data from all of the laboratory analyses performed during the Hazardous Materials Inventory; and
- PRIORITY.DBF is the modified dBase file provided to Pioneer by MDSL/AMRB from the master inventory.

The information from these four files can be readily combined with one another to form a relational database.

4.0 SITE RANKING

The final task of the Hazardous Materials Inventory involved the development of a system to rank the severity of hazards or environmental threats associated with the sites investigated in order to assist the MDSL/AMRB in prioritizing reclamation efforts and allocation of resources. This system, the Abandoned and Inactive Mines Scoring System (AIMSS), closely follows the EPA's Hazard Ranking System, although the AIMSS is specifically focused on potential hazards typically associated with the abandoned or inactive hardrock mines.

The AIMSS also evaluated potential safety hazards associated with the sites such as hazardous mine openings, highwalls, and structures, and generated a separate safety score for each site. The AIMSS utilized the data collected for each site to assign a ranking score.

The AIMSS is focused towards the physical site setting and potential hazards associated with abandoned and inactive mines due to its capability to evaluate mine opening discharges and large quantities of mine wastes. The AIMSS scoring method evaluates relative risks between sites. This accounts for site-specific contaminant concentrations and the varying toxicity of different constituents, as well as adit discharges in the source evaluation. This method more effectively discriminates between sites with higher concentrations or more toxic constituents in relation to sites with lower concentrations or less toxic constituents. In order to generate an overall Mine Site Human Health and Environmental Hazard Score, the AIMSS evaluates the groundwater pathway, surface water pathway, air pathway, and direct contact pathway. Under each pathway, the AIMSS evaluates observed releases, potential to release, pathway characteristics, waste characteristics, and targets.

Table 4-1 lists the 1994 supplemental priority sites and their associated AIMSS score, sorted in descending order. Three of the 62 sites were not ranked due to complications associated with collecting the necessary data. Two of the three unranked sites were inaccessible and no data was collected. The third unranked site had no identifiable mine waste material present on-site.

The AIMSS also generates a distinct safety score for each site by evaluating site accessibility and safety hazards present (i.e., shafts, stopes, open adits, hazardous structures, and explosives/other hazardous materials or chemicals). Table 4-2 lists the 1994 supplemental priority sites and their associated safety score, sorted in descending order.

1994 RANK	County	District	Site Name	PA #	AIMSS SCORE
1	Lewis & Clark	Helena	Josyln Street Tailings	25-501	1894.49
2	Lewis & Clark	Rimini	National Extension	25-287	1309.35
3	Lewis & Clark	Rimini	Peerless Jenny/King	25-006	175.26
4	Park	New World	Great Republic Smelter	34-000	97.91
5	Granite	Philipsburg	Wenger No. 2	20-073	81.62
6	Lewis & Clark	Rimini	Monte Cristo	25-275	55.85
7	Jefferson	Elkhorn	Elkhorn Creek Tailings	22-502	54.32
8	Madison	Pony	Garnet Gold Mine	29-035	45.76
9	Cascade	Neihart	Queen of the Hills	07-085	40.78
10	Jefferson	Basin	Josephine	22-031	26.88
11	Broadwater	Winston	Sunrise/January	04-130	26.64
12	Lewis & Clark	Rimini	Queensbury	25-262	26.58
13	Jefferson	Elkhorn	Carmody	22-337	16.51
14	Madison	Virginia City	Prospect	29-136	15.92
15	Broadwater	Winston	Kleinschmidt	04-010	12.83
16	Cascade	Neihart	Hartley	07-082	11.85
17	Madison	Virginia City	U.S. Grant	29-095	10.60
18	Cascade	Neihart	Broadwater	07-079	10.10
19	Lewis & Clark	Marysville	Drumlummon Mine/Mill/Tailings	25-024	9.70
20	Lewis & Clark	Rimini	Woodrow Wilson	25-258	9.69
21	Jefferson	Basin	Old Basin Millsite	22-500	9.60
22	Cascade	Neihart	Rebellion Mine (Upper & Lower)	07-157	9.07
23	Broadwater	Indian Creek	Bullion King	04-081	7.03
24	Jefferson	Cataract	Boulder Chief	22-132	5.94
25	Granite	Philipsburg	Little Gem	20-071	5.46
26	Jefferson	Cataract	Cresent/Alsace	22-106	4.84
27	Beaverhead	Hecla/Vipond Park	True Blue	01-138	4.07
28	Fergus	Warm Springs	Gilt Edge Tailings	14-008	4.04
29	Broadwater	Winston	Chartam	04-501	3.94
30	Jefferson	Cataract	Rocker/Ada	22-170	3.84
31	Broadwater	Winston	Golden Age	04-050	3.78
32	Fergus	Warm Springs	Prester John	14-090	3.05
33	Judith Basin	Hughesville	Danny T	23-500	2.48
34	Jefferson	Basin	Lady Leith	22-316	2.14
35	Jefferson	Colorado	Crawley Camp	22-028	2.04
36	Missoula	Clinton	Wallace Creek Millsite	32-019	1.97
37	Lewis & Clark	Rimini	Monitor Creek Tailings	25-503	1.72
38	Broadwater	Winston	Custer Millsite	04-006	1.51
39	Lewis & Clark	Rimini	Peter	25-259	1.39
40	Cascade	Neihart	Ripple Mines	07-163	1.14
41	Granite	Frog Pond	Millers Mine	20-176	0.97
42	Cascade	Neihart	Lexington	07-167	0.83
43	Jefferson	Basin	Doris	22-293	0.79
44	Granite	Alps	Argo	20-081	0.77
45	Cascade	Neihart	Emma	07-144	0.63
46	Jefferson	Elkhorn	Trumley Heap Leach	22-501	0.52
47	Missoula	Copper Cliff	Copper Cliff	32-001	0.49
48	Madison	Virginia City	Belle	29-098	0.43
49	Missoula	Copper Cliff	Frogs Diner	32-027	0.37
50	Lewis & Clark	Rimini	Bear Gulch	25-504	0.35
51	Granite	Garnet	Free Coin/Red Cloud	20-134	0.28
52	Lewis & Clark	Stemple	Jay Gould Mine/Millsite	25-500	0.23
53	Jefferson	Elkhorn	Iron	22-359	0.13
54	Lewis & Clark	Stemple	New Jay Gould Millsite	25-502	0.03
55	Cassade	Neihart	Snow Creek Millsite	07-505	0.02
56	Cascade	Neihart	Hutchinson	07-177	0.01
57	Fergus	Warm Springs	Western Mine/Millsite	14-030	0.004
58	Mineral	St. Regis	Gold Chrome	31-037	0.0007
59	Beaverhead	Lemhi	Thorium City	01-500	0.0003
60	Broadwater	Winston	Aurora Millsite	04-500	Not Ranked
61	Madison	Pony	Chicago Mining Corp. Pony Mill	29-500	Not Ranked
62	Judith Basin	Yogo	Roncor/Amax Sapphire	23-501	Not Ranked

TABLE 4-1: 1994 ABANDONED HARDROCK MINES PRIORITY SITES AMISS RANKING

1994 RANK	County	District	Site Name	PA #	SAFETY SCORE
1	Granite	Philipsburg	Wenger No. 2	20-073	1152.00
2	Madison	Virginia City	Prospect	29-136	1102.50
3	Granite	Philipsburg	Little Gem	20-071	1054.00
4	Lewis & Clark	Marysville	Drumlummon Mine/Mill/Tailings	25-024	590.00
5	Madison	Virginia City	U.S. Grant	29-095	566.50
6	Jefferson	Elkhorn	Carmody	22-337	435.00
7	Cascade	Neihart	Queen of the Hills	07-085	405.00
8	Granite	Garnet	Free Coin/Red Cloud	20-134	325.50
9	Jefferson	Basin	Old Basin Millsite	22-500	256.00
10	Beaverhead	Hecla/Vipond Park	True Blue	01-138	236.00
11	Jefferson	Elkhorn	Iron	22-359	118.50
12	Broadwater	Winston	Sunrise/January	04-130	108.90
13	Cascade	Neihart	Broadwater	07-079	104.00
14	Cascade	Neihart	Emma	07-144	94.60
15	Madison	Virginia City	Belle	29-098	92.80
16	Madison	Pony	Garnet Gold Mine	29-035	85.00
17	Cascade	Neihart	Hartley	07-082	72.00
18	Jefferson	Cataract	Cresent/Alsace	22-106	59.40
19	Jefferson	Colorado	Crawley Camp	22-028	55.20
20	Jefferson	Basin	Doris	22-293	51.60
21	Granite	Frog Pond	Millers Mine	20-176	50.40
22	Lewis & Clark	Stemple	New Jay Gould Millsite	25-502	44.00
23	Fergus	Warm Springs	Prester John	14-090	40.00
24	Lewis & Clark	Rimini	Monte Cristo	25-275	38.50
25	Fergus	Warm Springs	Western Mine/Millsite	14-030	36.00
26	Missoula	Clinton	Wallace Creek Millsite	32-019	35.00
27	Judith Basin	Hughesville	Danny T	23-500	30.00
28	Broadwater	Indian Creek	Bullion King	04-081	27.00
29	Jefferson	Basin	Lady Leith	22-316	26.00
30	Broadwater	Winston	Kleinschmidt	04-010	23.50
31	Cascade	Neihart	Ripple Mines	07-163	23.00
32	Lewis & Clark	Rimini	Woodrow Wilson	25-258	22.80
33	Jefferson	Cataract	Boulder Chief	22-132	20.25
34	Jefferson	Elkhorn	Elkhorn Creek Tailings	22-502	20.00
35	Fergus	Warm Springs	Gilt Edge Tailings	14-008	19.20
36	Lewis & Clark	Rimini	Peerless Jenny/King	25-006	17.60
37	Lewis & Clark	Rimini	National Extension	25-287	16.50
38	Missoula	Copper Cliff	Copper Cliff	32-001	13.80
39	Broadwater	Winston	Custer Millsite	04-006	8.25
40	Broadwater	Winston	Golden Age	04-050	7.30
41	Cascade	Neihart	Lexington No. 4	07-167	4.00
42	Jefferson	Cataract	Rocker/Ada	22-170	3.60
43	Lewis & Clark	Stemple	Jay Gould Mine/Millsite	25-500	3.10
44	Broadwater	Winston	Chartam	04-501	2.65
45	Jefferson	Basin	Josephine	22-031	2.55
46	Lewis & Clark	Rimini	Queensbury	25-262	2.40
47	Cassade	Neihart	Snow Creek Millsite	07-505	1.60
48	Granite	Alps	Argo	20-081	1.00
49	Cascade	Neihart	Rebellion Mine (Upper & Lower)	07-157	0.80
50	Lewis & Clark	Rimini	Monitor Creek Tailings	25-503	0.75
51	Beaverhead	Lemhi	Thorium City	01-500	0.00
52	Mineral	St. Regis	Gold Chrome	31-037	0.00
53	Madison	Pony	Chicago Mining Corp. Pony Mill	29-500	0.00
54	Broadwater	Winston	Aurora Millsite	04-500	0.00
55	Lewis & Clark	Helena	Josyln Street Tailings	25-501	0.00
56	Cascade	Neihart	Hutchinson	07-177	0.00
57	Lewis & Clark	Rimini	Bear Gulch	25-504	0.00
58	Missoula	Copper Cliff	Frogs Diner	32-027	0.00
59	Jefferson	Elkhorn	Trumley Heap Leach	22-501	0.00
60	Lewis & Clark	Rimini	Peter	25-259	0.00
61	Park	New World	Great Republic Smelter	34-000	0.00
62	Judith Basin	Yogo	Roncor/Amax Sapphire	23-501	0.00

TABLE 4-2: 1994 ABANDONED HARDROCK MINES PRIORITY SITES SAFTEY RANKING

5.0 SITE SUMMARY FORMS

The following section presents a one page summary sheet for each of the 62 sites investigated during the 1994 inventory. Each summary sheet provides the site name, location, and other geographic information; and investigation details and summary of findings. Analytical data obtained at each site is summarized on the back of each summary sheet.

SAMPLE DESIGNATION LEGEND

GW: Groundwater sample from well, spring, shaft, or adit discharge.

SW: Surface water sample from stream, river, or ditch.

AD: Adit discharge.

SE: Stream sediment sample.

TP: Mill tailings sample from tailings pond or pile, or streamside tailings deposit.

WR: Waste rock sample from waste rock dump.

SS: Background soil sample.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: True Blue
Legal Description: T 3S R 11W
Mining District: Hecla/Vipond Park
Latitude: N 45° 36' 18"
Longitude: W 112° 55' 42"
Land Status: Private
Quad: Mount Tahepia
Inspectors: Bisch, Flammang, West
Organization: Pioneer Technical Services, Inc.

County: Beaverhead
Section(s): SW 1/4, NE 1/4, Section 2
Mine Type: Millsite/Ag, Pb, Au
Primary Drainage: Trapper Creek
USGS Code: 10020004
Secondary Drainage: Spring Creek
Date Investigated: August 1, 1994
P.A. # 01-138

- The volume of tailings observed at the site was estimated to be 5,860 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 81.4 to 85.7 mg/kg
  Arsenic: 142J to 3,030J mg/kg
  Cadmium: 37.9J to 293J mg/kg
  Copper: 767 to 8,970 mg/kg
  Mercury: 2.96JX to 90.4JX mg/kg
  Lead: 7,780 to 38,400 mg/kg
  Antimony: 114J to 1,420J mg/kg
  Zinc: 12,800 to 34,000 mg/kg

- The volume of waste rock observed at the site was estimated to be 1,350 cubic yards. The waste rock was sampled for XRF analysis only due to the coarse nature of the material in conjunction with well established vegetation on the dumps. The following elements were elevated at least three times background:
  Copper: 337 mg/kg
  Iron: 66,247 mg/kg
  Manganese: 3,794 mg/kg

- An unnamed tributary to Sappington Creek flows adjacent to the site on the north side; observed releases to the tributary (sediment) were documented for silver, arsenic, and cadmium.

- No MCLs were exceeded in the tributary; however, the chronic aquatic life criteria for mercury was exceeded in both the upstream and downstream samples, and the chronic aquatic life criteria for lead was exceeded in the upstream sample.

- A spring emanating from near the foot of the mill was sampled during the investigation. The EPA action level for lead and the acute and chronic aquatic life criteria for copper, lead, and zinc were all exceeded in the spring sample.

- Potential safety hazards observed at the site included the collapsing mill building (which is a very large structure) and several collapsing cabins.

True Blue PA# 01-138
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BISCH
INVESTIGATION DATE: 08/01/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
01-138-SE1	4.2	54.1 J	21.8	3.8 J	3.6	5.1 J	125	19200 JX	0.60 JX	268 J	9.3	548	22.1 J	537	NR
01-138-SE2	1.2	17.7 J	44.4	1.1 UJ	8.5	8.0 J	47.6	23700 JX	0.43 JX	342 J	13.1	243	14.3 UJ	232	NR
01-138-TP1	81.4	142 J	6.9	37.9 J	2.5	1.3 UJ	767	3820 JX	2.96 JX	724 J	3.2	7780	114 J	12800	NR
01-138-TP2	85.7	3030 J	37.0	293 J	4.6	14.8 J	8970	32800 JX	90.4 JX	2520 J	14.7	38400	1420 J	34000	NR
BACKGROUND	2.1	45.0 J	223 J	2.2 J	10.1	16.2 J	45.7	19600 JX	0.34 JX	1190 J	14.2	275	13.0 UJ	322	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
01-138-TP1	<0.01	0.00	200	200	<0.01	<0.01	0.03	0.00	200
01-138-TP2	0.08	2.50	172	169	0.07	<0.01	0.02	0.00	172

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
01-138-SW1	0.12	1.9	23.6	4.0 U	8.4 U	6.8 U	5.9 U	37.4	0.13	2.3 U	14.4 U	4.5 J	51.6 U	15.6 U	158
01-138-SW2	0.12 U	2.1	23.3	4.0 U	8.4 U	6.8 U	5.9 U	98.9	0.12	6.4	14.4 U	6.3 J	51.6 U	15.6 U	162
01-138-SW3	1.02	11.8	10.5	4.0 U	8.4 U	9.0	35.2	222	0.25	24.0	14.4 U	252 J	51.6 U	247	109

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
01-138-SW1	103	<5.0	5.0	0.14	NR
01-138-SW2	134	<5.0	5.0	0.17	NR
01-138-SW3	56	<5.0	<5.0	<0.05	NR

LEGEND

SE1 - Downgradient of TP1; pile is 340' west and 160' north.
SE2 - Upgradient of mill, just below where three spring flows merge together.
TP1 - Grab sample of the TP1A subsample.
TP2 - Grab sample of the TP1C subsample.
BACKGROUND - From the True Blue Mine (01-138-SS1).
SW1 - Same as sample 01-138-SE1.
SW2 - Same as sample 01-138-SE2.
SW3 - Spring approx. 10' southeast of southeast mill building corner.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Thorium City
Legal Description: T 10S R 15W
Mining District: Lemhi
Latitude: N 45° 57' 05"
Longitude: W 113° 27' 10"
Land Status: Public
Quad: Lemhi Pass
Inspectors: N/A
Organization: Pioneer Technical Services, Inc.

County: Beaverhead
Section(s): NE 1/4, NW 1/4, Section 28; NW 1/4, NE 1/4, Section 28
Mine Type: Hardrock/Thorium
Primary Drainage: Horse Prairie Creek
USGS Code: 10020001
Secondary Drainage: North Frying Pan Creek
Date Investigated: N/A
P.A. # 01-500

- A site visit was not conducted as part of the 1994 inventory for the site. Part of the site was inventoried in 1993 under the South Frying Pan Creek site (01-211). Additional data were previously collected at the site by the Bureau of Land Management while conducting a Preliminary Assessment in 1986.

- No mill tailings were observed at the site.

- The volume of radioactive waste rock observed at the site was estimated to be 300 cubic yards. The contamination consists of gross radiation (2 to 4 mRem/Hr). The following radioactive isotopes were elevated in the waste rock at the indicated concentrations (1986 BLM data):

  Thorium-228: 18 ± 2 pCi/g
  Thorium-230: 0.18 ± 0.11 pCi/g
  Thorium-232: 14 ± 2 pCi/g
  Thorium-234: 24 ± 2 pCi/g
  Gross Alpha: 93 ± 16 pCi/g
  Gross Beta: 75 ± 4 pCi/g
  Lead-210: 0.93 ± 0.17 pCi/g

- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.

- No radioactive isotopes were elevated in nearby surface water (South Frying Pan Creek).

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Bullion King
Legal Description: T 7N R 1W
Mining District: Indian Creek
Latitude: N 46° 22' 12"
Longitude: W 111° 42' 12"
Land Status: Private
Quad: Giant Hill
Inspectors: Tuesday, Belanger, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Broadwater
Section(s): SE 1/4, SE 1/4, Section 10; NW 1/4, NW 1/4, Section 14; NE 1/4, NE 1/4, Section 15
Mine Type: Hardrock/Ag, Pb, Au
Primary Drainage: Missouri River
USGS Code: 10030101
Secondary Drainage: Indian Creek
Date Investigated: June 20, 1994
P.A. # 04-081

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 6,745 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Arsenic: 3,190 mg/kg
  Copper: 91.5 to 1,320 mg/kg
  Manganese: 37,100 mg/kg
  Zinc: 350J to 1,070J mg/kg
  Cadmium: 11.8J mg/kg
  Mercury: 0.98JX to 1.51JX mg/kg
  Lead: 8,160 to 47,900 mg/kg
- One discharging adit was observed at the site during the investigation. The discharge flowed approximately 200 feet before seeping into the ground. No MCLs were exceeded in the adit discharge; however, the acute and chronic aquatic life criteria for cadmium, copper, and zinc were exceeded in the adit discharge. Additionally, the chronic aquatic life criteria for mercury and lead were exceeded in the adit discharge.
- No significant sources of surface water were on or near the site.
- Potential safety hazards observed at the site included two unstable trenches and one caved shaft with steep slopes.

Bullion King PA# 04-081
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 06/20/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-081-WR1	43.9	77.3	179	11.8 J	20.8	4.7	1320	58400	1.51 JX	37100	1.5 U	47900	28.3 J	1070 J	NR
04-081-WR2	31.9	3190	104	1.1 J	4.1	5.3	91.5	59200	0.98 JX	290	1.4 U	8160	5.8 J	350 J	NR
BACKGROUND	NR	44 J	315	1.0 U	24.0 J	15.0 J	28.9 J	37600	0.088 J	1220 J	9.05 J	31	11.0 UJ	112 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
04-081-WR1	0.96	30.0	49.0	19.0	0.10	0.40	0.46	12.5	36.5
04-081-WR2	2.04	63.7	-1.05	-65	1.32	0.20	0.52	6.25	-7.30

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
04-081-AD1	0.12 U	12.3	3.6	4.9	8.7 U	4.7 UX	50.0	725	0.18	83.1	8.0 U	13.0 J	29.4 U	712	49.0
04-081-GW1	0.12 U	1.1 U	4.5	2.6 U	8.7 U	4.7 UX	4.6 U	45.7	0.11 U	4.4 U	8.0 U	1.1 U	29.4 U	5.77	29.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-081-AD1	4.0	<5.0	48	0.65	NR
04-081-GW1	60	<5.0	7.0	0.15	NR

LEGEND

WR1 - Composite of WR1A through 1C.
WR2 - Composite of WR2A through 2C and 3.
BACKGROUND - From the Park Mine (04-012-SS1) (1993 data).
AD1 - Adit discharge west.
GW1 - No. 2 trench discharge, east.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Custer Millsite
Legal Description: T 8N R 1W
Mining District: Winston
Latitude: N 46° 26' 48"
Longitude: W 111° 39' 59"
Land Status: Private
Quad: Winston
Inspectors: Tuesday, Belanger, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Broadwater
Section(s): SE 1/4, Section 13
Mine Type: Hardrock/Au, Pb, Zn
Primary Drainage: Missouri River
USGS Code: 10030101
Secondary Drainage: Iron Age Gulch
Date Investigated: June 22, 1994
P.A. # 04-006

- The volume of tailings observed at the site was estimated to be 22,960 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 5.5 mg/kg	Nickel: 13.8 mg/kg
Arsenic: 535 mg/kg	Lead: 507 mg/kg
Cadmium: 8.6J mg/kg	Zinc: 1,640J mg/kg
Chromium: 17.7 mg/kg	Manganese: 2,810 mg/kg

- No waste rock was observed at the site.
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation; however, a groundwater monitoring well was sampled. No MCLs were exceeded in the well sample.
- No surface water or sediment samples were collected during the investigation due to the extended distance to the nearest surface water and the lack of a direct runoff route.
- Potential safety hazards observed at the site included a highwall located above the mill foundation.

Custer Millsite PA# 04-006
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 06/22/94

SOLID MATRIX ANALYSES

Metals in soils -
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-006-TP1	5.5	535	331	8.6 J	9.3	17.7	59.7	20100	0.04 JX	2810	13.8	507	9.2	1640 J	0.308
BACKGROUND	0.8 U	98.6	130	0.8 U	11.8	5.9 JX	49.1 JX	24600	0.05 J	947	3.8 JX	29.2	10.2 UJ	64.9 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
04-006-TP1	0.61	19.1	36.9	17.9	0.40	0.16	0.05	5.00	31.9

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
04-006-GW1	0.12 U	1.1 U	17.1	2.6 U	8.7 U	4.7 JX	4.6 U	9.4 U	0.11 U	53.2	8.0 U	2.8	29.4 U	5.13	91.8

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-006-GW1	227	9.2	112	<0.05	<0.005

LEGEND

TP1 - Composite of subsamples TP1A and 1B.
BACKGROUND - From the Kleinschmidt Mine (04-016-SS1).
GW1 - Downgradient (northeast) of tailings; WB-16 monitoring well.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Kleinschmidt
Legal Description: T 7N R 1W
Mining District: Winston
Latitude: N 46° 23' 25"
Longitude: W 111° 42' 45"
Land Status: Private
Quad: Winston
Inspectors: Flammang, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Broadwater
Section(s): SW 1/4, NE 1/4, Section 3
Mine Type: Hardrock/Au, Pb, Zn, Ag
Primary Drainage: Missouri River
USGS Code: 10030101
Secondary Drainage: Whitehorse Creek
Date Investigated: July 21, 1994
P.A. # 04-010

- The volume of tailings observed at the site was estimated to be 1,210 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 111 mg/kg
  Arsenic: 8,030 mg/kg
  Cadmium: 8.8 mg/kg
  Copper: 335JX mg/kg
  Mercury: 0.66J mg/kg
  Manganese: 3,030 mg/kg
  Lead: 12,100 mg/kg
  Antimony: 56.9J mg/kg
  Zinc: 1,480JX mg/kg

- The volume of waste rock observed at the site was estimated to be 8,685 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 28.5 to 61.2 mg/kg
  Cadmium: 2.9 mg/kg
  Lead: 5,070 to 6,840 mg/kg
  Arsenic: 1,760 to 4,180 mg/kg
  Mercury: 0.18J to 0.75J mg/kg
  Zinc: 421JX to 534JX mg/kg

- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.

- Whitehorse Creek flows adjacent to the site on the south side. Observed releases to Whitehorse Creek were documented for silver, arsenic, copper, lead, and zinc. The MCL for arsenic and the EPA action level for lead were exceeded in the downstream sample. Additionally, the acute and chronic aquatic life criteria for copper, lead, and zinc were exceeded in the downstream sample. These exceedances were directly attributable to the site.

- Potential safety hazards observed at the site included several collapsing wooden structures (loadout and cabins) and several, relatively small, open pits and trenches.

Kleinschmidt PA# 04-010
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - FLAMMANG
INVESTIGATION DATE: 07/21/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-010-SE1	49.3	3960	119	5.8	3.0	4.0 JX	147 JX	39200	0.19 J	2510	4.0 UJX	4790	27.3 J	778 JX	NR
04-010-SE2	1.1 U	26.5	34.7	1.0 U	2.1 U	2.1 JX	14.2 JX	6500	0.03 J	191	4.3 JX	42.4	12.6 UJ	222 JX	NR
04-010-WR1	28.5	1760	57.3	2.9	1.7	1.7 JX	88.2 JX	30600	0.75 J	1570	2.3 UJX	5070	8.2 UJ	421 JX	NR
04-010-WR2	61.2	4180	58.2	2.9	2.5	1.3 UJX	123 JX	53100	0.18 J	1400	2.8 UJX	6840	10.2 UJ	534 JX	NR
04-010-WR3	111.0	8030	68.3	8.8	1.7 U	2.7 JX	335 JX	67100	0.66 J	3030	3.0 UJX	12100	56.9 J	1480 JX	NR
BACKGROUND	0.8 U	98.6	130	0.8 U	11.8	5.9 JX	49.1 JX	24600	0.05 J	947	3.8 JX	29.2	10.2 UJ	64.9 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
04-010-WR1	1.32	41.2	1.44	-40	1.13	0.01	0.18	0.31	1.13
04-010-WR2	3.60	112	-9.03	-121	2.01	0.54	1.05	16.9	-25.9

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
04-010-SW1	3.1	88.7 J	24.1	4.0 U	8.4 U	6.8 U	19.2	3740	0.16	314	14.4 U	122 J	51.6 U	114	37.3
04-010-SW2	0.12 U	7.5 J	5.5 U	4.0 U	8.4 U	6.8 U	5.9 U	316	0.14	37.9	14.4 U	3.9 J	51.6 U	25.1	29.6

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-010-SW1	59	<5	5	0.11	NR
04-010-SW2	59	<5	<5	0.21	NR

LEGEND

SE1 - Approx. 80' downgradient of WR4 after last bunch of large dead trees.
SE2 - 20' downgradient of spring that starts White Horse Creek; 150' south of WR3.
WR1 - Composite of subsamples WR1A through 1C, and 2A and 2B.
WR2 - Composite of subsamples WR3A through 3C.
WR3 - Composite of subsamples WR4A-A, 4B, and 4C.
BACKGROUND - From the Kleinschmidt Mine (04-010-SB1).
SW1 - Same as sample 04-010-SB1.
SW2 - Same as sample 04-010-SB2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Golden Age
Legal Description: T 8N R 1W
Mining District: Winston
Latitude: N 46° 24' 05"
Longitude: W 111° 42' 42"
Land Status: Private/Public
Quad: Winston
Inspectors: Flammang, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Broadwater
Section(s): SW 1/4, SE 1/4, Section 34
Mine Type: Hardrock/Au, Pb, Zn, Ag
Primary Drainage: Beaver Creek
USGS Code: 10030101
Secondary Drainage: Weasel Creek
Date Investigated: July 21, 1994
P.A. # 04-050

- No mill tailings were observed at the site.

- The volume of waste rock observed at the site was estimated to be 8,995 cubic yards. The following were elevated to at least three times the background concentrations:
  Silver: 15.6 to 17 mg/kg
  Arsenic: 1,410 to 11,000 mg/kg
  Cadmium: 6.3 mg/kg
  Copper: 180JX mg/kg
  Mercury: 1.47J mg/kg
  Lead: 756 to 2,790 mg/kg
  Zinc: 945JX mg/kg

- Three discharging adits were observed at the site. The MCL for arsenic and the chronic aquatic life criteria for mercury and lead were exceeded in the Adit #1 discharge. The chronic aquatic life criteria for mercury was exceeded in the Adit #2 discharge.

- The flows from two of the discharging adits at the site (Adit #2 and Adit #3) combined to form the headwaters of Weasel Creek. No MCLs were exceeded in Weasel Creek; however, the acute and chronic aquatic life criteria for zinc and the chronic aquatic life criteria for mercury and lead were exceeded.

- Potential safety hazards observed at the site included two open adits, a 15-foot highwall, and a 20-feet-deep open pit.

Golden Age PA# 04-050
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - FLAMMANG
INVESTIGATION DATE: 07/21/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-050-SE1	12.0	1690	32.7	13.9	4.4	1.6 UJX	219 JX	30200	0.06 J	6440	3.3 UJX	12400	11.7 UJ	1730 JX	NR
04-050-WR1	17.0	1410	60.6	6.3	1.6	1.2 UJX	51.7 JX	23400	0.14 J	1870	2.6 UJX	2790	9.2 UJ	945 JX	NR
04-050-WR2	15.6	11000	42.7	1.0	3.7	1.1 UJX	180 JX	59800	1.47 J	1850	2.3 UJX	756	8.3 UJ	77.4 JX	NR
BACKGROUND	0.8 U	98.6	130	0.8 U	11.8	5.9 JX	49.1 JX	24600	0.05 J	947	3.8 JX	29.2	10.2 UJ	64.9 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
04-050-WR1	1.77	55.3	24.0	-31	1.17	0.22	0.38	6.87	17.4
04-050-WR2	1.09	34.1	-2.95	-37.0	0.78	0.08	0.23	2.50	-5.44

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
04-050-AD1	0.12 U	72.7 J	10.8	4.0 U	8.4 U	6.8 U	5.9 U	233	0.14	26.7	14.4 U	1.9	51.6 U	15.6 U	50.8
04-050-AD2	0.12 U	13.4 J	11.7	4.0 U	8.4 U	6.8 U	5.9 U	92.8	0.14	12.6	14.4 U	0.4	51.6 U	54.4	115
04-050-SW1	0.12 U	13.7 J	9.0	4.0 U	8.4 U	6.8 U	5.9 U	50.2	0.14	7.4	14.4 U	2.9	51.6 U	178	88.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-050-AD1	124	<5	16	1.38	NR
04-050-AD2	182	<5	32	0.39	NR
04-050-SW1	160	<5	34	0.74	NR

LEGEND

SE1 - Downgradient of WR1.
WR1 - Composite of subsamples WR1A through 1D.
WR2 - Composite of subsamples WR2A and 2B.
BACKGROUND - From the Kleinschmidt Mine (04-010-SE1).
AD1 - Discharge from adit #2A.
AD2 - Discharge from Adit #1, where it flows from a 6" pipe.
SW1 - Same as sample 04-050-SE1.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Sunrise/January
Legal Description: T 8N R 1W
Mining District: Winston
Latitude: N 46° 24' 55"
Longitude: W 111° 41' 48"
Land Status: Private/Public
Quad: Winston
Inspectors: Flammang, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Broadwater
Section(s): S 1/2, SW 1/4, Section 26
Mine Type: Hardrock/Cu, Pb, Zn, Ag, Au
Primary Drainage: Beaver Creek
USGS Code: 10030101
Secondary Drainage: Weasel Creek
Date Investigated: August 5, 1994
P.A. # 04-130 & 04-126

- No mill tailings were observed at the site.

- The volume of waste rock observed at the site was estimated to be 11,030 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Silver: 63.9J to 70.7J mg/kg
  Arsenic: 402 to 905 mg/kg
  Cadmium: 8.8 to 24.8 mg/kg
  Chromium: 17.9 mg/kg
  Copper: 489 to 515 mg/kg
  Mercury: 0.21J to 0.63J mg/kg
  Lead: 10,400 to 15,900 mg/kg
  Antimony: 42.8J mg/kg
  Zinc: 1,600 to 4,070 mg/kg

- Two discharging adits were associated with the site; both flows discharge to Weasel Creek. The MCLs for cadmium and antimony and the acute and chronic aquatic life criteria for cadmium and zinc were exceeded in the Adit #1 discharge. Additionally, the chronic aquatic life criteria for copper and mercury were exceeded in the Adit #1 discharge. Only the chronic aquatic life criteria for mercury was exceeded in the Adit #2 discharge.

- Weasel Creek flows through the center of the site. An observed release to Weasel Creek was documented for zinc. The MCL for cadmium, as well as the acute and chronic aquatic life criteria, were exceeded in the downstream sample. These exceedances were directly attributable to the site. The acute and chronic aquatic life criteria for zinc and the chronic aquatic life criteria for mercury and lead were exceeded both upstream and downstream from the site.

- Potential safety hazards observed at the site included one small mine opening, a 30-foot highwall, and several collapsing structures.

Sunrise/January PA# 04-130/04-126
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - FLAMMANG
INVESTIGATION DATE: 08/06/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-130-SE1	3.5 J	361	77.7	16.8	7.0	4.2	145	24500	0.09 J	761	3.7 U	860	13.4 UJ	2170	NR
04-130-SE2	1.8 J	312	63.0	7.3	7.1	5.1	130	23300	0.03 J	624	3.0 U	321	10.8 UJ	797	NR
04-130-WR1	63.9 J	905	168	8.8	3.8	1.2 U	489	39600	0.63 J	371	2.6 U	10400	28.2 J	1600	NR
04-130-WR2	70.7 J	614	64.0	24.8	6.1	17.9	515	32200	0.21 J	1020	5.0	15900	42.8 J	4070	NR
04-130-WR3	0.8 UJ	402	47.1	1.5	11.5	4.9	95.7	43100	0.03 J	1580	6.3	83.5	9.9 UJ	162	NR
BACKGROUND	0.8 U	98.6	130	0.8 U	11.8	5.9 JX	49.1 JX	24600	0.05 J	947	3.8 JX	29.2	10.2 UJ	84.9 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
04-130-WR1	1.93	60.3	-1.98	-62	1.69	0.07	0.17	2.19	-4.17
04-130-WR2	0.99	30.9	4.71	-26	0.72	0.16	0.11	5.00	-0.29
04-130-WR3	1.25	39.0	58.3	19.3	0.39	0.67	0.19	20.9	37.4

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
04-130-AD1	0.12 U	1.1 U	9.6	128	8.4 U	6.8 U	106	117	0.16 JX	5210	20.6	0.4	54.3	26000	838
04-130-AD2	0.12 U	29.0	5.5 U	4.0 U	8.4 U	6.8 U	5.9 U	572	0.17 JX	30.4	14.4 U	0.4 U	51.6 U	23.3	212
04-130-SW1	0.12 U	16.5	7.2	10.7	8.4 U	6.8 U	5.9 U	138	0.13 JX	39.4	15.5	4.6	51.6 U	1060	119
04-130-SW2	0.12 U	18.8	5.5	4.0 U	8.4 U	6.8 U	5.9 U	119	0.16 JX	10.4	14.4 U	3.1	51.6 U	217	90.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-130-AD1	981	<5.0	699	<0.05	NR
04-130-AD2	244	<5.0	83	0.61	NR
04-130-SW1	170	<5.0	82	0.47	NR
04-130-SW2	72	<5.0	37	0.56	NR

LEGEND

SE1 - 100' below last adit, below where lowest seep comes in.
SE2 - 150' upstream of WR5.
WR1 - Composite of subsamples WR1A and 1B.
WR2 - Composite of subsamples WR2A through 2C and WR4.
WR3 - Composite of WR3A, 3B, 5A, and 5B.
BACKGROUND - From the Rhinehardt Mine (04-016-SE1).
AD1 - Discharge from adit south of WR1.
AD2 - Discharge from adit above WR3.
SW1 - Same as sample 04-582-SE1.
SW2 - Same as sample 04-582-SE2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Aurora Mine and Millsite
Legal Description: T 8N R 1W
Mining District: Winston
Latitude: N 46° 26' 55"
Longitude: W 111° 39' 45"
Land Status: Private
Quad: Winston
Inspectors: Tuesday, Belanger, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Broadwater
Section(s): SE 1/4, NE 1/4, SW 1/4, Section 13
Mine Type: Hardrock/Au, Ag, Pb
Primary Drainage: Missouri River
USGS Code: 10030101
Secondary Drainage: Iron Age Gulch
Date Investigated: June 22, 1994
P.A. # 04-500

- The only evidence that any mining activity occurred at this site was the existence of a single, open (and potentially hazardous) adit. No tailings or milling equipment were found. A mill claim may have been placed on the property; however, observations indicated that a mill was never constructed or operated at the site.

- No soil or water samples were collected at the site due to the lack of contaminant sources.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Chartam
Legal Description: T 8N R 1W
Mining District: Winston
Latitude: N 46° 26' 52"
Longitude: W 111° 39' 45"
Land Status: Private
Quad: Winston
Inspectors: Tuesday, Belanger, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Broadwater
Section(s): Sections 13 and 24
Mine Type: Hardrock/Ag, Au
Primary Drainage: Missouri River
USGS Code: 10030101
Secondary Drainage: Iron Age Gulch
Date Investigated: June 22, 1994
P.A. # 04-501

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 10,690 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Silver: 3.8 to 23 mg/kg
  Arsenic: 1,740 to 10,300 mg/kg
  Cadmium: 48.0J to 55.0J mg/kg
  Copper: 169 to 515 mg/kg
  Mercury: 0.34JX to 2.12JX mg/kg
  Manganese: 4,580 mg/kg
  Lead: 109 to 8,070 mg/kg
  Zinc: 3,030J to 7,630J mg/kg

- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
- Miller Gulch flowed directly through the center of the site. An observed release to Miller Gulch was documented for mercury. Also, the MCL for mercury and the acute and chronic aquatic life criteria for mercury were exceeded in the downstream sample. These exceedences were directly attributable to the site.
- Potential safety hazards observed at the site included one open adit and a large, open pit.

Chartam PA# 04-501
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 06/22/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-501-SE1	1.2	8.2	83.8 J	1.4	9.7	12.5 J	29.1	25600	0.03 U	397 J	8.9	42.6	7.0 U	201	NR
04-501-SE2	13.5	4880	117 J	49.1	17.0	13.3 J	306	52100	0.14	1940 J	10.0	3770	16.0	7930	NR
04-501-WR1	3.8	217	32.0	1.0 J	1.2 U	0.6 U	47.8	14200	2.12 JX	66.5	1.1 U	109	4.0 UJ	190 J	NR
04-501-WR2	4.8	1740	29.5	55.0 J	13.6	8.2	169	35700	0.14 JX	4580	10.9	1440	19.0 J	7630 J	NR
04-501-WR3	23	10300	71.1	48.0 J	12.5	9.2	515	72000	0.34 JX	1120	2.6	8070	12.9 J	3030 J	NR
BACKGROUND	0.8 U	98.6	130	0.8 U	11.8	5.9 JX	49.1 JX	24600	0.05 J	947	3.8 JX	29.2	10.2 UJ	64.9 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
04-501-WR1	0.34	10.6	-2.59	-13	0.32	0.01	0.01	0.31	-2.90
04-501-WR2	2.04	63.7	21.3	-42	1.06	0.78	0.2	24.4	-3.05
04-501-WR3	2.03	63.4	1.20	-62	1.20	0.55	0.28	17.2	-16.0

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
04-501-SW1	0.16	4.6	58.0	2.6 U	8.7 U	4.7 UX	11.2	2680	0.11 U	113	8.0 U	23.8 J	29.4 U	74.4	135
04-501-SW2	0.12 U	8.3	36.3	2.6 U	8.7 U	5.0 JX	4.6 U	14.2	5.48	4.4 U	8.0 U	2.3	29.4 U	9.9	295

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-501-SW1	175	5.2	30	0.44	NR
04-501-SW2	396	<5.0	167	0.65	NR

LEGEND

SE1 - Upstream in Miller Gulch.
SE2 - Downstream in Iron Age Gulch after confluence with Miller Gulch.
WR1 - Grab sample of the WR1 subsample.
WR2 - Composite of subsamples WR2A and 2B.
WR3 - Grab sample of the WR3 subsample.
BACKGROUND - From the Kleinschmidt Mine (04-010-SS1).
SW1 - Same as sample 04-501-SE1.
SW2 - Same as sample 04-501-SE2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Broadwater
Legal Description: T 14N R 8E
Mining District: Neihart
Latitude: N 46° 56' 03"
Longitude: W 110° 43' 27"
Land Status: Private
Quad: Neihart
Inspectors: Tuesday, Bisch, West
Organization: Pioneer Technical Services, Inc.

County: Cascade
Section(s): NE 1/4, SE 1/4, Section 32
Mine Type: Hardrock/Au, Ag, Cu, Pb, Zn
Primary Drainage: Belt Creek
USGS Code: 10030105
Secondary Drainage: Belt Creek
Date Investigated: July 12, 1994
P.A. # 07-079

- No mill tailings were observed at the site.

- The volume of waste rock observed at the site was estimated to be 41,200 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Silver: 34.8JX to 92.8JX mg/kg
  Barium: 599 to 683 mg/kg
  Copper: 58.1 to 105 mg/kg
  Manganese: 8,700 to 10,600 mg/kg
  Lead: 4,380 to 7,420 mg/kg
  Zinc: 5,360 to 5,710 mg/kg
  Arsenic: 174J to 224J mg/kg
  Cadmium: 25.8 to 28.7 mg/kg
  Mercury: 0.52J to 1.09J mg/kg
  Nickel: 45.6 mg/kg
  Antimony: 14.3J to 23.3J mg/kg

- One discharging adit was observed at the site during the investigation. The discharge flowed a short distance over a waste rock dump and eventually seeped into the dump. The MCLs for cadmium and antimony and the acute and chronic aquatic life criteria for cadmium and zinc were exceeded in the adit discharge.

- A surface water sample was collected from a flowing stream that emanated at the foot of the mine's lowermost waste rock dump. The MCL for cadmium and the acute and chronic aquatic life criteria for zinc were exceeded in the stream. Additionally, the chronic aquatic life criteria for cadmium was exceeded in the stream.

- Potential safety hazards observed at the site included an open adit with an unsecured chain-link fence placed at the entrance and two collapsing wooden loadout structures.

Broadwater PA# 07-079
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/12/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-079-WR1	92.8 JX	224 J	599	28.7	13.4	10.8	105	28300	0.52 J	8700	14.8	7420	23.3 J	5710	NR
07-079-WR2	34.8 JX	174 J	683	25.8	27.0	38.0	58.1	42600	1.09 J	10600	45.8	4380	14.3 J	5360	NR
BACKGROUND	0.5 B	9.6	87.6	1.32 JX	9.05 J	27.2 J	10.8 J	21100	0.04	708 J	10.3	52.4 JX	4.7 UJ	135	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
07-079-WR1	0.93	29.1	11.7	-17	0.38	0.07	0.48	2.19	9.53
07-079-WR2	0.62	19.4	30.0	10.6	0.20	0.12	0.30	3.75	26.2

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-079-AD1	0.12 U	1.9 B	2.8 B	20.2 J	8.7 U	4.7 U	4.6 U	99.9 B	0.08 U	3030	99.4	3.1	46.0 B	15400	489
07-079-SW1	0.12 U	1.5 B	30.5 B	14.5 J	8.7 U	4.7 U	4.8 U	128	0.08 U	48.7	13.6 B	15.5	29.4 U	4830	376

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-079-AD1	690	<5	472	<0.05	NR
07-079-SW1	521	<5	322	<0.05	NR

LEGEND

WR1 - Composite of subsamples WR1A through 1G.
WR2 - Composite of subsamples WR2A through 2C.
BACKGROUND - From the Ripple Mine (07-143-S51).
AD1 - Discharge from lower adit on WR2.
SW1 - Downstream of mine dumps in unnamed drainage.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Hartley
Legal Description: T 14N R 8E
Mining District: Neihart
Latitude: N 46° 56' 17"
Longitude: W 110° 43' 41"
Land Status: Private
Quad: Neihart
Inspectors: Tuesday, Belanger, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Cascade
Section(s): NE 1/4, NE 1/4, Section 32
Mine Type: Hardrock/Ag, Pb, Zn
Primary Drainage: Belt Creek
USGS Code: 10030105
Secondary Drainage: Compromise Gulch
Date Investigated: June 8, 1994
P.A. # 07-082

- The volume of tailings observed at the site was estimated to be 255 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 105J mg/kg
  Arsenic: 133 mg/kg
  Barium: 658 mg/kg
  Cadmium: 28.9JX mg/kg
  Copper: 118J mg/kg
  Mercury: 0.32 mg/kg
  Manganese: 13,800J mg/kg
  Nickel: 48.9 mg/kg
  Lead: 13,900JX mg/kg
  Antimony: 21.4J mg/kg
  Zinc: 6,650 mg/kg

- The volume of waste rock observed at the site was estimated to be 21,860 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 64.1J to 69.9J mg/kg
  Barium: 574 mg/kg
  Copper: 64.2J to 266J mg/kg
  Manganese: 3,570J to 7,970J mg/kg
  Lead: 3,260JX to 6,270JX mg/kg
  Arsenic: 46.3 to 72.9 mg/kg
  Cadmium: 28.1JX to 34.2JX mg/kg
  Mercury: 1.66 mg/kg
  Nickel: 35.7 mg/kg
  Zinc: 6,310 to 8,490 mg/kg

- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.

- Intermittent Compromise Gulch passes through the center of the site. Compromise Gulch was dry throughout most of the site during the investigation; however, water was flowing near the lower (southeast) boundary. Observed releases to Compromise Gulch (sediment) were documented for arsenic, manganese, lead, antimony, and zinc. No MCLs were exceeded in the downstream surface water sample; however, the acute and chronic aquatic life criteria for zinc and the chronic aquatic life criteria for lead were exceeded.

Hartley PA# 07-082
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 06/08/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-082-SE1	103 J	160	939	29.5 JX	15.5 J	16.4 J	81.0 J	46600	0.16	19800 J	47.8	7980 JX	54.2 J	5340	NR
07-082-SE2	77.7 J	28.6	971	17.4 JX	8.66 J	31.9 J	98.2 J	18600	0.07	1160 J	33.5	1010 JX	8.6 UJ	1000	NR
07-082-TP1	105 J	133	658	28.9 JX	19.6 J	21.8 J	118 J	42000	0.32	13800 J	48.9	13900 JX	21.4 J	6650	NR
07-082-WR1	69.9 J	46.3	574	34.2 JX	6.51 J	21.5 J	266 J	15700	1.66	3570 J	17.1	3260 JX	12.7 J	8490	NR
07-082-WR2	64.1 J	72.9	211	28.1 JX	15.8 J	21.6 J	64.2 J	27100	0.06	7970 J	35.7	6270 JX	12.6 J	6310	NR
BACKGROUND	0.5	9.6	87.6	1.32 JX	9.05 J	27.2 J	10.8 J	21100	0.04	708 J	10.3	52.4 JX	4.7 UJ	135	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULPATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
07-082-TP1	0.89	27.8	21.3	-6.5	0.06	0.39	0.44	12.2	9.14
07-082-WR1	1.26	39.4	43.9	4.58	0.18	0.60	0.48	18.7	25.2
07-082-WR2	0.64	20.0	40.7	20.7	0.08	0.32	0.24	10.0	30.7

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-082-SW1	0.76	1.1 U	37.8	2.6 U	8.7 U	4.7 UX	4.6 U	146	0.11 U	4.4 U	8.0 U	9.7	29.4 U	494	70.7

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-082-SW1	143	<5	39	0.28	NR

LEGEND

SE1 - Approximately 100' downgradient of WR4.
SE2 - Approximately 50' above the mine area.
TP1 - Composite of subsamples TP1A, 1B, and 1C.
WR1 - Composite of subsamples WR1, 2, and 3.
WR2 - Composite of subsamples WR4 and 5.
BACKGROUND - From the Ripple Mine (07-163-SS1).
SW1 - Same as sample 07-082-SE1.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Queen of the Hills
Legal Description: T 14N R 8E
Mining District: Neihart
Latitude: N 46° 56' 19"
Longitude: W 110° 44' 25"
Land Status: Private
Quad: Neihart
Inspectors: Tuesday, Belanger, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Cascade
Section(s): SE 1/4, SW 1/4, Section 29
Mine Type: Hardrock/Ag, Pb, Zn
Primary Drainage: Belt Creek
USGS Code: 100301015
Secondary Drainage: Rock Creek
Date Investigated: June 8 and 10, 1994
P.A. # 07-085

- No mill tailings were observed at the site. Tailings from this mill may have been disposed of at the Neihart Tailings site (07-154) located approximately 1/4 mile downstream on Belt Creek.

- The volume of waste rock observed at the site was estimated to be 54,640 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Silver: 21.8J to 95.8J mg/kg
  Arsenic: 43.1 to 683 mg/kg
  Barium: 545 to 753 mg/kg
  Cadmium: 11.4JX to 90.4JX mg/kg
  Copper: 75.4J to 229J mg/kg
  Mercury: 0.26 to 0.44 mg/kg
  Manganese: 4,410J to 32,800J mg/kg
  Nickel: 34.7 mg/kg
  Lead: 1,810JX to 13,900JX mg/kg
  Antimony: 21.8J to 40.1J mg/kg
  Zinc: 2,580 to 21,000 mg

- One discharging adit that seeped into waste rock after flowing a short distance was observed at the site. No MCLs were exceeded in the adit discharge; however, the acute and chronic aquatic life criteria for zinc were exceeded.

- No surface water or sediment samples were collected during the investigation due to the extended distance to the nearest surface water (Rock Creek) and the lack of a direct runoff route.

- Potential safety hazards observed at the site included three open adits and several collapsing structures.

Queen of the Hills PA# 07-085
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 06/08 & 10/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-085-WR1	95.8 J	683	753	90.4 JX	19.4 J	5.86 J	229 J	54800	0.26	32800 J	34.7	13900 JX	40.1 J	21000	NR
07-085-WR2	48.7 J	172	570	49.6 JX	14.6 J	12.4 J	75.4 J	35700	0.33	13200 J	28.1	5700 JX	21.8 J	11500	NR
07-085-WR3	21.8 J	43.1	545	11.4 JX	11.9 J	19.9 J	27.1 J	13100	0.44	4410 J	19.5	1810 JX	6.5 J	2580	NR
BACKGROUND	0.5	9.6	87.6	1.32 JX	9.05 J	27.2 J	10.8 J	21100	0.04	708 J	10.3	52.4 JX	4.7 UJ	135	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
07-085-WR1	3.35	105	38.5	-66	<0.01	1.57	2.00	49.0	-10.6
07-085-WR2	1.31	40.9	36.5	-4.5	0.25	0.39	0.67	12.2	24.3
07-085-WR3	0.17	5.31	11.1	5.80	0.11	0.01	0.05	0.31	10.8

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-085-AD1	0.44	1.1 U	42.2	2.6 U	8.7 U	4.7 UX	4.6 U	34.2	0.11 U	57.8	8.0 U	1.8	29.4 U	1120	260

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-085-AD1	331	<5	176	0.06	NR

LEGEND

WR1 - Composite of subsamples WR1A through 1C.
WR2 - Composite of subsamples WR2A and 2B.
WR3 - Composite of subsamples WR3, 4, and 5.
BACKGROUND - From the Ripple Mine (07-163-SR1).
AD1 - Adit #2 discharge.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Emma
Legal Description: T 14N R 8E
Mining District: Neihart
Latitude: N 46° 58' 43"
Longitude: W 110° 42' 04"
Land Status: Private
Quad: Neihart
Inspectors: Tuesday, Belanger, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Cascade
Section(s): NW 1/4, NW 1/4, Section 15
Mine Type: Hardrock/Pb, Zn, Ag
Primary Drainage: Belt Creek
USGS Code: 10030105
Secondary Drainage: Squaw Creek
Date Investigated: June 6, 1994
P.A. # 07-144

- No mill tailings were observed at the site.

- The volume of waste rock observed at the site was estimated to be 520 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 16.2J mg/kg	Manganese: 2,430J mg/kg
Arsenic: 35.9 mg/kg	Lead: 8,460JX mg/kg
Cadmium: 52.2JX mg/kg	Antimony: 20.2J mg/kg
Copper: 1,210J mg/kg	Zinc: 14,200 mg/kg

- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.

- Squaw Creek flows through the center of the site. Observed releases to Squaw Creek (sediment) were documented for arsenic and copper.

- MCLs for cadmium, copper, nickel, and antimony, as well as the EPA action level for lead, were exceeded in Squaw Creek both upstream and downstream from the site. Flow in Squaw Creek originates at the discharge from the Silver Dyke Adit (07-135). Additionally, acute and chronic aquatic life criteria for cadmium, copper, lead, and zinc were exceeded in Squaw Creek both upstream and downstream from the site.

- Potential safety hazards observed at the site included a collapsing loadout structure and an unstable slope located above a caved adit.

Emma PA# 07-144
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 06/06/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-144-SE1	53.5 J	36.0	67.6	26.0 JX	26.3 J	19.3 J	3510 J	36000	0.03 U	3070 J	9.5	2240 JX	8.9 J	6390	NR
07-144-SE2	12.3 J	29.5	101	20.7 JX	20.1 J	14.8 J	1050 J	28400	0.04 U	2750 J	8.6	2910 JX	7.6 J	4350	NR
07-144-WR1	16.2 J	35.9	42.3	52.2 JX	24.4 J	11.4 J	1210 J	47800	0.04	2430 J	14.6	8460 JX	20.2 J	14200	NR
BACKGROUND	0.5	9.6	87.6	1.32 JX	9.05 J	27.2 J	10.8 J	21100	0.04	708 J	10.3	52.4 JX	4.7 UJ	135	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
07-144-WR1	4.04	126	11.3	-115	<0.01	2.39	2.96	74.7	-63.3

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-144-SW1	0.73	1.1 U	20.6	397	96.1	4.7 UX	4370	4220	0.11 U	49900	145	618	112 J	59800	594
07-144-SW2	0.92	1.1 U	21.9	447	105	8.6 JX	4980	5180	0.11 U	58000	170	703	131 J	67600	655

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-144-SW1	1180	<5	737	0.23	NR
07-144-SW2	1320	<5	859	0.22	NR

LEGEND

SE1 - Squaw Creek; 50' below lowest dump.
SE2 - Squaw Creek; 40; above machinery, below road.
WR1 - Composite of subsamples WR1B and WR2.
BACKGROUND - From the Ripple Mine (07-163-SS1).
SW1 - Same as sample 07-144-SE1.
SW2 - Same as sample 07-144-SE2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Rebellion (Upper & Lower)
Legal Description: T 14N R 8E
Mining District: Neihart
Latitude: N 46° 56' 53"; N 46° 57' 00"
Longitude: W 110° 42' 13"; W 110° 42' 00"
Land Status: Private
Quad: Neihart
Inspectors: Tuesday, Belanger, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Cascade
Section(s): SW 1/4, NW 1/4, Section 27; NW 1/4, NW 1/4, Section 27
Mine Type: Hardrock/Au, Ag, Pb, Zn
Primary Drainage: Belt Creek
USGS Code: 10030105
Secondary Drainage: Snow Creek
Date Investigated: June 9, 1994
P.A. # 07-157 & 07-158

- No mill tailings were observed at the site.

- The volume of waste rock observed at the site was estimated to be 64,920 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Silver: 7.9J to 98.7J mg/kg
  Arsenic: 53.9 to 181 mg/kg
  Barium: 345 to 401 mg/kg
  Cadmium: 10.1JX to 12.8JX mg/kg
  Copper: 64.0J to 117J mg/kg
  Mercury: 0.34 to 0.48 mg/kg
  Lead: 713JX to 3,090JX mg/kg
  Manganese: 7090J mg/kg
  Zinc: 536 to 2,950 mg/kg

- Three discharging adits were associated with the site. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium, copper, and zinc were exceeded in all three adit discharges. The EPA action level for lead, as well as the acute and chronic aquatic life criteria for lead, were exceeded in the two adit discharges associated with the upper portion of the Rebellion Mine.

- The three adit discharges eventually merged to form the headwaters of a tributary to Snow Creek. A surface water sample was collected from this tributary downstream from the site. The MCL and the acute and chronic aquatic life criteria for cadmium were exceeded in the sample. Additionally, the acute and chronic aquatic life criteria for copper and zinc and the chronic aquatic life criteria for lead were exceeded in the sample.

- Potential safety hazards observed the site included several collapsing structures (two loadout structures and two collapsing sheds).

Rebellion (Upper & Lower) PA# 07-157 & 07-158
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 06/09/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-157-WR1	67.9 J	181	401	10.1 JX	6.37 J	4.86 J	64.0 J	22900	0.48	7090 J	7.6	2380 JX	9.4	2040	NR
07-157-WR2	98.7 J	155	345	12.8 JX	5.18 J	5.89 J	117 J	36300	0.34	1920 J	5.5	3090 JX	11.4	2950	NR
07-158-WR1	7.9 J	53.9	29.5	3.71 JX	10.8 J	8.92 J	71.4 J	24000	0.42	1990 J	15.1	713 JX	4.7 UJ	536	NR
BACKGROUND	0.5	9.6	87.6	1.32 JX	9.05 J	27.2 J	10.8 J	21100	0.04	708 J	10.3	52.4 JX	4.7 UJ	135	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
07-157-WR1	1.20	37.5	39.0	1.48	0.26	0.59	0.35	18.4	20.5
07-157-WR2	0.49	15.3	3.24	-12	0.34	0.02	0.13	0.62	2.62
07-158-WR1	0.52	16.2	3.71	-13	0.26	0.08	0.18	2.50	1.21

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-157-AD1	4.42	15.4	15.1	68.5	16.4	7.1 JX	263	6880	0.11 U	10200	45.5	221	29.4 U	10200	113
07-157-AD2	4.23	12.5	15.0	68.1	16.7	5.5 JX	263	5680	0.11 U	10300	40.8	235	29.4 U	10400	115
07-158-AD1	1.12	1.1 U	12.2	22.9	11.7	4.7 UX	45.6	1780	0.11 U	9140	29.8	53.5	29.4 U	4730	124
07-158-SW1	1.13	1.1 U	12.5	42.0	8.7 U	4.7 UX	97.2	25.0	0.11 U	7960	38.9	19.1	29.4 U	7450	116

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-157-AD1	284	<5	166	<0.05	NR
07-157-AD2	271	<5	168	0.25	NR
07-158-AD1	233	<5	141	<0.05	NR
07-158-SW1	243	<5	142	<0.05	NR

LEGEND

07-157-WR1 - Composite of subsamples WR1 through WR3.
07-157-WR2 - Composite of subsamples WR4A through 4C and 5.
07-158-WR1 -Composite of subsamples WR1A through 1D.
BACKGROUND - From the Ripple Mine (07-163-BS1).
07-157-AD1 - Adit discharge at base of WR4, near WR5.
07-157-AD2 - Adit discharge at base of WR4 below old loadout.
07-158-AD1 - Adit discharge from the caved adit behind buildings at Lower Re
07-158-SW1 - Downstream from Lower Rebellion mine in unnamed trib. of Snow Creek.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Ripple Mines
Legal Description: T 14N R 8E
Mining District: Neihart
Latitude: N 46° 56' 43"
Longitude: W 110° 41' 52"
Land Status: Private
Quad: Neihart
Inspectors: Tuesday, Belanger, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Cascade
Section(s): NE 1/4, SW 1/4, Section 27
Mine Type: Hardrock/Ag, Au, Pb, Zn
Primary Drainage: Belt Creek
USGS Code: 10030105
Secondary Drainage: Snow Creek
Date Investigated: June 7, 1994
P.A. # 07-163

- No mill tailings were observed at the site.

- The volume of waste rock observed at the site was estimated to be 6,100 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Silver: 77J to 105J mg/kg
  Arsenic: 391 to 687 mg/kg
  Barium: 459 mg/kg
  Cadmium: 8.47 JX mg/kg
  Copper: 89.3J to 184J mg/kg
  Mercury: 0.83 to 1.12 mg/kg
  Lead: 6,270JX to 6,920JX mg/kg
  Zinc: 515 to 1,670 mg/kg

- There were four discharging adits observed at the site during the investigation; however, none of the flows reached a flowing surface water source. The MCLs for arsenic and cadmium were exceeded in the Adit #1A discharge; and the MCL for cadmium was exceeded in the Adit #3 discharge. The acute and chronic aquatic life criteria for zinc were exceeded in all four discharges; and the acute and chronic aquatic life criteria for cadmium and copper were exceeded in all discharges except Adit #2. Additionally, the chronic aquatic life criteria for lead was exceeded in all of the discharges.

- The surface water sample collected below the site exceeded the MCL for cadmium. The acute and chronic aquatic life criteria were exceeded for cadmium, copper, lead, and zinc, as well as the chronic aquatic life criteria for iron.

- Potential safety hazards observed at the site included three open adits, a collapsing loadout structure, and a collapsing cabin.

Ripple Mines PA# 07-163
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 06/07/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-163-WR1	105 J	687	156	8.47 JX	1.8 UJ	1.31	89.3 J	34400	1.12	396 J	5.5	6920 JX	13.5 J	1670	NR
07-163-WR3	77 J	391	459	2.83 JX	1.4 UJ	1.21	184 J	25300	0.83	163 J	1.32 U	6270 JX	4.9 UJ	515	NR
BACKGROUND	0.5	9.6	87.6	1.32 JX	9.05 J	27.2 J	10.8 J	21100	0.04	708 J	10.3	52.4 JX	4.7 UJ	135	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULPATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
07-163-WR1	1.09	34.1	0.37	-34	0.62	0.09	0.38	2.81	-2.44
07-163-WR3	1.28	40.0	-1.14	-41	1.17	0.02	0.09	0.62	-1.77

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-163-AD1A	0.15	115	22.6	30.6	9.8	4.7 UX	175	15500	0.11 U	5500	17.3	5.4	29.4 U	5530	47.9
07-163-AD1B	1.00	1.9	7.5	3.1	8.7 U	4.7 UX	36.9	765	0.11 U	431	8.0 U	42.0	29.4 U	505	31.6
07-163-AD2	0.27	3.1	10.3	2.6 U	8.7 U	11.3 JX	4.6 U	653	0.11 U	29.9	8.0 U	4.0	29.4 U	55.4	21.8
07-163-AD3	0.89	1.1	31.3	8.0	8.7 U	4.7 UX	73.5	665	0.11 U	1030	8.0 U	50.1	29.4 U	882	23.6
07-163-SW1	0.35	24.8	15.2	14.3	8.7 U	4.7 UX	103	3530	0.11 U	3180	8.0 U	33.4	29.4 U	3220	39.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-163-AD1A	138	<5	86	0.11	NR
07-163-AD1B	78	<5	22	0.16	NR
07-163-AD2	52	<5	6.0	0.14	NR
07-163-AD3	55	<5	22	0.26	NR
07-163-SW1	132	<5	61	0.18	NR

LEGEND

WR1 - Composite of subsamples WR1A through 1D.
WR3 - Composite of subsamples WR1A and 1B.
BACKGROUND - From the Ripple Mine (07-163-SS1).

AD1A - Discharge from adit associated with WR1A.
AD1B - Discharge from adit associated with WR1B.
AD2 - Discharge from adit associated with WR2.
AD3 - Discharge from adit associated with WR3.
SW1 - At confluence of Adits #1A and #1B discharges on dump WR1A.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Lexington No. 4
Legal Description: T 14N R 8E
Mining District: Neihart
Latitude: N 46° 56' 50"
Longitude: W 110° 42' 35"
Land Status: Private
Quad: Neihart
Inspectors: Tuesday, Belanger, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Cascade
Section(s): SW 1/4, NE 1/4, Section 28
Mine Type: Hardrock/Ag, Pb, Au
Primary Drainage: Belt Creek
USGS Code: 10030105
Secondary Drainage: Snow Creek
Date Investigated: June 9, 1994
P.A. # 07-167

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 6,600 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Silver: 18.9J mg/kg
  Arsenic: 316 mg/kg
  Cadmium: 10.8JX mg/kg
  Copper: 46.8J mg/kg
  Mercury: 0.19 mg/kg
  Lead: 2,410 mg/kg
  Zinc: 2,850 mg/kg

- One discharging adit was observed at the site during the investigation; however, the adit did not reach a surface water source. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium, copper, lead, and zinc were exceeded in the adit discharge.
- Potential safety hazards observed at the site included a collapsing shed and several unstable, steep slopes associated with the waste rock dumps and caved adit.

Lexington No. 4 PA# 07-167
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 06/08/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-167-WR1	18.9 J	316	37.3	10.8 JX	5.35	7.31 J	46.8 J	36400	0.19	1170 J	8.7	2410 JX	6.8	2850	NR
BACKGROUND	0.5	9.6	87.6	1.32 JX	9.05 J	27.2 J	10.8 J	21100	0.04	708 J	10.3	52.4 JX	4.7 UJ	135	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
07-167-WR1	1.51	47.2	8.95	-38	0.86	0.25	0.40	7.81	1.14

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-167-AD1	0.33	18.5	2.1	9.1	8.7 U	4.7 UX	23.1	2900	0.11 U	1770	8.0 U	96.8	29.4 U	1840	48.4
07-167-SW1	0.12 U	1.1 U	5.7	5.4	8.7 U	4.7 UX	4.8 U	36.4	0.11 U	234	8.0 U	4.5	29.4 U	1090	37.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-167-AD1	96	<5	34	0.06	NR
07-167-SW1	73	<5	35	<0.05	NR

LEGEND

WR1 - Composite of subsamples WR2A, 2B, 2C, and 2D.
BACKGROUND - From the Ripple Mine (07-163-SS1).
AD1 - Lexington #4 adit discharge.
SW1 - Adit discharge below dump and across road.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Hutchinson
Legal Description: T 14N R 8E
Mining District: Neihart
Latitude: N 46° 57' 33"
Longitude: W 110° 42' 09"
Land Status: Private
Quad: Neihart
Inspectors: Tuesday, Belanger, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Cascade
Section(s): NW 1/4, SW 1/4, Section 22
Mine Type: Hardrock/Unknown
Primary Drainage: Belt Creek
USGS Code: 10030105
Secondary Drainage: Snow Creek
Date Investigated: June 7, 1994
P.A. # 07-177

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 130 cubic yards; however, the waste rock was not sampled due to the small volume involved and the fact that the dump was fully vegetated and was not located in a drainage.
- One discharging adit was observed at the site during the investigation. No MCLs were exceeded in the adit discharge; however, the acute and chronic aquatic life criteria for cadmium, copper, and zinc were exceeded. The adit discharge seeped into the ground before reaching surface water.
- Snow Creek flows adjacent to the site on the south side. No surface water or sediment samples were collected from Snow Creek since the waste rock was not located in the drainage and there was not direct runoff route to surface water.
- No hazardous mine openings or structures were observed at the site.

Hutchinson PA# 07-177
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 06/07/94

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-177-AD1	0.12 U	1.1 U	6.5	5.0	8.7 U	4.7 UX	30.2	744	0.11 U	139	8.0 U	1.3	29.4 U	108	38.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-177-AD1	103	<5	48	0.13	NR

LEGEND

AD1 - Discharge from adit #1.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Snow Creek Millsite
Legal Description: T 14N R 8E
Mining District: Neihart
Latitude: N 46° 57' 30"
Longitude: W 110° 43' 10"
Land Status: Public
Quad: Neihart
Inspectors: Tuesday, Bisch, West
Organization: Pioneer Technical Services, Inc.

County: Cascade
Section(s): SE 1/4, NW 1/4, SW 1/4, Section 21
Mine Type: Cyanide Mill/Au, Ag
Primary Drainage: Belt Creek
USGS Code: 10030105
Secondary Drainage: Snow Creek/Carpenter Creek
Date Investigated: July 11, 1994
P.A. # 07-505

- The volume of mill tailings observed at the site was estimated to be 183 cubic yards; approximately 25 percent of the tailings were contained in a wooden vat. The following elements were elevated to at least three times the background concentrations:

Silver: 78.6JX mg/kg	Lead: 962 mg/kg
Copper: 61.7 mg/kg	Antimony: 55.7J mg/kg
Mercury: 0.24J mg/kg	Zinc: 775 mg/kg

- No waste rock dumps were observed at the site.
- Snow Creek flows adjacent to the site on the southwest side. No MCLs were exceeded in Snow Creek; however, acute and chronic aquatic life criteria for zinc were exceeded in both the upstream and downstream samples. Additionally, the acute and chronic aquatic life criteria for cadmium were exceeded in the downstream sample.
- Potential safety hazards observed at the site included several collapsing wooden structures (cabins and mill building) and abundant wood and metal debris.

Snow Creek Mill PA# 07-505
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/11/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-505-SE1	0.6 UX	21.8 J	187	8.5	11.5	10.6	35.5	15900	0.03 UJ	2700	20.8	142	6.5 UJ	1850	NR
07-505-SE2	2.0 JX	13.0 J	76.8	6.6	11.4	9.8	31.6	13600	0.03 UJ	2090	19.3	136	6.4 UJ	1540	NR
07-505-TP1	78.6 JX	25.9 J	7.2	1.3	1.5 U	2.6	61.7	5200	0.24 J	90.7	1.8	962	55.7 J	775	3.552
BACKGROUND	0.5	9.6	87.6	1.32 JX	9.05 J	27.2 J	10.8 J	21100	0.04	708 J	10.3	52.4 JX	4.7 UJ	135	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
07-505-TP1	0.21	6.56	1.47	-5.1	0.04	<0.01	0.17	0.00	1.47

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-505-SW1	0.12 U	1.9	13.6	4.7	8.7 U	4.7 U	4.6 U	99.9	0.08 U	23.2	8.0 U	1.6	29.4 U	882	64.1
07-505-SW2	0.12 U	2.2	14.9	2.6 U	8.7 U	4.7 U	4.6 U	77.7	0.08 U	24.9	11.4	1.3	29.4 U	903	65.1

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-505-SW1	104	<5	45	0.07	NR
07-505-SW2	83	<5	45	0.06	NR

LEGEND

SE1 - Snowcreek below millsite.
SE2 - Snow creek above millsite.
TP1 - Composite of subsamples TP1A, 1B, 2A, and 2B.
BACKGROUND - From the Ripple Mine (07-163-SS1).
SW1 - Same as sample 07-505-SE1.
SW2 - Same as sample 07-505-SE2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Gilt Edge Tailings
Legal Description: T 16N R 20E
Mining District: Warm Springs
Latitude: N 47° 07' 53"
Longitude: W 109° 12' 29"
Land Status: Private/Public
Quad: Judith Peak
Inspectors: Tuesday, Bisch, West
Organization: Pioneer Technical Services, Inc.

County: Fergus
Section(s): SW 1/4, SW 1/4, Section 17; SE 1/4, SE 1/4, Section 20
Mine Type: Millsite/Au, Ag, Pb, Cu
Primary Drainage: Chippewa Creek
USGS Code: 10040204
Secondary Drainage: Ox Frame Gulch/ Chippewa Creek
Date Investigated: July 14, 1994
P.A. # 14-008

- The volume of tailings observed at the site was estimated to be 69,860 cubic yards. This volume includes a previously reclaimed tailings pond (located near the headwaters of Chippewa Creek at the Gilt Edge Mine), as well as an uncontained tailings pile located near the small community of Gilt Edge (approximately 1.5 miles downstream from the Gilt Edge Mine). The following elements were elevated to at least three times the background concentrations:
  Arsenic: 928J mg/kg
  Antimony: 21.0J to 128J mg/kg
  Mercury: 2.23J mg/kg to 4.50J mg/kg

- A domestic well was sampled in the town of Gilt Edge downgradient of TP-2. No MCLs were exceeded in this groundwater sample.

- The headwaters of Chippewa Creek are located at the Gilt Edge Mine, and the creek flows adjacent to the large, uncontained tailings pile located downstream. Observed releases to Chippewa Creek (sediment) were documented for arsenic and mercury.

- No MCLs were exceeded in Chippewa Creek; however, the chronic aquatic life criteria for mercury was exceeded in the downstream sample. This exceedence was directly attributable to the site.

- Two, potentially hazardous, mine openings (adits) were observed in the mine area. Additional safety hazards at the site included two elevated, large metal vats and a wooden loadout structure located near the lower tailings pile.

Gilt Edge Tailings PA# 14-008
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/14/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
14-008-SE1	1.7 JX	7.5 J	103	0.5 U	3.9	5.2	6.8	7530	0.02 UJ	619	8.9	23.2	5.4 UJ	70.6	NR
14-008-SE2	2.4 JX	147 J	221	0.7 U	9.0	9.9	16.9	15200	1.58 J	340	22.7	25.5	7.7 UJ	169	NR
14-008-SE3	1.8 JX	183 J	247	0.8 U	4.9	6.1	9.7	8900	1.59 J	309	9.0	11.2 U	33.4 J	94.8	NR
14-008-TP1	1.0 JX	389 J	325	0.5 U	3.9	3.7	11.8	10200	2.23 J	293	10.5	35.1 U	21.0 J	96.1	0.628
14-008-TP2	0.5 UX	928 J	257	0.4 U	13.9	11.9	14.8	15400	4.50 J	309	11.0	29.5 U	128 J	148	9.899
BACKGROUND	0.5 UX	131 J	124	0.5 U	7.0	13.4	14.5	17600	0.08 J	467	18.2	19.3	5.3 UJ	65.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
14-008-TP1	0.05	1.56	439	438	<0.01	0.03	0.06	0.94	438
14-008-TP2	0.27	8.43	253	245	0.24	<0.01	0.03	0.00	253

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
14-008-GW1	0.12 U	2.0	33.8	2.6 U	8.7 U	4.7 U	4.6 U	766	0.08 U	163	8.0 U	2.3	29.4 U	4.5 U	471
14-008-SW2	0.12 U	98.9	141	2.6 U	8.7 U	5.1	4.6 U	383	0.08 U	194	8.0 U	2.5	29.4 U	10.2	385
14-008-SW3	0.12 U	51.5	127	2.6 U	8.7 U	4.7 U	4.6 U	189	0.10	32.6	8.0 U	1.8	29.4 U	4.5 U	419

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	Total DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
14-008-GW1	NR	NR	NR	<0.05	<0.005
14-008-SW2	423	<5	53	0.09	NR
14-008-SW3	449	<5	89	0.23	NR

LEGEND

SE1 - Upstream 400' above TP1.
SE2 - Downstream of TP1, up from TP2 in Chippewa Creek.
SE3 - Downstream of TP2 in Chippewa Creek.
TP1 - Composite of subsamples TP1A and 1B.
TP2 - Composite of subsamples TP2A through 2E.
BACKGROUND - From the Foster John Mine (14-090-SS1).
GW1 - Residential well 1,800' downgradient from site.
SW2 - Same as sample 14-008-SS2.
SW3 - Same as sample 14-008-SS3.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Western Mine and Millsite
Legal Description: T 16N R 19E
Mining District: Warm Springs
Latitude: N 47° 10' 11"; N 47° 10' 07"
Longitude: W 109° 17' 15"; W 109° 16' 37"
Land Status: Private
Quad: New Year
Inspectors: Tuesday, Bisch, West
Organization: Pioneer Technical Services, Inc.

County: Fergus
Section(s): NE 1/4, NW 1/4, Section 11; NW 1/4, NW 1/4, Section 11
Mine Type: Hardrock; Millsite/Au
Primary Drainage: Warm Springs Creek
USGS Code: 10040103
Secondary Drainage: Devils Canyon/Muskrat Creek
Date Investigated: July 13, 1994
P.A. # 14-023 and 14-030

- Although evidence of two separate mill structures were observed at the site, no mill tailings were found.

- The volume of waste rock observed at the site was estimated to be 1,030 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 3.6JX to 124JX mg/kg
  Antimony: 67.4J to 78.2J mg/kg
  Mercury: 1.16J to 2.12J mg/kg

- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.

- An unnamed intermittent tributary to Devil's Canyon (dry during investigation) is located within approximately 20 feet of waste sources at the site; however, no sediment samples were collected from the tributary due to the very stable condition of the drainage (extremely heavy vegetative cover), the general lack of sediment, and the lack of a defined channel.

- Potential safety hazards observed at the site included four open adits and a large, unstable loadout structure.

Western Mine & Millsite PA# 14-023 & 14-030
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/13/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
14-023-WR1	107 JX	44.1 J	18.0	0.5 U	1.8 U	7.3	19.3	3270	2.12 J	175	5.2	36.7U	67.4 J	75.4	NR
14-023-WR2	3.6 JX	130 J	113	0.5 U	7.7	12.3	19.9	9340	1.76 J	224	18.5	40.8	5.8	48.8	NR
14-023-WR3	124 JX	148 J	92.1	0.5 U	8.6	20.8	29.8	16400	1.16 J	219	26.9	17.4	78.2 J	48.4	NR
BACKGROUND	0.5 UX	131 J	124	0.5 U	7.0	13.4	14.5	17600	0.08 J	467	18.2	19.3	5.3 UJ	65.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
14-023-WR1	<0.01	0.00	772	772	<0.01	0.04	0.05	1.25	771
14-023-WR2	0.03	0.94	541	540	<0.01	0.04	0.01	1.25	540
14-023-WR3	0.02	0.62	406	405	<0.01	0.02	0.01	0.62	405

LEGEND

WR1 - Composite of subsamples WR1, 2, 3, and 4.
WR2 - Composite of subsamples WR5A and 5B.
WR3 - Composite of subsamples WR7A and 7B.
BACKGROUND - From the Pastor John Mine (14-090-881).

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Prester John
Legal Description: T 16N R 20E
Mining District: Warm Springs
Latitude: N 47° 07' 4.6
Longitude: W 109° 14' 30.5
Land Status: Private/Public
Quad: Judith Peak/Horsethief Coulee West
Inspectors: Tuesday, Bisch, West
Organization: Pioneer Technical Services, Inc.

County: Fergus
Section(s): S 1/2, SW 1/4, Section 30
Mine Type: Hardrock/Au
Primary Drainage: Chippewa Creek
USGS Code: 10040204
Secondary Drainage: South Fork of Chippewa Creek
Date Investigated: July 15, 1994
P.A. # 14-090

- The volume of mill tailings observed at the site was estimated to be 20,835 cubic yards. The following elements were elevated to at least three times background concentrations:
  Arsenic: 1,430J mg/kg
  Antimony: 45.0J mg/kg
  Barium: 598 mg/kg
  Zinc: 199 mg/kg
  Mercury: 3.26J mg/kg

- The volume of waste rock observed at the site was estimated to be 3,870 cubic yards. The following elements were elevated to at least three times background concentrations:
  Arsenic: 781 mg/kg
  Mercury: 0.98J mg/kg
  Barium: 481 mg/kg

- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.

- The entire volume of tailings associated with the site are situated directly in an intermittent, unnamed tributary to the south fork of Chippewa Creek (dry during investigation). The tailings extend for more than 1/2-mile downstream along the drainage. Observed releases to the tributary (sediment) were documented for arsenic, mercury, barium, and antimony.

- Potential safety hazards observed at the site included two open adits (previously gated, but subsequently broken into), a fenced shaft, and a relatively large, open pit.

Prester John PA# 14-090
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/16/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
14-090-SE1	0.6 UX	174 J	158	0.6 U	9.1	12.8	22.4	19800	0.16 J	649	27.5	23.2	6.3 UJ	68.5	NR
14-090-SE2	0.5 UX	614 J	478	0.5 U	2.7	8.8	21.1	6260	2.83 J	171	7.9	35.6 U	29.6 J	114	NR
14-090-TP1	1.0 JX	1430 J	598	0.4 U	5.0	14.9	10.4	10600	3.26 J	147	12.0	30.6 U	45.0 J	199	0.734
14-090-WR1	0.4 UX	781 J	481	0.4 U	3.1	5.4	14.5	9540	0.98 J	141	8.5	25.2 U	5.9 J	99.1	NR
BACKGROUND	0.5 UX	131 J	124	0.5 U	7.0	13.4	14.5	17600	0.08 J	467	18.2	19.3	5.3 UJ	65.8	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULPATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
14-090-TP1	0.01	0.31	345	345	<0.01	<0.01	0.01	0.00	345
14-090-WR1	<0.01	0.00	362	362	<0.01	0.01	0.01	0.31	362

LEGEND

SB1 - Dry drainage above mine and mill.
SB2 - Dry drainage 700' below breached dam.
TP1 - Composite of subsamples TP1A through 1D.
WR1 - Composite of subsamples WR1, 2, 3A, and 3B.
BACKGROUND - From the Prester John Mine (14-090-SB1).

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Argo
Legal Description: T 10N R 16W
Mining District: Alps
Latitude: N 46° 34' 50"
Longitude: W 113° 34' 10"
Land Status: Private
Quad: Spink Point
Inspectors: Tuesday, Belanger, West
Organization: Pioneer Technical Services, Inc.

County: Granite
Section(s): SW 1/4, NE 1/4, Section 35
Mine Type: Hardrock/Au, Ag
Primary Drainage: Clark Fork River
USGS Code: 17010201
Secondary Drainage: Harvey Creek
Date Investigated: July 6, 1994
P.A. # 20-081

- The volume of tailings observed at the site was estimated to be 10 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Barium: 2,840 mg/kg
  Lead: 460 mg/kg
  Mercury: 0.29J mg/kg

- The volume of waste rock observed at the site was estimated to be 1,700 cubic yards. The following element was elevated to at least three times the background concentrations:
  Mercury: 0.33J mg/kg

- One discharging adit was associated with the site. The MCL for antimony and the chronic aquatic life criteria for lead were exceeded in the adit discharge.

- Harvey Creek flows adjacent to the site on the southwest side. No observed releases to Harvey Creek were documented. The acute and chronic aquatic life criteria for cadmium were exceeded in the downstream sample, although not attributable to this site.

- Potential safety hazards observed at the site included one open adit.

Argo PA# 20-081
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/06/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-081-SE1	0.5 U	9.8 J	345	0.6 J	66.7	3.5 J	23.3 J	24700	0.08 J	2570	44.3 JX	7.2 U	5.8 UJX	54.7	NR
20-081-SE2	0.6 U	10.5 J	556	0.6 UJ	14.0	2.5 J	16.8 J	18300	0.06 J	1290	13.3 JX	8.2 U	6.6 UJX	16.8	NR
20-081-TP1	1.3	36.0 J	2840	0.5 UJ	1.6 U	9.5 J	13.6 J	25600	0.29 J	27.3	1.5 UJX	460	5.3 UJX	28.2	NR
20-081-WR1	0.4 U	29.3 J	316	0.4 UJ	2.6	1.2 J	3.6 J	23100	0.33 J	183	1.5 JX	33.4	4.5 UJX	29.1	NR
BACKGROUND	NR	19 JX	415	0.6 U	2.4 J	4.6 J	5.6	17300 J	0.067	985 J	8 J	12 J	4 U	26 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
20-081-TP1	0.23	7.19	-0.71	-7.90	0.16	0.04	0.03	1.25	-1.96
20-081-WR1	0.24	7.50	-0.59	-8.1	0.21	0.01	0.02	0.31	-0.90

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-081-AD1	0.12 U	1.1 U	184	2.6 U	8.7 U	4.7 U	4.6 U	438	0.11 U	108	8.0 U	0.6	34.1 JX	10.5 JX	18.7
20-081-SW1	0.12 U	1.1 U	80.2	2.7	8.7 U	4.7 U	4.6 U	61.1	0.11 U	18.3	8.0 U	0.4 U	31.0 JX	4.5 UX	12.3
20-081-SW2	0.12 U	1.1 U	90.5	2.6 U	8.7 U	4.7 U	4.6 U	24.4	0.11 U	4.4 U	8.2	0.5	50.0 JX	4.5 UX	9.0
20-081-SW3	0.12 U	1.1 U	80.5	2.6 U	8.7 U	4.7 U	4.6 U	360	0.11 U	11.0	8.0 U	0.8	45.4 JX	10.5 JX	11.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-081-AD1	49	<5.0	11	11	NR
20-081-SW1	44	<5.0	8.0	0.05	NR
20-081-SW2	34	<5.0	<5.0	0.07	NR
20-081-SW3	15	<5.0	7.0	0.12	NR

LEGEND

SB1 - Downgradient of the site in Harvey Creek.
SB2 - Upgradient of the site in Harvey Creek.
TP1 - Composite of the subsamples TP1A and 1B.
WR1 - Composite of the subsamples WR1A, 1B, 2A, and 2B.
BACKGROUND - From the Alpo Mine (22-065-SB1) (1993 Data).
AD1 - Discharge from adit associated with WR1 and WR2.
SW1 - Same as sample 20-081-SB1.
SW2 - Same as sample 20-081-SB2.
SW3 - Seep 30' below the toe of waste rock dump #1.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Millers Mine
Legal Description: T 3N R 17W
Mining District: Frog Pond
Latitude: N 46° 01' 49"
Longitude: W 113° 40' 50"
Land Status: Private
Quad: Whetstone Ridge
Inspectors: Tuesday, Belanger, West
Organization: Pioneer Technical Services, Inc.

County: Granite
Section(s): NE 1/4, NW 1/4, Section 11
Mine Type: Hardrock/Au, Ag, Cu, Pb, Zn
Primary Drainage: Copper Creek
USGS Code: 17010202
Secondary Drainage: Lutz Creek
Date Investigated: July 7, 1994
P.A. # 20-176

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 9,045 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Cadmium: 17.1J to 29.5J mg/kg
  Copper: 274J to 473J mg/kg
  Arsenic: 68.6J to 92.3J mg/kg
  Lead: 1,980 to 4,020 mg/kg
  Zinc: 2,020 to 2,570 mg/kg
  Mercury: 0.78J to 1.73J mg/kg

- A surface water sample was collected downstream from the site after flowing from a bog area. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium, copper, and zinc were exceeded in the sample.
- One discharging adit and two filled shafts were observed at the site during the investigation. No MCLs were exceeded in the adit discharge; however, the acute and chronic aquatic life criteria for cadmium and zinc and the chronic aquatic life criteria for iron and lead were exceeded. The MCL for cadmium was exceeded in one of the shafts.
- Potential safety hazards observed at the site included three open shafts, a collapsing headframe, and two collapsing cabins.

Millers Mine PA# 20-176
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/07/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-176-WR1	6.1	68.6 J	179	17.1 J	18.3	6.1 J	473 J	15400	1.73 J	495	4.6 JX	1980	6.8 JX	2570	NR
20-176-WR2	15.7	92.3 J	34.1	29.5 J	1.5 U	1.9 J	274 J	12700	0.78 J	61.0	1.4 UJX	4020	5.2 UJX	2020	NR
BACKGROUND	NR	11 J	267	1.7	11.0	8.7	7.8	12800	0.08 JX	250	9.0	15	5.0 UJ	62	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
20-176-WR1	0.66	21.8	1.85	-19	0.55	0.02	0.09	0.62	1.23
20-176-WR2	0.31	9.68	-1.60	-11	0.23	0.02	0.06	0.62	-2.23

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-176-AD1	0.12 U	5.7	26.1	4.6	8.7 U	4.7 U	4.6 U	1230	0.11 U	578	8.0 U	16.0 J	29.4 UX	183 JX	56.1
20-176-GW1	0.12 U	1.7 U	16.3	28.9	8.7 U	4.7 U	17.3	60.5	0.11 U	117	8.0 U	39.7	29.4 U	1060	40.5
20-176-GW2	0.12 U	1.7 U	24.8	2.8	8.7 U	4.7 U	4.6 U	336	0.11 U	136	8.8	1.3 U	29.4 U	21.4	21.7
20-176-SW1	0.12 U	1.1 U	22.1	7.4	8.7 U	4.7 U	17.4	97.8	0.11 U	12.8	8.0 U	0.4 U	29.4 UX	471 JX	21.7

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-176-AD1	75	<5.0	5.0	0.10	NR
20-176-GW1	70	<5.0	12	0.07	NR
20-176-GW2	15	<5.0	5.0	0.05	NR
20-176-SW1	44	<5.0	7.0	<0.05	NR

LEGEND

WR1 - Composite of subsamples WR1A through 1E.
WR2 - Composite of subsamples WR2A and 2B.
BACKGROUND - From the Montana Prince Mine (41-004-SS1) (1993 Data).
AD1 - Discharge from collapsed adit; collected where seepages from ground.
GW1 - Upper shaft at WR1.
GW2 - Lower shaft in bog (flooded).
SW1 - Below bog where culvert runs under trail.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Free Coin/Red Cloud
Legal Description: T 12N R 14W
Mining District: Garnet
Latitude: N 46° 49' 12"
Longitude: W 113° 20' 44"
Land Status: Private
Quad: Elevation Mountain
Inspectors: Bisch, Flammang, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Granite
Section(s): SW 1/4, SE 1/4, Section 3
Mine Type: Hardrock, Millsite/Au
Primary Drainage: Bear Creek
USGS Code: 17010201
Secondary Drainage: First Chance Gulch
Date Investigated: June 29, 1994
P.A. # 20-134

- The overall volume of mill tailings associated with the site could not be determined during the investigation. Tailings were observed in several scattered and very small (shallow) pockets near the mill building during the investigation. Additional tailings may be deposited at depth beneath the large waste rock dumps at the site; however, attempts to bore through the waste rock were unsuccessful.

- The volume of waste rock observed at the site was estimated to be 22,325 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Silver: 4.8JX mg/kg
  Arsenic: 37.4J mg/kg
  Copper: 61.4J to 104J mg/kg
  Mercury: 2.08 to 2.44 mg/kg
  Lead: 137 to 171 mg/kg

- One discharging adit, which flowed directly into First Chance Gulch, was observed at the site. The MCL for antimony, as well as the chronic aquatic life criteria for lead, were exceeded in the adit discharge.

- First Chance Gulch flows into a constructed, lined pond located near the center of the site. The pond appeared to be part of a diversion structure which directs the flow underground (directly beneath the site). The stream re-emerges downstream from the lowermost workings at the site. No observed releases were documented, and no MCLs or acute or chronic aquatic life criteria were exceeded in the stream.

- Hazardous mine openings observed at the site included four open adits and an open pit with a 30-foot highwall. Additionally, the mill building was in a state of collapse.

Free Coin/Red Cloud PA# 20-134
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BISCH
INVESTIGATION DATE: 06/29/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-134-SE1	0.6 JX	7.2 J	662	0.7 J	7.0 J	14.6 J	41.4 J	17500	1.03	500 J	9.0 JX	48.2	6.1 U	44.1 J	NR
20-134-SE2	1.0 UJX	9.1 UJ	254	0.9 UJ	10.5 J	32.8 J	54.3 J	29500	0.51	712 J	16.8 JX	40.9	10.2 U	134 J	NR
20-134-SE3	1.3 UJX	12.0 UJ	378	3.5 J	197 J	13.9 J	1150 J	31000	1.59	20800 J	70.2 JX	48.9	13.3 U	161 J	NR
20-134-WR1	4.8 JX	9.3 J	164	0.6 J	9.1 J	10.1 J	61.4 J	23600	2.44	565 J	6.7 JX	171	5.2 U	38.1 J	NR
20-134-WR5	3.3 JX	37.4 J	40.0	0.5 UJ	5.8 J	13.6 J	104 J	37900	2.08	322 J	10.8 JX	137	13.9	37.7 J	NR
BACKGROUND	1.3 JX	7.8 J	209	0.4 UJ	6.2 J	12.1 J	10.9 J	15300	0.06	797 J	9.4 JX	6.0 U	5.0	40.2 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
20-134-WR1	0.42	13.1	20.7	7.61	0.02	0.21	0.19	6.56	14.2
20-134-WR5	0.17	5.31	2.29	-3	0.04	0.01	0.12	0.31	1.97

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-134-GW1	0.12 U	2.3 JX	25.4	2.6 U	8.7 U	4.7 U	4.6 U	6040	0.11 U	1320	8.0 U	1.6	29.4 U	4.5 U	329
20-134-SW1	0.12 U	2.0 JX	43.6	2.6 U	8.7 U	4.7 U	5.6	74.3	0.11 U	9.4	8.0 U	1.5	29.4 U	4.5 U	195
20-134-SW2	0.12 U	1.3 UX	50.6	2.6 U	8.7 U	4.7 U	4.6 U	480	0.11 U	29.1	8.0 U	1.3	29.4 U	7.4	185
20-134-SW3	0.12 U	1.5 JX	30.2	2.6 U	8.7 U	4.7 U	10.3	212	0.11 U	91.2	8.0 U	1.3	29.4 U	8.1	167

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-134-GW1	401	<5.0	184	0.07	NR
20-134-SW1	233	<5.0	67	0.12	NR
20-134-SW2	191	<5.0	41	<0.05	NR
20-134-SW3	241	<5.0	143	<0.05	NR

LEGEND

SE1 - Downstream 50' of last settling pond in First Chance Gulch.
SE2 - Upstream in First Chance Gulch.
SE3 - Side upgradient of WR9 in unnamed tributary.
WR1 - Composite of subsamples WR1A, 1B, 2A, and 2B.
WR5 - Grab sample of subsample WR5.
BACKGROUND - From the Free Coin/Red Cloud Mine (20-134-SB1).

GW1 - Discharge associated with Adit #1; discharge flows 25' over dump material and discharges into First Chance Gulch.
SW1 - Same as sample 20-134-SB1.
SW2 - Same as sample 20-134-SE2.
SW3 - Same as sample 20-134-SE3.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Little Gem
Legal Description: T 7N R 13W
Mining District: Philipsburg
Latitude: N 46° 19' 43"
Longitude: W 113° 16' 22"
Land Status: Private
Quad: Philipsburg
Inspectors: Flammang, Belanger, West
Organization: Pioneer Technical Services, Inc.

County: Granite
Section(s): NE 1/4, SW 1/4, Section 30
Mine Type: Hardrock/Ag, Au, Pb, Zn
Primary Drainage: Camp Creek
USGS Code: 17010202
Secondary Drainage: Cliff Gulch
Date Investigated: July 5, 1994
P.A. # 20-071

- The volume of tailings observed at the site was estimated to be 18,290 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 53 to 68.5 mg/kg
  Cadmium: 15.1 mg/kg
  Copper: 145J mg/kg
  Manganese: 29,600 mg/kg
  Lead: 903 to 2,890 mg/kg
  Zinc: 2,590 to 9,250 mg/kg

- The volume of waste rock observed at the site was estimated to be 4,810 cubic yards. The waste rock was previously sampled during the 1993 Hazardous Materials Inventory as part of the Trout Mine (20-062) investigation. The following elements were elevated to at least three times the background concentrations:
  Cadmium: 9.8 mg/kg
  Copper: 323 mg/kg
  Zinc: 1,480 mg/kg

- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.

- Intermittent Cliff Gulch (dry during investigation) flows adjacent to the site on the north side. Sediment samples were collected from Cliff Gulch; however, no observed releases were documented due to upgradient impacts from the Trout site.

- Potential safety hazards observed at the site included one open adit, a collapsing headframe, and two collapsing wooden structures.

Little Gem PA# 20-071
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - FLAMMANG
INVESTIGATION DATE: 07/05/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-062-WR3	NR	10 J	39.5	9.8	4.7	14.7	323	15600	0.054 JX	581	12	13	4 UJ	1480	NR
20-071-SE1	60.4	225 J	1690	16.4 J	1.8	7.9 J	168 J	13500	0.75 J	20900	2.3 JX	2240	18.2 JX	9560	NR
20-073-SE2	55.4	252 J	2120	15.9 J	2.0	9.6 J	191 J	14700	0.74 J	22500	5.0 JX	1990	16.1 JX	8940	NR
20-071-TP1	53.0	309 J	808	3.8 J	1.9 U	7.8 J	111 J	24500	1.18 J	6510	3.4 JX	903	6.4 UJX	2590	2.28
20-071-TP2	68.5	189 J	846	15.1 J	2.5	8.7 J	145 J	12200	1.03 J	29600	1.6 UJX	2890	18.8 JX	9250	1.23
BACKGROUND	8.6	169 J	484	1.6 J	6.6	12.6 J	44.4 J	15600	0.63 J	3830	7.3 JX	192	6.7 UJX	440	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
20-071-TP1	2.06	64.4	25.8	-39	0.78	1.03	0.25	32.2	-6.54
20-071-TP2	1.33	41.5	146	104	0.19	0.96	0.18	30.0	116

LEGEND

SE1 - Upgradient of Little Gem; downgradient of Trust, approx. 75' from toe of waste rock (Trust) in valley.
20-073-SE1 - Upgradient of Wenger #2, downgradient of Little Gem and White Horse Mines.
TP1 - Composite of subsamples TP2A-2 and 2A-3.
TP2 - Composite of subsamples TP2A-4 through 2A-6.
20-062-WR3 - Grab sample of the WR3 subsample, from the Trust mine.
BACKGROUND - From the Little Gem Mine (20-071-SE1).

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Wenger No. 2
Legal Description: T 7N R 13W
Mining District: Philipsburg
Latitude: N 46° 19' 10"
Longitude: W 113° 16' 47"
Land Status: Private
Quad: Philipsburg
Inspectors: Flammang, Belanger, West
Organization: Pioneer Technical Services, Inc.

County: Granite
Section(s): SW 1/4, SW 1/4, Section 30
Mine Type: Hardrock/Ag, Au, Pb, Zn
Primary Drainage: Camp Creek
USGS Code: 17010202
Secondary Drainage: Cliff Gulch
Date Investigated: July 5, 1994
P.A. # 20-073

- The volume of tailings observed at the site was estimated to be 86,635 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 52.4 to 70.6 mg/kg	Arsenic: 520J mg/kg
Barium: 3,880 to 7,050 mg/kg	Cadmium: 10J to 12.4J mg/kg
Copper: 187J to 644J mg/kg	Manganese: 16,000 mg/kg
Lead: 1,920 to 2,340 mg/kg	Zinc: 6,820 to 7,860 mg/kg

- The volume of waste rock observed at the site was estimated to be 8,350 cubic yards. The following elements were elevated to at least three times the background concentrations:

Barium: 1,940 mg/kg	Copper: 330J mg/kg
Manganese: 36,900 mg/kg	Zinc: 2,500 mg/kg

- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
- Intermittent Cliff Gulch (dry during investigation) flows adjacent to the site on the northeast side. Sediment samples were collected from the Cliff Gulch drainage; however, no observed releases were documented.
- Potential safety hazards observed at the site included two open adits, a collapsing loadout structure, and a collapsing cabin.

Wenger No. 2 PA# 20-073
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - FLAMMANG
INVESTIGATION DATE: 07/05/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-073-SE1	28.9	150 J	1580	8.6 J	1.6 U	6.4 J	123 J	9140	0.70 J	15400	1.4 UJX	1430	7.1 JX	5310	NR
20-073-SE2	55.4	252 J	2120	15.9 J	2.0	9.6 J	191 J	14700	0.74 J	22500	5.0 JX	1990	16.1 JX	8940	NR
20-073-TP1	70.6	198 J	7050	10.0 J	1.9 U	7.3 J	644 J	9080	0.78 J	6440	7.5 JX	2340	23.4 JX	7860	2.28
20-073-TP2	52.4	520 J	3880	12.4 J	2.2	13.2 J	187 J	14300	1.22 J	16000	4.6 JX	1920	24.5 JX	6820	1.23
20-073-WR1	23.5	42.2 J	1940	3.8 J	2.2	4.5 J	330 J	7190	0.43 J	36900	1.3 UJX	272	4.8 UJX	2500	NR
BACKGROUND	8.6	169 J	484	1.6 J	6.6	12.6 J	44.4 J	15600	0.63 J	3830	7.3 JX	192	6.7 UJX	440	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
20-073-TP1	0.89	27.8	89.6	61.8	0.23	0.59	0.07	18.4	71.2
20-073-TP2	1.09	34.1	64.8	30.7	0.18	0.71	0.20	22.2	42.6
20-073-WR1	0.01	0.31	599	599	<0.01	<0.01	0.08	0.00	599

LEGEND

SE1 - Downstream of culvert exit on west side of creek.
SE2 - Upgradient of Wenger #2, downgradient of Little Gem and White Horse Mine; west of road in drainage.
TP1 - Grab sample of the TP3A-A subsample.
WR1 - Composite of subsamples WR1A through 1C, 2A, 2B, and 3.
BACKGROUND - From the Little Gem Mine (20-071-SB1).

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Josephine
Legal Description: T 8N R 6W
Mining District: Basin
Latitude: N 46° 24' 58"
Longitude: W 112° 18' 36"
Land Status: Private
Quad: Three Brothers
Inspectors: Bisch, Flammang, West
Organization: Pioneer Technical Services, Inc.

County: Jefferson
Section(s): SE 1/4, NE 1/4, Section 26
Mine Type: Hardrock/Au, Ag, Pb
Primary Drainage: Basin Creek
USGS Code: 10020006
Secondary Drainage: Clear Creek
Date Investigated: August 2, 1994
P.A. # 22-031

- No mill tailings were observed at the site.

- The volume of waste rock observed at the site was estimated to be 21,680 cubic yards. Several of the dumps were situated directly in the Clear Creek floodplain. The following elements were elevated to at least three times the background concentrations:
  Silver: 30.8 to 64.7 mg/kg
  Arsenic: 1,960J mg/kg
  Lead: 3,000 to 10,600 mg/kg

- One discharging adit and two filled shafts were observed at the site. The pH of the adit discharge, which eventually entered Clear Creek, was measured at 4.16. The MCL for cadmium and the EPA action level for lead were exceeded in the adit discharge, as were the acute and chronic aquatic life criteria for silver, cadmium, copper, lead, and zinc and the chronic aquatic life criteria for mercury. One of the filled shafts that was sampled during the investigation had a pH of 5.8. No MCLs were exceeded in water contained in the shaft.

- Observed releases to Clear Creek were documented for silver and lead. No MCLs were exceeded in Clear Creek; however, the acute and chronic aquatic life criteria for silver and lead were exceeded in the downstream sample. These exceedances were directly attributable to the site.

- Potential safety hazards observed at the site included two fenced but open shafts, a collapsing loadout structure, and several collapsing cabins.

Josephine PA# 22-031
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BISCH
INVESTIGATION DATE: 08/02/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-031-SE1	3.4	82.2 J	13.3 J	0.9 UJ	1.8 UJ	1.5 UJ	41.9	4470 JX	0.17 JX	20.3 J	3.1 U	465	11.3 UJ	45.9	NR
22-031-SE2	1.1 U	32.2 J	63.3 J	1.0 UJ	2.5 J	1.7 UJ	11.4	3990 JX	0.09 JX	418 J	3.5 U	72.4	12.5 UJ	53.5	NR
22-031-WR1	30.8	225 J	19.7 J	0.7 UJ	1.4 UJ	1.2 UJ	75.4	8960 JX	0.70 JX	66.4 J	2.5 U	3000	8.9 UJ	46.4	NR
22-031-WR2	64.7	1960 J	17.0 J	0.7 UJ	1.4 UJ	1.1 UJ	106	7020 JX	0.50 JX	1.7 J	2.4 U	10600	23.0 J	68.0	NR
BACKGROUND	1.0 U	84.1 J	67.8 J	1.0 UJ	2.5 J	2.5 J	55.9	7500 JX	0.24 JX	442 J	3.5 U	53.3	12.5 UJ	57.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-031-WR1	0.10	3.12	-0.70	-3.8	0.10	<0.01	0.01	0.00	-0.70
22-031-WR2	0.38	11.9	-3.30	-15	0.26	0.03	0.09	0.94	-4.24

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-031-AD1	2.55	15.3	11.4	10.4	8.4 U	6.8 U	295	446	0.10	259	14.4 U	554 J	51.6 U	1430	48.4
22-031-GW1	0.28	7.1	5.5 U	4.0 U	8.4 U	6.8 U	5.9 U	898	0.08 U	48.1	14.4 U	22.8 J	51.6 U	15.6 U	2.8
22-031-GW2	0.26	7.5	5.5 U	4.0 U	8.4 U	6.8 U	5.9 U	1050	0.08 U	57.7	14.4 U	23.4 J	51.6 U	27.2	3.0
22-031-SW1	0.72	7.8	5.5 U	4.0 U	8.4 U	6.8 U	13.7	241	0.13	20.8	14.4 U	39.8 J	51.6 U	84.1	8.7
22-031-SW2	0.21	3.5	5.5 U	4.0 U	8.4 U	6.8 U	5.9 U	32.1	0.11	2.3 U	14.4 U	2.0 J	51.6 U	15.6 U	4.2

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-031-AD1	68	<5.0	66	<0.05	NR
22-031-GW1	13	<5.0	10	<0.05	NR
22-031-GW2	<4.0	<5.0	10	<0.05	NR
22-031-SW1	40	<5.0	10	0.23	NR
22-031-SW2	<4.0	<5.0	<5.0	0.09	NR

LEGEND

SE1 - 150' downstream from WR1 in Clear Creek.
SE2 - Dry sediment sample collected upstream from WR7 and WR2.
WR1 - Composite of subsamples WR1A, 1B, 2A, 3A, 3B, 4A, 5A, 5B, and 7.
WR2 - Composite of subsamples WR6A through 6C.
BACKGROUND - From the Josephine Mine (22-031-SE1).
AD1 - Approx. 3' from where water emerges from collapsed adit on WR1.
GW1 - Standing water in shaft #3.
GW2 - Duplicate of GW1.
SW1 - Same as sample 22-031-SE1.
SW2 - Sample from Clear Creek between WR7 and WR2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Doris
Legal Description: T 6N R 5W
Mining District: Basin
Latitude: N 46° 66' 58"
Longitude: W 112° 16' 30"
Land Status: Private
Quad: Basin
Inspectors: Bullock, Bisch, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Jefferson
Section(s): SW 1/4, SE 1/4, Section 7
Mine Type: Hardrock/Unknown
Primary Drainage: Basin Creek
USGS Code: 10020006
Secondary Drainage: Basin Creek
Date Investigated: June 17, 1994
P.A. # 22-293

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 4,470 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Silver: 17 mg/kg
  Cadmium: 11.9JX mg/kg
  Cobalt: 10.4 mg/kg
  Copper: 531J mg/kg
  Mercury: 3.33J mg/kg
  Manganese: 2410JX mg/kg
  Lead: 182JX to 2,000JX mg/kg
  Zinc: 722 to 1,570 mg/kg

- Waste rock was actively eroding into Basin Creek at the site. An observed release to Basin Creek (sediment) was documented for copper.
- No MCLs were exceeded in Basin Creek; however, acute and chronic aquatic life criteria for copper and zinc were exceeded in both the upstream and downstream samples. Additionally, the chronic aquatic life criteria for lead and mercury were exceeded in both the upstream and downstream samples.
- Potential safety hazards observed at the site included two partially backfilled adits and a collapsing loadout structure (low hazard potential).

Doris PA# 22-293
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 06/17/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-293-SE1	0.7	45.9 JX	37.2	2.5 JX	6.5	3.5 J	161 J	9170 J	0.07 J	608 JX	3.9	89.3 JX	6.6 UJ	284	NR
22-293-SE2	0.6 U	74.5 JX	48.7	3.3 JX	7.5	0.9 UJ	27.3 J	5410 J	0.06 J	937 JX	2.5	67.1 JX	5.9 UJ	292	NR
22-293-WR1	17	44.4 JX	9.68	11.9 JX	4.7	3.2 J	531 J	18800 J	3.33 J	527 JX	5.5	2000 JX	5.8 J	1570	NR
22-293-WR2	0.6 U	5.7 UJX	7.84	2.4 JX	10.4	4.9 J	82.2 J	22100 J	0.07 J	2410 JX	8.4	182 JX	6.3 UJ	722	NR
BACKGROUND	1.0 U	84.1 J	67.8 J	1.0 UJ	2.5	2.5 J	55.9	7500 JX	0.24 JX	442 J	3.5 U	53.3	12.5 UJ	57.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-293-WR1	0.93	29.1	2.93	-26	0.61	0.05	0.27	1.56	1.36
22-293-WR2	0.27	8.43	13.6	5.20	<0.01	0.07	2.19	2.19	11.4

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-293-SW1	0.13 JX	13.0	19.4	2.6 U	8.7 U	4.7 U	11.2	390	0.14	29.8	8.0 U	2.9	29.4 U	91.1	24.1
22-293-SW2	0.22 JX	13.7	18.9	2.6 U	8.7 U	4.7 U	11.8	404	0.12	32.7	8.0 U	3.0	29.4 U	98.7	23.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-293-SW1	53	<5	9.0	0.06	NR
22-293-SW2	64	<5	7.0	0.06	NR

LEGEND

SE1 - Downstream in Basin Creek.
SE2 - Upstream in Basin Creek.
WR1 - Composite of subsamples WR1A through 1C.
WR2 - Grab sample of the WR2 subsample.
BACKGROUND - From the Josephine Mine (23-831-ES1).
SW1 - Same as sample 22-293-SE1.
SW2 - Same as sample 22-293-SE2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Lady Leith
Legal Description: T 7N R 5W
Mining District: Basin
Latitude: N 46° 23' 28"
Longitude: W 112° 16' 48"
Land Status: Private/Public
Quad: Three Brothers
Inspectors: Bisch, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Jefferson
Section(s): NE 1/4, NW 1/4, Section 6
Mine Type: Hardrock/Pb, Zn
Primary Drainage: Basin Creek
USGS Code: 10020006
Secondary Drainage: Basin Creek
Date Investigated: June 15, 1994
P.A. # 22-316

- No mill tailings were observed at the site.

- The volume of waste rock observed at the site was estimated to be 3,505 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 3.6 to 22.2 mg/kg
  Arsenic: 79.2JX to 3,740JX mg/kg
  Cadmium: 8.0JX to 32.2JX mg/kg
  Copper: 246J mg/kg
  Zinc: 620 to 1,100 mg/kg
  Mercury: 0.12J to 0.13J mg/kg
  Manganese: 4,720JX to 5,820 mg/kg
  Lead: 355JX to 4,950JX mg/kg
  Antimony: 78.8J mg/kg

- Two discharging adits were observed at the site. The MCL and acute and chronic aquatic life criteria for cadmium were exceeded in the discharge from Adit #1; and the MCL for arsenic was exceeded in the discharge from Adit #2. Additionally, acute and chronic aquatic life criteria for copper, lead, and zinc were exceeded in the Adit #1 discharge; and acute and chronic aquatic life criteria for zinc were exceeded in the Adit #2 discharge.

- An unnamed tributary to Basin Creek flows through the site. Observed releases to the stream were documented for manganese (surface water) and arsenic, cadmium, lead, and zinc (sediment).

- No MCLs were exceeded in the tributary; however, the chronic aquatic life criteria for lead was exceeded in the downstream sample. These exceedances were directly attributable to the site.

- Potential safety hazards observed at the site included a fenced, but open shaft and multiple collapsing cabins (low hazard potential).

Lady Leith PA# 22-316
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BISCH
INVESTIGATION DATE: 06/15/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-316-SE1	0.6 U	41.4 JX	21.0	1.4 JX	4.8	7.1 J	15.3 J	11100 J	0.04 J	248 JX	3.3	77.1 JX	6.1 UJ	65.7	NR
22-316-SE2	0.6 U	211 JX	67.7	4.5 JX	15.4	8.9 J	31.7 J	21700 J	0.07 J	1190 JX	6.8	203 JX	6.6 UJ	357	NR
22-316-WR1	15.7	3080 JX	26.0	4.8 JX	10.7	5.3 J	58.7 J	35000 J	0.05 J	1360 JX	3.0	2730 JX	5.8 UJ	620	NR
22-316-WR3	3.6	79.2 JX	16.0	8.0 JX	10.9	4.4 J	67.5 J	30100 J	0.12 J	5820 JX	6.3	355 JX	4.8 UJ	981	NR
22-316-WR6	22.2	3740 JX	10.7	32.2 JX	12.7	1.7 J	246 J	40400 J	0.13 J	4720 JX	1.4 U	4950 JX	78.8 J	1100	NR
BACKGROUND	0.6 U	23.1	178	2.0 J	9.7	3.9	23.1	13600	0.04 J	1280	3.4	42.3	6.4 UJ	120	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-316-WR1	0.75	23.4	-3.18	-27	0.55	<0.01	0.20	0.00	-3.18
22-316-WR3	0.77	24.1	91.2	67.1	0.13	0.38	0.26	11.9	79.3
22-316-WR6	0.36	11.1	-1.85	-13.0	0.33	<0.01	0.03	0.00	-1.85

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-316-AD1	0.69 JX	15.9	5.1	10.6	21.7	4.7 U	16.4	1670	0.11	536	15.1	84.3	29.4 U	1180	55.5
22-316-AD2	0.12 UX	68.1	10.4	2.6 U	8.7 U	4.7 U	4.6 U	2430	0.11 U	1730	8.0 U	2.8	29.4 U	695	122
22-316-SW1	0.12 UX	3.4	2.8	2.6 U	8.7 U	4.7 U	4.6 U	35.0	0.11 U	4.4 U	8.0 U	1.1 U	29.4 U	13.5	18.9
22-316-SW2	0.12 UX	5.9	3.5	2.6 U	8.7 U	4.7 U	4.6 U	95.2	0.11 U	27.5	8.0 U	2.1	29.4 U	21.1	18.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-316-AD1	120	<5	81	<0.05	NR
22-316-AD2	131	<5	70	<0.05	NR
22-316-SW1	10	<5	<5	<0.05	NR
22-316-SW2	9.0	<5	5.0	<0.05	NR

LEGEND

SE1 - Upstream above site.
SE2 - Downstream below culvert.
WR1 - Grab sample of the WR1 subsample.
WR3 - Grab sample of the WR3 subsample.
WR6 - Composite of subsamples WR4, 5, and 6.
BACKGROUND - From the Boulder Chief Mine (22-132-SE1).
AD1 - Uppermost adit with minor discharge; associated with WR1.
AD2 - Adit located above culvert; associated with WR3.
SW1 - Same as sample 22-316-SE1.
SW2 - Same as sample 22-316-SE2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Old Basin Millsite
Legal Description: T 6N R 5W
Mining District: Basin
Latitude: N 46° 16' 10"
Longitude: W 112° 16' 46"
Land Status:
Quad: Basin
Inspectors: N/A
Organization: Pioneer Technical Services, Inc.

County: Jefferson
Section(s): SW 1/4, Section 17; SE 1/4, Section 18
Mine Type: Millsite/Au, Zn, Cu, Ag, Pb
Primary Drainage: Boulder River
USGS Code: 10020006
Secondary Drainage: Basin Creek
Date Investigated: N/A
P.A. # 22-500

- A site visit was not conducted at the site during the 1994 inventory. The EPA investigated the site in 1990, and the northwestern part of the site was investigated by MDSL in 1993 (Basin Millsite Inventory, 22-036).

- According to the EPA, the total surface area covered by tailings at this site was estimated to be 280,000 square feet. However, the EPA's identification of "tailings" includes waste rock. Using this area, the volume of tailings was estimated to range from 10,000 to 30,000 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Arsenic: 72 to 1,640 mg/kg
  Lead: 274 to 2,710 mg/kg

- No discharging adits, filled shafts, seeps, or springs were associated with the site.

- The Boulder River flows adjacent to the site on the south side. Observed releases to the Boulder River were documented for arsenic (surface water) and lead (sediment). No MCLs were exceeded. The water metals data were not comparable to aquatic life standards due to the lack of associated water hardness data.

- Potential safety hazards associated with the site include a collapsing brick smelter stack and flue and a collapsing loadout structure. Potentially hazardous mine openings were not evaluated by the EPA.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Cresent/Alsace
Legal Description: T 8N R 5W
Mining District: Cataract
Latitude: N 46° 25' 17"
Longitude: W 112° 14' 45"
Land Status: Private
Quad: Chessman Reservoir
Inspectors: Tuesday, Bisch, Flammang
Organization: Pioneer Technical Services, Inc.

County: Jefferson
Section(s): NE 1/4, NE 1/4, Section 29
Mine Type: Hardrock/Pb, Ag, Zn, Au
Primary Drainage: Boulder River
USGS Code: 10020006
Secondary Drainage: Cataract Creek
Date Investigated: August 12, 1994
P.A. # 22-106

- The volume of tailings observed at the site was estimated to be 840 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 32.6 mg/kg
  Lead: 4,570 mg/kg
  Cadmium: 3.67 mg/kg
  Zinc: 618 mg/kg
  Copper: 356 mg/kg

- The volume of waste rock observed at the site was estimated to be 8,460 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 35.8 mg/kg
  Lead: 5,820 mg/kg
  Copper: 583 mg/kg
  Zinc: 340 mg/kg
  Iron: 41,300 mg/kg

- One discharging adit was observed at the site. The MCL and acute and chronic aquatic life criteria for cadmium, and the MCLG and acute and chronic aquatic life criteria for copper were exceeded in the adit discharge. Additionally, the acute and chronic aquatic life criteria for zinc and the chronic aquatic life criteria for mercury were exceeded in the adit discharge.

- The headwaters of Cataract Creek flows directly adjacent to the site. Observed releases to Cataract Creek were documented for cadmium, copper, lead, and zinc.

- The MCL for cadmium and acute and chronic aquatic life criteria for cadmium, copper, and zinc were exceeded in the downstream sample. These exceedances were directly attributable to the site.

- Potential safety hazards observed at the site included a partially collapsed adit, an unstable loadout structure, several collapsing buildings, and various scattered wooden and metal debris.

Cresent/Alsace PA# 22-106
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 08/12/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-106-SE1	1.5 U	15.0	55.2	6.3	30.1	11.5	903	26300	0.08	2170	5.0 U	441	18.0 UJ	1200	NR
22-106-SE2	1.1 U	8.4 U	62.0	1.0 U	5.4	8.9	13.8	13800	0.04	307	3.6 U	11.0 U	12.9 UJ	31.2	NR
22-106-SE3	1.4 U	23.9	89.2	29.9	45.6	8.0	529	20800	0.06	4880	4.6 U	793	16.3 UJ	2580	NR
22-106-TP1	32.6	131 J	14.1	3.67	2.25	4.16 J	356	18500	0.103	165	4.5	4570	10.2 UJ	618	<0.285
22-106-WR1	35.8	218	22.5	0.7 U	1.5 U	4.5	583	41300	0.29	216	2.6 U	5820	9.4 UJ	340	NR
BACKGROUND	1.0 U	84.1 J	67.8 J	1.0 UJ	2.5 B	2.5 J	55.9	7500 JX	0.24 JX	442 J	3.5 U	53.3	12.5 UJ	57.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-106-TP1	0.21	6.56	-1.51	-8.1	0.13	0.04	0.04	1.25	-2.76
22-106-WR1	0.75	23.4	-3.35	-27	0.62	0.06	0.07	1.87	-5.22

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-106-AD1	0.12	2.8	17.0	133	42.2	6.8 U	2820	602	0.18	1960	31.5	673	51.6 U	22400	85.2
22-106-SW1	0.12 U	1.1 U	14.8	24.6	13.8	6.8 U	54.2	112	0.17	904	14.4 U	16.6	51.6 U	3350	42.0
22-106-SW2	0.12 U	2.1	24.5	4.0 U	8.4 U	6.8 U	5.9 U	903	0.21	56.1	14.4 U	4.1	51.6 U	15.6 U	38.5
22-106-SW3	0.28	2.4	24.6	5.7	9.5	6.8 U	80.2	1380	0.18	619	14.4 U	100	51.6 U	539	42.1
22-106-SW4	0.12 U	1.1 U	5.5 U	4 U	8.4 U	6.8 U	5.9 U	12.3 U	0.19	2.3 U	17.0	1.3	51.6 U	15.6 U	0.1 U

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-106-AD1	218	<5	151	<0.05	NR
22-106-SW1	27	<5	40	<0.05	NR
22-106-SW2	25	<5	6.0	<0.05	NR
22-106-SW3	19	<5	6.0	<0.05	NR

LEGEND

SE1 - Downstream of site in Calumet Creek.
SE2 - Upgradient of mine/tailings 60' above cabin.
SE3 - Downgradient of tailings in streambed by road (east side).
TP1 - Composite of subsamples TP1A-1 through TP1D without TP1B-3.
WR1 - Composite of subsamples WR1A, 1B, and WR2A through 2C.
BACKGROUND - From the Josephine Mine (22-031-SB1).

AD1 - Adit discharge onto WR2.
SW1 - Same as sample 22-106-SE1.
SW2 - Same as sample 22-106-SE2.
SW3 - Same as sample 22-106-SE3.
SW4 - QA/QC sample.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Boulder Chief
Legal Description: T 7N R 5W
Mining District: Cataract
Latitude: N 46° 19' 48"
Longitude: W 112° 12' 24"
Land Status: Private
Quad: Mount Thompson
Inspectors: Bullock, Bisch, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Jefferson
Section(s): SW 1/4, NW 1/4, Section 27
Mine Type: Hardrock/Pb, Ag, Cu
Primary Drainage: Cataract Creek
USGS Code: 10020006
Secondary Drainage: Cataract Creek
Date Investigated: June 14, 1994
P.A. # 22-132

- The volume of mill tailings observed at the site was estimated to be 138 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 76 mg/kg
  Arsenic: 186 mg/kg
  Cadmium: 170 mg/kg
  Copper: 302 mg/kg
  Mercury: 0.53J mg/kg
  Lead: 24,300 mg/kg
  Antimony: 105J mg/kg
  Zinc: 23,700 mg/kg

- The volume of waste rock observed at the site was estimated to be 14,225 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 3.2 to 17.8 mg/kg
  Cadmium: 9.5J to 13.6J mg/kg
  Copper: 158 mg/kg
  Zinc: 883 to 1060 mg/kg
  Mercury: 0.83J mg/kg
  Manganese: 10,100 mg/kg
  Lead: 364 to 7680 mg/kg

- One discharging adit was observed at the site; however, the discharge had no measurable flow at the time of the investigation (standing water) and eventually seeped into a waste rock dump (WR2) after a relatively short surface expression. A sample was collected for field parameters only; the pH was 3.0 and S.C. was 497 uS/cm.

- Observed releases to an unnamed tributary of Cataract Creek were documented for lead and zinc. The MCL for cadmium was exceeded in the tributary as were the acute and chronic aquatic life criteria for cadmium, copper, lead, and zinc. These exceedances were directly attributable to the site.

- Visual impacts to terrestrial vegetation were observed for approximately 1/4-mile downgradient from the site. The stressed vegetation was due to eroding waste rock and tailings (likely occurring during snowmelt and high runoff precipitation events).

- Potential safety hazards observed at the site included an open pit (fenced) with a 30-foot highwall and a collapsing, wooden loadout structure.

Boulder Chief PA# 22-132
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 06/14/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-132-SE1	0.6 U	7.0	45.6	9.1 J	5.1	5.2	17.6	8500	0.03 U	396	7.9	156	6.4 UJ	1140	NR
22-132-SE2	0.7 U	11.3	93.7	0.9 J	7.8	8.2	22.2	13000	0.05 J	709	11.9	16.3	7.3 UJ	45.8	NR
22-132-SE3	24.2	37.8	44.5	69.4 J	5.6	3.0	71.1	8780	0.06 J	1830	4.9	2130	27.7 J	9420	NR
22-132-TP1	76	186	8.5	170 J	1.3 U	0.7 U	302	9300	0.53 J	51	1.5	24300	105 J	23700	NR
22-132-WR1	4.9	10.9	113	13.6 J	9.8	1.0 U	27.2	29700	0.07 J	10100	5.3	364	6.0 UJ	883	NR
22-132-WR2	17.8	26.7	90.2	9.5 J	2.7	2.5	158	13300	0.83 J	556	5.8	7680	5.1 UJ	1060	NR
22-132-WR3	3.2	19.8	126	0.6 J	2.3	2.2	31.4	12600	0.06 J	239	2.4	723	4.5 UJ	30.2	NR
BACKGROUND	0.6 U	23.1	178	2.0 J	9.7	3.9	23.1	13600	0.04 J	1280	3.4	42.3	6.4 UJ	120	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-132-TP1	3.67	115	-5.14	-120	0.42	1.06	2.19	33.1	-38.3
22-132-WR1	0.04	1.25	3.44	2.19	0.04	<0.01	<0.01	0.00	3.44
22-132-WR2	0.51	15.9	3.66	-12	0.30	0.03	0.18	0.94	2.73
22-132-WR3	0.06	1.87	-0.04	-1.9	0.05	0.01	<0.01	0.31	-0.35

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-132-SW1	0.12 U	3.5	9.9	5.1	8.7 U	5.5	4.6 U	200	0.11 U	7.1	8.0 U	21.9	29.4 U	806	28.9
22-132-SW2	0.12 U	4.0	10.6	2.6 U	8.7 U	4.7 U	4.6 U	151	0.11 U	6.4	8.0 U	1.9	29.4 U	4.5 U	24.2
22-132-SW3	2.15	5.6	10.4	35.1	8.7 U	4.7 U	8.7	479	0.11 U	40.7	8.0 U	289	29.4 U	6300	33.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD LD.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-132-SW1	91	<5	15	<0.05	NR
22-132-SW2	82	<5	8.0	<0.05	NR
22-132-SW3	121	<5	40	<0.05	NR

LEGEND

SE1 - Downstream in tributary to Calumet Cdr. below confluence with mine drainage.
SE2 - Upstream in tributary to Calumet Cdr. above confluence with mine drainage.
SE3 - PPE of mine drainage with tributary to Calumet Creek.
TP1 - Composite of subsamples TP1A and 1B.
WR1 - Composite of subsamples WR1A and 1B.
WR2 - Composite of subsamples WR2A, 2B, and 2C.
WR3 - Composite of subsamples WR3A and 3B.

BACKGROUND - From the Boulder Chief Mine (22-132-SE1).
SW1 - Same as sample 22-132-SE1.
SW2 - Same as sample 22-132-SE2.
SW3 - Same as sample 22-132-SE3.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Rocker/Ada
Legal Description: T 7N R 5W
Mining District: Cataract
Latitude: N 46° 21' 52"; N 46° 21' 44"
Longitude: W 112° 14' 48"; W 112° 15' 12"
Land Status: Private/Public
Quad: Basin and Mount Thompson
Inspectors: Bullock, Bisch, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Jefferson
Section(s): SW 1/4, NE 1/4, Section 17
Mine Type: Hardrock/Au, Ag, Pb
Primary Drainage: Cataract Creek
USGS Code: 10020006
Secondary Drainage: Rocker Creek
Date Investigated: June 16, 1994
P.A. # 22-170

- No mill tailings were observed at the site.

- The volume of waste rock observed at the site was estimated to be 7,525 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Silver: 6.7 to 116 mg/kg
  Arsenic: 601JX to 1,190JX mg/kg
  Cobalt: 34.2 mg/kg
  Copper: 159J to 1,030J mg/kg
  Mercury: 0.26J to 1.25J mg/kg
  Lead: 1,030JX to 5,440JX mg/kg
  Antimony: 42.3J to 631J mg/kg
  Iron: 55,500J mg/kg

- Multiple discharging adits were observed at the site during the investigation: the MCL for arsenic was exceeded in AD-1, AD-2, and AD-4; the MCLs for cadmium and copper were exceeded in AD-1 and AD-5; and the MCL for antimony was exceeded in AD-1. Additionally, acute and chronic aquatic life criteria for copper and zinc were exceeded in all the adit discharges at the site.

- Several of the adit discharges flowed directly into Rocker Creek. Observed releases to Rocker Creek were documented for arsenic, copper, and zinc. Acute and chronic aquatic life criteria for copper and zinc were exceeded in Rocker Creek downstream from the site. These exceedances were directly attributable to the site.

- Potential safety hazards observed at the site included a partially open shaft and a collapsing headframe and loadout structure.

- Vehicular access to this site is not possible. The site which is spread out over an area exceeding 3/4-mile in length can be reached by hiking approximately 1/2-mile along a well-marked trail.

Rocker/ADA PA# 22-170
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 06/16/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-170-SE1	0.5 U	135 JX	32.0	3.1 JX	34.2	4.9 J	305 J	14800 J	0.07 J	1650 JX	4.3	93.1 JX	5.5 UJ	258	NR
22-170-SE2	0.6 U	14.8 JX	76.6	0.8 JX	8.2	10.3 J	6.6 J	15900 J	0.06 J	604 JX	2.0	30.7 JX	6.6 UJ	33.6	NR
22-170-WR1	92	797 JX	28.3	1.6 JX	1.6	1.9 J	159 J	31800 J	1.25 J	106 JX	1.4 U	2120 JX	123 J	77.6	NR
22-170-WR2	116	1190 JX	32.2	1.9 JX	34.2	0.8 UJ	1030 J	55500 J	0.26 J	21.1 JX	4.1	3690 JX	631 J	42.4	NR
22-170-WR3	6.7	1010 JX	17.6	1.3 JX	2.0 U	2.2 J	245 J	17200 J	0.51 J	148 JX	1.9 U	1030 JX	42.3 J	121	NR
22-170-WR4	40.4	601 JX	18.2	0.5 UX	1.5 U	0.8 UJ	270 J	14100 J	0.52 J	8.0 JX	1.4 U	5440 JX	61.4 J	63.5	NR
BACKGROUND	0.6 U	23.1	178	2.0 J	9.7	3.9	23.1	13600	0.04 J	1280	3.4	42.3	6.4 UJ	120	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-170-WR1	0.61	19.1	-3.67	-23	0.58	<0.01	0.05	0.00	-3.67
22-170-WR2	3.83	120	-9.13	-129	0.68	1.33	1.82	41.5	-50.7
22-170-WR3	0.15	4.69	-2.22	-6.9	0.14	<0.01	0.01	0.00	-2.22
22-170-WR4	0.33	10.3	-3.15	-14	0.30	0.01	0.02	0.31	-3.46

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-170-AD1	26.3 JX	3310	10.9	47.9	245	4.7 U	6170	147000	0.11 U	11800	42.4	256	58.7	6810	138
22-170-AD2	0.19 JX	79.9	2.1 U	2.6 U	8.7 U	4.7 U	16.4	140	0.11	7.6	8.0 U	1.8	29.4 U	234	27.2
22-170-AD3	0.12 UX	47.2	23.8	2.6 U	8.7 U	4.7 U	22.2	6200	0.11 U	1580	9.8	10.5	29.4 U	239	65.3
22-170-AD4	0.31 JX	82.7	4.9	2.6 U	8.7 U	4.7 U	17.3	839	0.13	381	8.0 U	16.6	29.4 U	138	7.7
22-170-AD5	0.20 JX	2.9	21.6	24.5	53.4	4.7 U	1600	6900	0.11 U	2250	15.2	20.5	29.4 U	3930	69.8
22-170-SW1	0.12 UX	11.9	6.3	4.4	8.7 U	4.7 U	51.7	692	0.11	68.9	8.0 U	1.1 U	29.4 U	56.1	15.0
22-170-SW2	0.12 UX	3.9	9.6	2.6 U	8.7 U	4.7 U	4.6 U	373	0.16	26.9	8.0 U	1.6	29.4 U	4.5 U	10.1

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-170-AD1	669	<5	521	<0.05	NR
22-170-AD2	59	<5	15	<0.05	NR
22-170-AD3	88	<5	30	<0.05	NR
22-170-AD4	7.0	<5	<5	<0.05	NR
22-170-AD5	218	<5	117	<0.05	NR
22-170-SW1	45	<5	8.0	<0.05	NR
22-170-SW2	13	<5	<5	<0.05	NR

LEGEND

SE1 - Downstream Rocker Creek.
SE2 - Upstream Rocker Creek.
WR1 - Composite of subsamples WR1A, 1B, 3, 4, 6A, and 6B.
WR2 - Grab sample of the WR2 subsample.
WR3 - Composite of subsamples WR7 and 8.
WR4 - Grab sample of the WR10 subsample.
BACKGROUND - From the Boulder Chief Mine (22-132-SE1).

AD1 - Discharge associated with WR6; flows over east side of WR6 and flows into ground 40' from dump.
AD2 - Discharge from Adit #5 and WR7 on path west of main workings (WR6).
AD3 - Discharge associated with WR8 on the south side of the creek.
AD4 - Discharge from the uppermost adit near new cabin.
AD5 - Rocker site adit discharge.
SW1 - Same as sample 22-170-SE1.
SW2 - Same as sample 22-170-SE2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Crawley Camp
Legal Description: T 7N R 4W
Mining District: Colorado
Latitude: N 46° 22' 04"
Longitude: W 112° 09' 30"
Land Status: Private
Quad: Mount Thompson
Inspectors: Bullock, Bisch, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Jefferson
Section(s): SW 1/4, SW 1/4, Section 7
Mine Type: Hardrock/Unknown
Primary Drainage: Clancy Creek
USGS Code: 10030101
Secondary Drainage: Clancy Creek
Date Investigated: June 13, 1994
P.A. # 22-028

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 2,800 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Silver: 2.8 to 114 mg/kg
  Arsenic: 73.7 to 459 mg/kg
  Copper: 75.4 mg/kg
  Mercury: 0.43J mg/kg
  Lead: 553 to 1820 mg/kg
  Antimony: 1,150J mg/kg

- The two waste rock dumps associated with this site are situated directly in the floodplain of Upper Clancy Creek. Additionally, the discharging adit associated with the site flowed directly into Upper Clancy Creek. The MCL for arsenic, the acute aquatic life criteria for zinc, and the chronic aquatic life criteria for copper, iron, lead, and zinc were all exceeded in the adit discharge.
- An observed release to Upper Clancy Creek was documented for arsenic. The chronic aquatic life criteria for lead was exceeded in both the upstream and downstream samples, and the chronic aquatic life criteria for iron was exceeded in the downstream sample.
- Potential safety hazards observed at the site included two partially collapsed cabins (low hazard potential).

Crawley Camp PA# 22-028
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 06/13/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-028-SE1	1.5 U	949	395	46.4 J	61.4	22.1	460	117000	0.12 J	37300	27.4	278	67.0 J	6440	NR
22-028-SE2	0.8 U	21.6	41.1	1.2 J	10.4	16.3	14.7	16500	0.04 U	603	10.0	30.2	8.4 UJ	72.4	NR
22-028-WR1	114	459	47.8	2.5 J	1.7 U	1.1	75.4	20300	0.07 J	28.9	2.1	1820	1150 J	228	NR
22-028-WR2	2.8	73.7	23.7	1.3 J	1.4 U	0.7 U	33.8	8250	0.43 J	12	1.2 U	553	6.0 J	58.8	NR
BACKGROUND	0.6 U	23.1	178	2.0 J	9.7 B	3.9	23.1	13600	0.04 J	1280	3.4	42.3	6.4 UJ	120	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-028-WR1	0.74	23.1	-4.72	-28	0.32	0.05	0.37	1.56	-6.28
22-028-WR2	0.19	5.94	-3.10	-9	0.18	<0.01	0.01	0.00	-3.10

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-028-AD1	0.43	50.8	5.7	2.6 U	8.7 U	4.7 U	12.9	5870	0.11 U	386	8.0 U	9.8	29.4 U	140	75.0
22-028-SW1	0.12 U	16.8	2.7	2.6 U	8.7 U	4.7 U	4.6 U	1390	0.11 U	225	8.0 U	4.7	29.4 U	75.9	72.1
22-028-SW2	0.12 U	4.0	3.6	2.6 U	8.7 U	4.7 U	4.6 U	370	0.11 U	20.7	8.0 U	2.9	29.4 U	4.7	53.7

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-028-AD1	116	<5	32	<0.05	NR
22-028-SW1	125	<5	32	<0.05	NR
22-028-SW2	80	<5	5.0	<0.05	NR

LEGEND

SE1 - Downstream in Upper Clancy Creek; iron staining from adit discharge; no vegetation.
SE2 - Upstream in Upper Clancy Creek.
WR1 - Composite of subsamples WR1A and 1B.
WR2 - Composite of subsamples WR2A and 2B.
BACKGROUND - From the Boulder Chief Mine (22-132-SS1).
AD1 - Adit discharge/seep above WR2.
SW1 - Same as sample 22-028-SS1.
SW2 - Same as sample 22-028-SS2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Carmody
Legal Description: T 6N R 3W
Mining District: Elkhorn
Latitude: N 46° 16' 20"
Longitude: W 111° 57' 05"
Land Status: Private
Quad: Elkhorn
Inspectors: Flammang, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Jefferson
Section(s): SW 1/4, NW 1/4, Section 14
Mine Type: Hardrock/Au, Ag
Primary Drainage: Elkhorn Creek
USGS Code: 10020006
Secondary Drainage: Slaughterhouse Gulch
Date Investigated: August 4, 1994
P.A. # 22-337

- The volume of tailings observed at the site was estimated to be 15,615 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 1.7J to 88.1J mg/kg
  Arsenic: 272 to 841 mg/kg
  Cadmium: 5.1 to 175 mg/kg
  Cobalt: 52.7J mg/kg
  Copper: 494 to 1,250 mg/kg
  Iron: 95,500 to 108,000 mg/kg
  Mercury: 0.40 to 138 mg/kg
  Lead: 5,540 to 13,100 mg/kg
  Antimony: 487J to 1,170J mg/kg
  Zinc: 278 to 29,500 mg/kg

- Significantly high concentrations of cyanide were detected in TP-1 (4,704 mg/kg) and TP-3 (3,075 mg/kg).

- The volume of waste rock observed at the site was estimated to be 2,475 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 1.7J mg/kg
  Arsenic: 1,560 mg/kg
  Cadmium: 6.6 mg/kg
  Copper: 616 mg/kg
  Iron: 138,000 mg/kg
  Mercury: 1.00 mg/kg
  Lead: 53.5 mg/kg

- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.

- Slaughterhouse Gulch flows through the center of the site. Observed releases to Slaughterhouse Gulch were documented for iron, lead, and zinc. No MCLs were exceeded in Slaughterhouse Gulch; however, the chronic aquatic life criteria for cadmium, copper, iron, and lead were exceeded in downstream samples. These exceedances were directly attributable to the site.

- Potential safety hazards observed at the site includes two open (but fenced) shafts, two open adits, three small open pits, and various collapsing wooden and metal structures.

Carmody PA# 22-337
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - FLAMMANG
INVESTIGATION DATE: 08/04/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-337-SE1	1.4 U	377	66.2	4.5	23.4 J	12.2	425	69400	0.20	682 JX	11.1	60.5	16.8 UJ	293	NR
22-337-SE2	0.8 U	73.7	51.2	1.3	7.7 J	4.7	112	21200	0.16	407 JX	4.9	31.7	9.3 UJ	67.0	NR
22-337-SE3	59.5 J	110	28.1	14.8	4.1 J	4.9	289	13600	72.0	267 JX	4.1	2410	205 J	6400	NR
22-337-SE4	22.5 J	57.1	46.9	19.3	6.7 J	13.6	110	16300	23.4	430 JX	14.0	1110	45.6 J	2060	NR
22-337-TP1	88.1 J	272	15	175	4.5 J	2.3	494	11600	7.53	2340 JX	6.1	5540	487 J	14700	4.704
22-337-TP2	1.7 J	448	223	6.4	18.7 J	38.1	1070	108000	0.10	285 JX	19.2	25.6	10.3 UJ	278	0.378
22-337-TP3	1.8 J	841	64.5	5.1	52.7 J	17.4	1210	95500	0.40	1210 JX	16.9	32.7	11.9 UJ	618	3.075
22-337-TP4	75.9 J	368	40.1	88.9	1.9 J	3.8	1250	16800	138	850 JX	5.5	13100	1170 J	29500	<0.285
22-337-WR1	1.7 J	1560	143	6.6	11.7 J	43.6	616	138000	1.00	434 JX	12.9	53.5	10.3 UJ	145	NR
BACKGROUND	0.5 U	21.3	267	0.5 U	9.3 J	15.0	13.9	17400	0.05	1410	11.1	17.7	5.8 UJ	85.8 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULPATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-337-TP1	<0.01	0.00	196	196	<0.01	0.10	0.03	3.12	193
22-337-TP2	1.64	51.2	1.02	-50	1.50	0.09	0.05	2.81	-1.80
22-337-TP3	0.12	3.75	77.5	73.8	0.05	0.04	0.03	1.25	76.3
22-337-TP4	0.07	2.19	118	116	0.05	<0.01	0.02	0.00	118
22-337-WR1	1.79	55.9	-0.82	-57	1.73	0.01	0.05	0.31	-1.13

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-337-GW1	0.12 U	5.2	5.5	4.0 U	8.4 U	6.8 U	5.9 U	53.7	0.13 JX	2.3 U	14.4 U	0.4 U	51.6 U	17.8	176
22-337-SW1	0.12 U	11.9	14.1	4.0 U	8.4 U	6.8 U	17.6	1420	0.08 UX	38.0	15.7	2.4	51.6 U	19.8	126
22-337-SW2	0.12 U	8.0	11.2	4.0 U	8.4 U	6.8 U	7.9	402	0.17 JX	21.4	14.4 U	0.9	51.6 U	15.6 U	125
22-337-SW3	0.23	11.4	12.7	4.2	8.4 U	6.8 U	10.0	481	0.29 JX	17.3	20.2	21.3	51.6 U	49.2	129

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-337-GW1	184	<5.0	37	0.28	<0.005
22-337-SW1	98	<5.0	8.0	<0.05	<0.005
22-337-SW2	111	<5.0	8.0	<0.05	<0.005
22-337-SW3	114	<5.0	8.0	<0.05	<0.005

LEGEND

SE2 - Upgradient in Slaughterhouse Gulch; 150' above residence.
SE3 - Downgradient; below TP4 on Elkhorn Creek and above next mill building.
SE4 - In Elkhorn Creek upgradient of confluence with Slaughterhouse Gulch.
TP1 - Composite of subsamples TP1A-1, 1B-1, and 1C-1.
TP2 - Composite of subsamples TP2A-A through 2A-C and TP2B-A and 2B-B.
TP3 - Composite of subsamples TP3A, TP3B-A through 3B-C.
TP4 - Composite of subsamples TP4A through 4D.
WR1 - Composite of subsamples WR1A through 4B.
GW1 - Well located possibly downgradient of TP1 & upgradient of the mill; outside faucet on pump.
SW1 - Same as sample 22-337-SE1.
SW2 - Same as sample 22-337-SE2.
SW3 - Same as sample 22-337-SE3.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Iron
Legal Description: T 7N R 3W
Mining District: Elkhorn
Latitude: N 46° 18' 37"
Longitude: W 111° 55' 43"
Land Status: Private
Quad: Elkhorn
Inspectors: Flammang, Belanger, West
Organization: Pioneer Technical Services, Inc.

County: Jefferson
Section(s): SW 1/4, SW 1/4, Section 36
Mine Type: Hardrock/Fe
Primary Drainage: Muskrat Creek
USGS Code: 10020006
Secondary Drainage: Muskrat Creek
Date Investigated: August 9, 1994
P.A. # 22-359

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 8,535 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Cobalt: 21.1 to 27.1 mg/kg Copper: 410 to 487 mg/kg
  Iron: 64,700 to 75,200 mg/kg
- One discharging adit was associated with the site. No MCLs were exceeded in the adit discharge; however, the acute and chronic aquatic life criteria for copper and the chronic aquatic life criteria for mercury were exceeded in the discharge.
- A sediment sample was collected from the adit discharge drainage (downstream from where the adit discharge seeped into the ground). The sediment contained significantly elevated (>3X background) levels of cobalt, copper, iron, and zinc.
- Potential safety hazards observed at the site included several collapsing loadout structures and several collapsing cabins.

Iron PA# 22-359
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - FLAMMANG
INVESTIGATION DATE: 08/09/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-359-SE2	2.4	119	74.9	4.6	164	10.2	4130	115000	0.30	671	17.4	85.5	13.2 UJ	451	NR
22-359-WR1	0.6 U	47.6	34.8	4.0	27.1	2.8	487	64700	0.33	773	4.0	20.1	7.4 U	106	NR
22-359-WR2	2.5	64.0	80.0	3.5	21.1	6.0	410	75200	0.06	332	2.7	53.9	7.6 U	96.0	NR
BACKGROUND	2.0	95.9	105	3.2	5.0	10.5	60.0	13300	0.17	1020	6.8	90.7	12.0 U	110	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-359-WR1	0.04	1.25	8.81	7.56	0.04	<0.01	0.01	0.00	8.81
22-359-WR2	0.32	10.0	4.68	-5.3	0.24	0.03	0.05	0.94	3.75

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-359-AD1	0.12 UX	2.0	5.5 U	4.0 U	8.4 U	6.8 U	15.7	45.2	0.12	3.6	14.4 U	1.1 U	51.6 U	15.6 U	71.2

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-359-AD1	80	<5.0	10	0.09	NR

LEGEND

SE2 - Organic soil present above SS1 in dry drainage 200' below mine.
WR1 - Composite of subsamples WR1A, 2A, 2B, 3A, and 3B.
WR2 - Composite of subsamples WR3A, 4A, and 4B.
BACKGROUND - From the Iron Mine (22-359-SS1).
AD1 - Sample where water flows off metal sheet; associated with WR4.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Trumley Heap Leach
Legal Description: T 6N R 3W
Mining District: Elkhorn
Latitude: N 46° 16' 13"
Longitude: W 111° 58' 15"
Land Status: Private
Quad: Elkhorn
Inspectors: Bisch, Flammang, West
Organization: Pioneer Technical Services, Inc.

County: Jefferson
Section(s): NW 1/4, SW 1/4, Section 15
Mine Type: Millsite/Au
Primary Drainage: Elkhorn Creek
USGS Code: 10020006
Secondary Drainage: Turnley Meadows Creek
Date Investigated: July 1, 1994
P.A. # 22-501

- The overall volume of tailings associated with this site could not be determined accurately. The site was previously reclaimed, and bore holes were not drilled through the reclaimed tailings to determine total depth. Although the reclamation effort appeared to have consisted of application of cover soil and revegetation, tailings were observed at the surface in several scattered, isolated pockets. The following elements were elevated to at least three times the background concentrations:

Silver: 55.2 mg/kg	Mercury: 2.83 mg/kg
Arsenic: 229 mg/kg	Lead: 3,710 mg/kg
Cadmium: 130 mg/kg	Antimony: 309J mg/kg
Copper: 367 mg/kg	Zinc: 12,100J mg/kg

- No waste rock was observed at the site.

- Turnley Creek flows adjacent to the site on the north side. No observed releases to Turnley Creek were documented; additionally, no MCLs or aquatic life criteria were exceeded in Turnley Creek either upstream or downstream from the site.

- Of the four monitoring wells located at the site, all were installed downgradient from the reclaimed tailings pond (no upgradient wells were found). The shallowest well was sampled (static water level = 8.15 feet from the top of the casing); and no MCLs were exceeded in the sample.

Trumley Heap Leach PA# 22-501
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER -
INVESTIGATION DATE: 07/06/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-501-SE1	0.6 U	8.3	28.0	0.6 U	5.7	12.8	13.6	8610	0.03 U	180	6.4	8.1 U	6.5 UJ	37.7 J	NR
22-501-SE2	0.7 U	8.1	19.2	0.7 U	2.5	5.8	7.2	8780	0.03 U	137	3.5	9.2 U	7.4 UJ	13.7 J	NR
22-501-SS2	10.7	459	83.3	31.8	12.3	12.5	94.6	24500	0.59	866	10.7	863	47.6 J	2860 J	NR
22-501-SS3	4.1	29.9	181	10.0	8.9	25.8	51.7	18800	0.25	961	13.9	239	16.3 J	902 J	NR
22-501-TP1	55.2	229	17.5	130	3.4	2.4	367	9570	2.83	1920	3.2	3710	309 J	12100 J	NR
BACKGROUND	0.5 U	21.3	267	0.5 U	9.3	15.0	13.9	17400	0.05	1410	11.1	17.7	5.8 UJ	85.8 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-501-TP1	0.05	1.56	148	145	<0.01	0.03	0.09	0.94	145

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-501-GW1	0.12 U	1.1 U	50.9	2.6 U	11.1 JX	4.7 U	4.6 U	15.0	0.11 U	4.4 U	8.0 U	2.3	29.4 U	13.9	503
22-501-GW2	0.12 U	1.1 U	50.5	2.6 U	10.7 JX	4.7 U	4.6 U	9.4 U	0.11 U	4.4 U	8.0 U	1.8	29.4 U	17.2	510
22-501-GW3	0.12 U	1.1 U	2.1 U	2.6 U	8.7 UX	4.7 U	4.6 U	9.4 U	0.11 U	4.4 U	8.0 U	0.4 U	29.4 U	4.5 U	<0.1
22-501-SW1	0.12 U	1.4	11.9	2.6 U	8.7 UX	4.7 U	4.6 U	410 J	0.11 U	29.1	8.0 U	1.0	29.4 U	5.1	57.1
22-501-SW2	0.12 U	1.5	8.7	2.6 U	8.7 UX	4.7 U	4.6 U	240 J	0.11 U	19.2	8.0 U	0.7	29.4 U	4.5 U	52.2

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-501-GW1	911	<5.0	532	1.72	0.01
22-501-GW2	997	<5.0	507	1.66	<0.005
22-501-GW3	NR	NR	NR	NR	<0.005
22-501-SW1	57	<5.0	10	0.07	0.01
22-501-SW2	80	<5.0	9.0	0.07	<0.005

LEGEND

SE1 - Downstream in Trumley Creek.
SE2 - Upstream in Trumley Creek.
SS2 - 5 point composite on line 50' apart across sparsley vegetated reclaimed area.
SS3 - 5 point composite on line 50' apart below fenceline, downgradient of reclaimed area.
TP1 - Composite of subsamples TP1 and UNK-1.
BACKGROUND - From the Trumley Heap Leach (22-501-SS1).
GW1 - Center monitoring well, uppermost aquifer.
GW2 - Duplicate of GW1.
GW3 - Blank sample.
SW1 - Same as sample 22-501-SE1.
SW2 - Same as sample 22-501-SE2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Elkhorn Creek Tailings
Legal Description: T 6N R 3W
Mining District: Elkhorn
Latitude: N 46° 10' 11"
Longitude: W 111° 57' 18"
Land Status: Private
Quad: Elkhorn
Inspectors: Tuesday, Belanger, West
Organization: Pioneer Technical Services, Inc.

County: Jefferson
Section(s): SE 1/4, E 1/2, Section 15
Mine Type: Hardrock/Au
Primary Drainage: Elkhorn Creek
USGS Code: 10020006
Secondary Drainage: Elkhorn Creek
Date Investigated: August 8, 1994
P.A. # 22-502

- The volume of tailings observed at the site was estimated to be 51,635 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 54.1 to 86.4 mg/kg	Mercury: 1.71 to 9.36 mg/kg
Arsenic: 189 to 448 mg/kg	Lead: 3,380 to 8,800 mg/kg
Cadmium: 134 to 229 mg/kg	Antimony: 256 to 484 mg/kg
Copper: 323 to 687 mg/kg	Zinc: 12,300 to 18,400 mg/kg

- No waste rock was observed at the site.
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
- Elkhorn Creek flows through the center of the site. Observed releases to Elkhorn Creek were documented for lead and zinc. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium and zinc were exceeded in the downstream sample. These exceedances were directly attributable to the site.
- Potential safety hazards observed at the site included a collapsing mill building.

Elkhorn Creek Tailings PA# 22-502
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 08/08/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-502-SE1	54.8	164	22.2	89.8	3.5	4.4	332	10300	26.9	1380	6.1 J	3510	225	9440	NR
22-502-SE2	63.2	165	19.4	79.9	3.5	4.1	340	10200	40.2	1370	5.0 J	3590	226	9260	NR
22-502-SE3	93.0	159	37.7	38.1	8.5	8.0	409	26800	44.3	384	7.8 J	3190	209	11400	NR
22-502-TP1	86.4	320	24.0	180	2.9	4.0	601	11300	5.45	2580	6.7 J	5910	430	14800	8.16
22-502-TP2	74.5	448	32.2	229	4.1	4.9	687	14900	9.36	3200	10.3 J	8800	484	18400	10.8
22-502-TP3	54.1	189	10.0	134	3.2	2.9	323	7330	1.71	1690	3.3 J	3380	256	12300	1.91
BACKGROUND	0.5 U	21.3	267	0.5 U	9.3	15.0	13.9	17400	0.05	1410	11.1	17.7	5.8 UJ	85.8 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-502-TP1	0.15	4.69	198	193	0.01	0.08	0.06	2.50	196
22-502-TP2	0.35	10.9	200	190	0.35	<0.01	0.01	0.00	200
22-502-TP3	0.17	5.31	204	199	0.02	<0.01	0.21	0.00	204

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-502-SW1	0.22 JX	10.7	19.4	9.8	8.4 U	6.8 U	8.7	77.9 J	0.76	43.2 J	14.4 U	86.2 J	51.6 U	299	148
22-502-SW2	0.15 JX	9.2	15.6	6.6	8.4 U	6.8 U	9.5	108 J	0.36	34.4 J	14.4 U	66.4 J	51.6 U	181	141
22-502-SW3	0.32 JX	9.5	12.7	4.0 U	8.4 U	6.8 U	7.0	98.0 J	0.30	8.8 J	14.4 U	16.0 J	51.6 U	21.1	126

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-502-SW1	121	<5.0	19	0.19	NR
22-502-SW2	125	<5.0	12	0.09	NR
22-502-SW3	100	<5.0	6	<0.05	NR

LEGEND

SE1 - Downstream Elkhorn Creek; below TP2.
SE2 - Midstream Elkhorn Creek; between TP1 and TP2.
SE3 - Upstream Elkhorn Creek; above TP1.
TP1 - Composite of subsamples TP1A-1 through 1A-4.
TP2 - Composite of subsamples TP1A-5 and 1A-6.
TP3 - Composite of subsamples TP2A-1 through 2A-6.
BACKGROUND - From the Transley Heap Leach (22-501-SE1).

SW1 - Same as sample 22-502-SE1.
SW2 - Same as sample 22-502-SE2.
SW3 - Same as sample 22-502-SE3.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Danny T
Legal Description: T 15N R 9E
Mining District: Hughesville
Latitude: N 47° 04' 39.7"
Longitude: W 110° 38' 0.7"
Land Status: Private
Quad: Barker
Inspectors: Tuesday, Bisch, West
Organization: Pioneer Technical Services, Inc.

County: Judith Basin
Section(s): SE 1/4, NW 1/4, Section 7
Mine Type: Hardrock/Ag, Pb, Zn
Primary Drainage: Dry Fork Belt Creek
USGS Code: 10030105
Secondary Drainage: Galena Creek
Date Investigated: July 11, 1994
P.A. # 23-500

- No mill tailings were observed at the site during the investigation.

- The volume of waste rock observed at the site was estimated to be 10,200 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Silver: 12.5JX mg/kg
  Arsenic: 200J mg/kg
  Copper: 56.3 mg/kg
  Mercury: 0.15J mg/kg
  Lead: 3,140 mg/kg
  Zinc: 213 mg/kg

- The waste rock dump was actively eroding down the drainage toward Galena Creek.

- One discharging adit that eventually flowed into Galena Creek was observed at the site. The adit was sampled at its mouth (AD-1) and again after flowing over the waste rock dump (SW-1). At the mouth, the pH was 3.01, and the MCLs for arsenic, cadmium, and antimony and the EPA action level for lead were exceeded. In addition, the acute and chronic aquatic life criteria for cadmium, copper, and zinc and the chronic aquatic life criteria for iron and lead were exceeded. After flowing over waste rock, the pH of the discharge was 3.0, and the MCLs for arsenic, cadmium, and antimony were exceeded. The acute and chronic aquatic life criteria for cadmium, copper, and zinc and the chronic aquatic life criteria for arsenic, iron, and lead were also exceeded.

- Galena Creek was not sampled due to known poor water quality and abundant available data for the stream and the effect of the Marcelline Mine below the Danny T at Galena Creek.

- No hazardous mine openings (the adit was gated) or structures were observed at the site; however, abundant debris was scattered throughout the site.

Danny T. Mine PA# 23-500
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/11/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
23-500-WR1	12.5 JX	200 J	125	0.5 U	1.8 U	1.6	56.3	28300	0.15 J	105	1.6 U	3140	5.9 UJ	213	NR
BACKGROUND	0.5 UX	4.5 UJ	150	0.4 U	6.1	8.9	11.2	15100	0.04 J	770	11.1	31.5	5.0 UJ	59.7	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
23-500-WR1	1.67	52.2	-7.53	-60	1.29	<0.01	0.38	0.00	-7.53

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
23-500-AD1	0.15	133	4.9	257 J	55.0	15.7	1010	142000	0.08 U	119000	40.8	144	96.1	58400	422
23-500-SW1	0.29	260	4.1	281 J	56.1	9.0	1130	142000	0.08 U	124000	40.7	113	107	62300	429

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
23-500-AD1	1790	<5	951	<0.05	NR
23-500-SW1	1850	<5	1050	<0.05	NR

LEGEND

WR1 - Composite of subsamples WR1A through 1C.
BACKGROUND - From the Danny T. Mine (23-500-SS1).
AD1 - Adit discharge associated with WR1.
SW1 - Adit discharge after flowing over WR1; just above Monolithic dump.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Roncor/Amax Sapphire
Legal Description: T 13N R 11E
Mining District: Yogo
Latitude: N 46° 52'
Longitude: W 110° 20'
Land Status: Private
Quad: Indian Hill and Woodhurst Mountain
Inspectors: Bullock, S. Babits
Organization: Pioneer Technical Services, Inc.

County: Judith Basin
Section(s): Sections 21, 22, 23, and 24
Mine Type: Open pit/Yogo sapphires
Primary Drainage: Judith River
USGS Code: 10040103
Secondary Drainage: Yogo Creek
Date Investigated: September 10, 1993
P.A. # 23-501

- A site visit was not conducted at this site during the 1994 inventory; however, the site was informally inspected in 1993 while conducting an inventory at the Vortex Site (23-027).
- The tailings observed at the site consisted of fine clays (limestone fines) from wash plant operations. The volume of tailings was not determined, and no tailings samples were collected; however, metals concentrations are expected to be very low according to data collected at the adjacent Vortex Site.
- No discharging adits, filled shafts, seeps, or springs were observed at the site.
- Yogo Creek flows adjacent to the site on the north side. Surface water and sediment data collected from Yogo Creek in 1993 indicated that metals concentrations were not significantly elevated downstream from the site compared to upstream concentrations. No MCLs or aquatic life criteria were exceeded in Yogo Creek.
- Potential safety hazards observed at the site included two hazardous mine openings, one large open adit, and an open shaft.

Roncor/Amax Sapphire PA# 23-501
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-BULLOCK
INVESTIGATION DATE: 9/10/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
23-027-SE-2	15.2	468	1.3 U	9.86	45.2	23.9	17000	0.045 U	392	44.4	21.9	9.17 UJ	90.9	NR
23-027-SE-3	14	385	1.0 U	8.21	37	19.5	15000	0.052 J	322	36.9	14.7	7.2 UJ	61.9	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

MECHANICAL ANALYSIS

FIELD ID	% CLAY	% SAND	% SILT	% COARSE MATERIAL (>2mm)
23-027-SE-2	10	63	27	0
23-027-SE-3	4	63	33	0

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	CALC. (mg CaCO3/L)
23-027-SW-2	1.38 JX	98.4	2.57 U	9.7 U	6.83 U	1.55 U	102	0.12 U	4.08 UJ	12.7 U	1.47	30.7 UJX	7.57 U	188
23-027-SW-3	0.96 U	110	2.57 U	9.7 U	6.83 U	2.47 J	99	0.12 U	4.08 U	12.7 U	0.72	30.7 U	8.17	203

Wet Chemistry Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	TOTAL SUSPENDED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE	TSS
23-027-SW-1	267	< 4	< 5.0	12	< 0.05	NR	< 4
23-027-SW-2	247	< 4	< 5.0	14	< 0.05	NR	< 4
23-027-SW-3	265	< 4	< 5.0	14	< 0.05	NR	< 4

LEGEND

SE2 - Between exposed and reclaimed pond, owned by Ronco. Downstream of shaft.
SE3 - At Ronco intake pond above Ronco tailings, downstream of placer tailings.
SW2 - Same as sample SE2.
SW3 - Same as sample SE3.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Joslyn Street Tailings
Legal Description: T 10N R 4W
Mining District: Helena
Latitude: N 46° 35' 49.1"
Longitude: W 112° 03' 56"
Land Status: Private
Quad: Helena
Inspectors: Tuesday, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Lewis and Clark
Section(s): NE 1/4, NE 1/4, SE 1/4, Section 23
Mine Type: N/A
Primary Drainage: Tenmile Creek
USGS Code: 10030101
Secondary Drainage: Tenmile Creek
Date Investigated: July 27, 1994
P.A. # 25-501

- The volume of tailings observed at the site was estimated to be 4,900 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Arsenic: 8,520 to 29,300 mg/kg
  Cadmium: 6.4J to 128J mg/kg
  Copper: 98.9 to 464 mg/kg
  Mercury: 0.22 to 0.32 mg/kg
  Lead: 557 to 9,230 mg/kg
  Antimony: 54.0 to 238 mg/kg
  Zinc: 1,010 to 16,400 mg/kg

- The tailings were located directly in a residential area and had exceptionally high concentrations of arsenic and lead. On-site residents were concerned about groundwater contamination and child exposure to these contaminants.

- No waste rock dumps, discharging adits, filled shafts, seeps, or springs were observed at the site. A small volume of ponded water was observed on one of the tailings areas. The ponded water was sampled for field parameters only (pH = 2.02, SC = 12,400 uS/cm).

- Groundwater samples were collected upgradient and downgradient from the site. No observed releases to groundwater were documented; and no MCLs were exceeded in either of the groundwater samples.

Joslyn Street Tailings PA# 25-501
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/27/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-501-TP1A	36.7 JX	13900	20.2	19.1 J	1.8	3.2 J	98.9	25300	0.22	47.5	2.6 U	3730	56.9	1900	1.522
25-501-TP1B	1.4 JX	8520	129	41.3 J	9.3	19.2 J	407	47200	0.08	1050	7.4	557	16.3	6130	0.657
25-501-TP2	59.0 JX	11800	137	6.4 J	1.7 U	27.3 J	432	58000	0.32	108	3.3	8650	54.0	1010	2.18
25-501-TP3	72.5 JX	29300	5.5	128 J	9.7	19.5 J	464	59700	0.16	571	3.3	9230	238	16400	<0.253
BACKGROUND	NR	27.1	165 JX	1.3 J	13.6	17.9	29.7	23300	0.071 JX	672	17.9 J	36.3 J	6.98 UJ	76.4	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
25-501-TP1A	1.68	52.5	-8.08	-61	0.57	0.33	0.78	10.3	-18.4
25-501-TP1B	3.99	125	-7.88	-133	3.74	<0.01	0.25	0.00	-7.88
25-501-TP2	1.83	57.2	0.50	-57	1.80	<0.01	0.03	0.00	0.50
25-501-TP3	5.55	173	-29.7	-203	<0.01	2.15	3.61	67.2	-96.8

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-501-GW1	0.12 U	9.3	52.3	0.13	8.4 U	6.8 U	5.9 U	14.0	0.18	2.3 U	14.4 U	4.2 J	3.4	15.6 U	343
25-501-GW2	0.12 U	4.5	49.6	0.09	8.4 U	6.8 U	5.9 U	12.3 U	0.11 U	2.3 U	14.4 U	1.1 U	2.4 U	20.3	196

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-501-GW1	447	29	81	4.92	<0.005
25-501-GW2	257	<5	38	0.85	<0.005

LEGEND

TP1A - Composite of subsamples TP1A-1, 1B-1, 1C-1, 1D-1, 1E-1, and 3A-1.
TP1B - Composite of subsamples TP1A-2, 1B-2, 1C-2, 1D-2, and 1E-2.
TP2 - Composite of subsamples TP 2A-1, and 2A-2.
TP3 - Composite of subsamples TP3A-4 and 3A-5.
BACKGROUND - From the Franklin Mine (25-X09-SS1) (1993 Data).

GW1 - GW well for tank supplying water for golf course irrigation, probably up or cross-gradient.
GW2 - Residential well downgradient (north) of tailings (Gutloff residence).

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Drumlummon Mine, Mill, and Tailings
Legal Description:
Mine/Mill T 12N R 6W and T 11N R 6W
Tailings T 12N R 5W and T 11N R 5W
Mining District: Marysville
Latitude: N 46° 44' 36"; N 46° 44' 58"
Longitude: W 112° 17' 45"; W 112° 15' 28"
Land Status: Private/Public
Quad: Greenhorn Mountain and Canyon Creek
Inspectors: Tuesday, Belanger, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Lewis and Clark
Mine/Mill Section(s): SE 1/4, Section 36 and NW 1/4, N 1/2, Section 1
Tailings Section(s): SE 1/4, S 1/2, Section 34 and NE 1/4, NE 1/4, Section 31
Mine Type: Hardrock/Cu, Au, Ag, Pb, Zn, Mo
Primary Drainage: Silver Creek
USGS Code: 10030101
Secondary Drainage: Silver Creek
Date Investigated: June 23-24, 1994
P.A. # 25-024

- The volume of tailings observed at the site was estimated to be 178,630 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 27.4 mg/kg
  Arsenic: 33.7 to 35.1 mg/kg
  Copper: 116 to 149 mg/kg
  Mercury: 1.85JX to 1.94JX mg/kg
  Lead: 112 to 117 mg/kg
  Zinc: 205J to 257J mg/kg

- The volume of waste rock observed at the site was estimated to be 9,020 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 5 mg/kg
  Arsenic: 46.2 mg/kg
  Cadmium: 2.8J mg/kg
  Copper: 55.3 mg/kg
  Mercury: 0.41JX to 1.43JX mg/kg
  Lead: 119 mg/kg
  Zinc: 311J mg/kg

- One discharging adit was observed at the site. The discharge flowed a short distance to a small pond. No MCLs were exceeded in the adit discharge; however, the chronic aquatic life criteria for iron was exceeded.

- Silver Creek flows adjacent to the site on the northwest side. An observed release to Silver Creek (sediment) was documented for mercury; however, no MCLs or aquatic life criteria were exceeded in the stream.

- Potential safety hazards observed at the site included four open shafts, two highwalls associated with two large open pits, and a collapsing loadout structure.

Drumlumon Mine/Mill PA# 25-024
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 06/23 & 24/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-024-SE1	1.9	30.5	148 J	0.8	6.1	13.9 J	38.8	16100	0.18	1050 J	7.7	203	6.2 U	196	NR
25-024-SE2	4.5	19.8	150 J	0.7	6.0	8.7 J	30.6	13100	6.20	490 J	6.4	62.0	7.4 U	73.7	NR
25-024-SE3	18.8	13.5	71.8 J	1.5	3.9	9.0 J	60.7	9120	3.78	742 J	4.9	77.7	5.4 U	123	NR
25-024-TP1	27.4	33.7	99.2	0.7	4.3	12.5	149	11100	1.94 JX	744	8.0	112	16.1 J	257 J	0.401
25-024-TP2	27.4	35.1	61.3	0.7	3.0	10.2	116	9230	1.85 JX	626	5.9	117	12.9 J	205 J	0.219
25-024-WR1	0.4 U	21.7	46.2	0.4 UJ	5.6	16.9	30.1	23300	0.41 JX	491	9.8	12.1	4.3 UJ	59.6 J	NR
25-024-WR2	5	46.2	57.0	2.8 J	4.2	9.3	55.3	13200	1.43 JX	727	6.1	119	5.7 UJ	311 J	NR
BACKGROUND	0.7 U	8.2	312 J	0.6 U	5.6	15.0 J	12.1	14500	0.03 U	454 J	9.8	8.56 U	6.9 U	58.1	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
25-024-TP1	0.01	0.31	72.6	72.3	<0.01	<0.01	0.01	0.00	72.6
25-024-TP2	0.01	0.31	82.0	81.7	<0.01	<0.01	0.01	0.00	82.0
25-024-WR1	0.04	1.25	153	152	<0.01	0.07	0.05	2.19	151
25-024-WR2	0.15	4.69	91.3	86.6	0.07	0.03	0.05	0.94	90.4

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-024-AD1	0.14	34.9	128	2.6 U	8.7 U	4.7 UX	4.6 U	2140	0.11 U	1640	8.0 U	2.1	29.4 U	6.07	319
25-024-SW1	0.12 U	2.2	94.0	2.6 U	8.7 U	4.9 JX	4.6 U	44.1	0.11 U	8.0	9.8	2.9	29.4 U	6.67	144
25-024-SW2	0.12 U	2.1	81.9	2.6 U	8.7 U	4.7 UX	4.6 U	91.4	0.11 U	21.8	8.0 U	2.3	29.4 U	4.5 U	139
25-024-SW3	0.12 U	3.6	74.4	2.6 U	8.7 U	5.9 JX	7.3	262	0.11 U	41.3	8.0 U	6.8	29.4 U	13.7	188

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-024-AD1	309	<5	24	<0.05	NR
25-024-SW1	137	<5	8.0	0.15	NR
25-024-SW2	148	<5.0	12	0.16	NR
25-024-SW3	177	<5	18	0.14	NR

LEGEND

SE1 - Ottawa Gulch (Silver Creek) upstream of mines and mills.
SE2 - Silver Creek below mines, mills, and TP1.
SE3 - Silver Creek below tailings from TP2, two miles below mills.
TP1 - Composite of subsamples TP2A-1 through 2A7.
TP2 - Composite of subsamples TP2B and 2C.
WR1 - Composite of subsamples WR1 and 2.
WR2 - Composite of subsamples WR3 and 4A through 4C.
BACKGROUND - From the Drumlumon Mine/Mill (25-024-SE1).
AD1 - Acid discharge on WR4.
SW1 - Same as sample 25-024-SE1.
SW2 - Same as sample 25-024-SE2.
SW3 - Same as sample 25-024-SE3.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Peerless Jenny/King
Legal Description: T 8N R 5W
Mining District: Rimini
Latitude: N 46° 25' 54.7"
Longitude: W 112° 14' 20.9"
Land Status: Private
Quad: Chessman Reservoir
Inspectors: Tuesday, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Lewis and Clark
Section(s): SE 1/4, NW 1/4, Section 21
Mine Type: Hardrock/Au, Ag, Pb
Primary Drainage: Banner Creek
USGS Code: 10030101
Secondary Drainage: Banner Creek
Date Investigated: July 26, 1994
P.A. # 25-006

- No mill tailings were observed at the site.

- The volume of waste rock associated with this site was estimated to be 28,030 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Silver: 25.2JX to 44.7JX mg/kg
  Arsenic: 65.2J to 91.3J mg/kg
  Copper: 103 to 291 mg/kg
  Mercury: 0.18 to 0.84 mg/kg
  Lead: 431 to 1,150 mg/kg
  Zinc: 1,050 mg/kg

- Two discharging adits and numerous springs were associated with the site. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium, copper, and zinc were exceeded in the Adit #2 discharge. The acute aquatic life criteria for silver and the chronic aquatic life criteria for lead were exceeded in the Adit #1 discharge.

- The adit discharges combined to form the flow in a intermittent drainage which ran through the center of the site. The acute and chronic aquatic life criteria for cadmium, copper, and zinc and the chronic aquatic life criteria for lead were exceeded in the drainage downstream from the site.

- Potential safety hazards observed at the site included two large, collapsing cabins/bunkhouses.

Peerless Jenny/King PA# 25-006
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/26/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-006-SE1	2.1	21.6	101	0.8	5.2	4.0	33.0	19700	0.03 UJX	536	3.7	48.6 J	9.4 UJ	52.4	NR
25-006-SE2	13.9	23.0	29.6	0.9	2.9	2.0	112	10100	0.03 UJX	693	3.0 U	401 J	10.9 UJ	209	NR
25-006-SE3	22.3 JX	32.2 J	62.0	5.1	6.2	1.6 U	310	15300	0.03	1240	3.5 U	544	12.4 UJ	528	NR
25-006-WR1	44.7 JX	91.3 J	26.1	1.5	2.0	1.1 U	291	21800	0.18	458	2.3 U	1150	8.2 UJ	302	NR
25-006-WR2	25.2 JX	65.2 J	93.3	8.4	5.8	1.4 U	103	18800	0.84	689	5.7	431	10.8 UJ	1050	NR
25-262-SE4	1 U	7.8 U	35	1.1	3.6	2.0	25.8	3870	0.03 JX	934	3.4 U	23.9 J	12.0 UJ	191	NR
BACKGROUND	0.8 UJX	18.9 J	117	3.5	5.1	1.9	13.5	8300	0.03	1480	4.5	93.2	9.4 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
25-006-WR1	0.17	5.31	-0.89	-6.2	0.15	0.01	0.01	0.31	-1.21
25-006-WR2	0.34	10.6	1.51	-9.1	0.25	<0.01	0.09	0.00	1.51

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-006-AD1	0.55	3.0	27.7	4.0 UX	8.4 U	6.8 U	5.9 U	33.2	0.08 U	3.1	14.4 U	3.2 J	51.6 U	15.6 U	18.9 B
25-006-AD2	0.22	4.9	26.6	10.4 JX	8.4 U	6.8 U	104	1090	0.08 U	4810	14.4 U	11.7 J	51.6 U	1230 J	129
25-006-SW2	1.85	1.9	37.7	33.1 JX	8.4 U	6.8 U	349	61.2	0.08 U	3540	14.4 U	47.1 J	51.6 U	3510 J	26.4 B
25-006-SW3	0.30	3.8	27.5	4.2 JX	8.4 U	6.8 U	19.6	38.3	0.08 U	680	14.4 U	3.3 J	51.6 U	887 J	88.0
25-262-SW4	0.13	3.2	25.9	4.0 UX	8.4 U	6.8 U	5.9 U	268	0.08 U	351	14.4 U	3.8 J	51.6 U	164 J	47.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-006-AD1	46	<5	9.0	0.06	NR
25-006-AD2	181	<5	99	0.06	NR
25-006-SW2	99	<5	40	0.06	NR
25-006-SW3	133	<5	71	0.06	NR
25-262-SW4	84	<5	31	0.06	NR

LEGEND

SR1 - Upstream of WR1 in dry drainage.
SR2 - Downstream of WR1 in drainage, upstream of WR2.
SR3 - Downstream of WR2 in drainage.
25-262-SR4 - From the Queensbury/Peerless King Mine; below Peerless drainage.
WR1 - Composite of subsamples WR1A through 1D.
WR2 - Composite of subsamples WR2A through 2E.
BACKGROUND - From the Peerless Jenny/King Mine (25-006-SR1).

AD1 - Upper adit at the Peerless Jenny.
AD2 - Lower adit at the Peerless Jenny.
SW2 - Same as sample 25-006-SR2.
SW3 - Same as sample 25-006-SR3.
25-262-SW4 - Same as sample 25-262-SR4.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Woodrow Wilson
Legal Description: T 8N R 5W
Mining District: Rimini
Latitude: N 46° 24' 51"
Longitude: W 112° 15' 22"
Land Status: Private
Quad: Three Brothers
Inspectors: Tuesday, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Lewis and Clark
Section(s): SW 1/4, SW 1/4, SW 1/4, Section 20
Mine Type: Hardrock/Au, Ag
Primary Drainage: Banner Creek
USGS Code: 10030101
Secondary Drainage: West Fork Banner Creek
Date Investigated: July 28, 1994
P.A. # 25-258

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 1,085 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 6.5JX mg/kg
  Arsenic: 295J mg/kg
  Mercury: 1.30 mg/kg
  Antimony: 30.0J mg/kg
- One discharging adit was observed at the site. The discharge eventually reached a tributary of the West Fork of Banner Creek downstream from the site. No MCLs were exceeded in the adit discharge; however, the acute and chronic aquatic life criteria for zinc and the chronic aquatic life criteria for lead were exceeded.
- A tributary to the West Fork of Banner Creek flows through the center of the site. An observed release to the tributary was documented for arsenic. No MCLs were exceeded in the tributary; however, the acute and chronic aquatic life criteria for zinc and the chronic aquatic life criteria for lead were exceeded both upstream and downstream from the site.
- Potential safety hazards observed at the site included unstable slopes near the collapsed adit, and a collapsing cabin.

Woodrow Wilson PA# 25-258
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/28/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-258-SE1	1.3 UJX	163 J	19.9	2.8	4.2	2.0 U	32.7	42500	0.20	70.2	4.2 U	34.7	15.1 UJ	33.4	NR
25-258-SE2	1.7 JX	67.4 J	18.7	1.0 U	3.9	1.7 U	18.0	20300	0.34	247	4.7	35.7	12.6 UJ	50.9	NR
25-258-SE3	7.1 JX	189 J	16.3	3.3 U	6.9 U	5.6 U	27.0	90000	0.58	34.8	11.8 U	49.8	42.1 UJ	20.1	NR
25-258-WR1	6.5 JX	295 J	28.3	0.7 U	1.5 U	1.2 U	12.0	10800	1.30	20.1	2.6 U	49.5	30.0 J	7.04	NR
BACKGROUND	0.8 UJX	18.9 J	117	3.5	5.1	1.9	13.5	8300	0.03	1480	4.5	93.2	9.4 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
25-258-WR1	0.08	2.50	-0.33	-2.8	0.08	<0.01	<0.01	0.00	-0.33

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-258-AD1	0.12 U	5.0	5.8	4.0 UX	8.4 U	6.8 U	5.9 U	762	0.08 U	134	14.4 U	1.5	51.6 U	44.2 J	18.6
25-258-SW1	0.28	7.8	9.5	4.0 UX	8.4 U	6.8 U	5.9 U	1150	0.08 U	160	14.4 U	2.0	51.6 U	40.3 J	16.5
25-258-SW2	0.25	3.7	8.4	4.0 UX	8.4 U	6.8 U	5.9 U	347	0.08 U	118	14.4 U	1.4	51.6 U	38.6 J	14.4
25-258-SW3	0.12 U	2.4	9.7	4.0 UX	8.4 U	6.8 U	5.9 U	490	0.08 U	74.5	14.4 U	2.0	51.6 U	52.2 J	9.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-258-AD1	56	<5	24	0.06	NR
25-258-SW1	5.0	<5	20	0.06	NR
25-258-SW2	5.0	<5	18	0.06	NR
25-258-SW3	44	<5	14	0.06	NR

LEGEND

SE1 - Downstream of site and adit discharge in West Fork of the West Fork of Beaver Creek.
SE2 - Downstream of part of dump and upstream of adit discharge.
SE3 - Upstream of mine in West Fork of the West Fork of Beaver Creek.
WR1 - Composite of the subsamples WR1A through 1C.
BACKGROUND - From the Purchase Jenny/King Mine (25-258-SS1).

AD1 - Adit discharge onto WR1.
SW1 - Same as sample 25-258-SE1.
SW2 - Same as sample 25-258-SE2.
SW3 - Same as sample 25-258-SE3.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Peter
Legal Description: T 8N R 5W
Mining District: Rimini
Latitude: N 46° 25' 27.2"
Longitude: W 112° 15' 42.7"
Land Status: Private
Quad: Three Brothers
Inspectors: Tuesday, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Lewis and Clark
Section(s): SW 1/4, SW 1/4, Section 20
Mine Type: Hardrock/Au, Ag, Silica
Primary Drainage: Banner Creek
USGS Code: 10030101
Secondary Drainage: West Fork Banner Creek
Date Investigated: July 28, 1994
P.A. # 25-259

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 730 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Arsenic: 142J mg/kg
  Mercury: 0.78 mg/kg
- One discharging adit was associated with the site. The flow from the adit eventually reached a tributary of the West Fork of Banner Creek. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium and zinc were exceeded in the adit discharge. Additionally, the chronic aquatic life criteria for iron and lead were exceeded in the adit discharge.
- A tributary to the West Fork of Banner Creek flows adjacent to the site on the east side. No observed releases to the tributary were documented; however, the chronic aquatic life criteria for lead was exceeded both upstream and downstream from the site.
- Potential safety hazards observed at the site included an unstable slope on the waste rock dump due to the dump being undercut by the stream.

Peter PA# 25-259
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/28/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-259-SE1	0.9 UJX	93.7 J	20.5	1.5	27.4	1.4 U	20.5	14500	0.07	775	12.8	27.4	10.3 UJ	179	NR
25-259-SE2	1.4 UJX	117 J	46.4	1.3 U	17.2	4.4	43.7	32100	0.06	723	10.0	41.6	16.5 UJ	87.8	NR
25-259-WR1	2.0 JX	142 J	14.2	0.9	2.5	1.1 U	13.1	16500	0.78	225	3.8	22.7	8.5 UJ	23.6	NR
BACKGROUND	0.8 UJX	18.9 J	117	3.5	5.1	1.9	13.5	8300	0.03	1480	4.5	93.2	9.4 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
25-259-WR1	0.28	8.75	1.32	-7.4	0.25	<0.01	0.03	0.00	1.32

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-259-AD1	0.12 U	10.2	11.0	5.5 JX	8.4 U	6.8 U	5.9 U	4870	0.08 U	329	14.4 U	1.6	51.6 U	95.7 J	28.0
25-259-SW1	0.12 U	2.9	5.5 U	4.0 UX	8.4 U	6.8 U	5.9 U	148	0.08 U	17.1	14.4 U	1.3	51.6 U	15.6 U	26.5
25-259-SW2	0.12 U	2.3	5.5 U	4.0 UX	8.4 U	6.8 U	5.9 U	102	0.08 U	9.3	14.4 U	1.6	51.6 U	15.6 U	25.2

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-259-AD1	9	<5	39	0.06	NR
25-259-SW1	59	<5	13	0.06	NR
25-259-SW2	60	<5	11	0.06	NR

LEGEND

SB1 - Downstream of mine in East Fork of West Fork of Bennet Creek.
SB2 - Upstream of mine in East Fork of West Fork of Bennet Creek.
WR1 - Composite of WR1A through 1C.
BACKGROUND - From the Fearless Jenny/King Mine (25-086-SB1).
AD1 - Adit discharge on WR1.
SW1 - Same as sample 25-259-SB1.
SW2 - Same as sample 25-259-SB2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Queensbury
Legal Description: T 8N R 5W
Mining District: Rimini
Latitude: N 46° 25' 57"
Longitude: W 112° 14' 03"
Land Status: Private
Quad: Chessman Reservoir
Inspectors: Tuesday, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Lewis and Clark
Section(s): SE 1/4, NW 1/4, Section 21
Mine Type: Hardrock/Au, Ag
Primary Drainage: Banner Creek
USGS Code: 10030101
Secondary Drainage: Banner Creek
Date Investigated: July 26, 1994
P.A. # 25-262

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 3,570 cubic yards of uncovered waste rock on-site. The following elements were elevated to at least three times the background concentrations:
  Silver: 27.8 mg/kg
  Copper: 50.5 mg/kg
  Lead: 727J mg/kg
  Arsenic: 63.6 mg/kg
  Mercury: 0.37JX to 0.41JX mg/kg
- One discharging adit was observed at the site which was routed through two settling ponds before discharging to Banner Creek. No MCLs were exceeded in the adit discharge; however, the acute and chronic aquatic life criteria for lead and zinc were exceeded.
- The adit discharge entered an intermittent drainage which was dry upstream from the site. Downstream from the site, the acute and chronic aquatic life criteria for cadmium and zinc and the chronic aquatic life criteria for lead were exceeded in this drainage.
- Potential safety hazards observed at the site included one collapsing cabin (low hazard potential).

Queensbury PA# 25-262
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/26/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-262-SE1	3.1	34.4	90.1	2.1	9.7	5.1	29.6	8710	0.07 JX	897	5.9	156 J	11.7 UJ	140	NR
25-262-SE2	2.3	8.2 U	41.3	1.0 U	2.6	5.2	6.3	3900	0.03 UJX	129	3.5 U	22.4 J	12.6 UJ	61.2	NR
25-262-SE3	1.7	7.7 U	50.2	2.5	4.6	3.7	10.7	4880	0.03 UJX	937	3.3 U	48.1 J	11.7 UJ	156	NR
25-262-SE4	1.0 U	7.8 U	35.0	1.1	3.6	2.0	25.8	3870	0.03 UJX	934	3.4 U	23.9 J	12.0 UJ	191	NR
25-262-WR1	1.5	63.6	104	0.8 U	1.6 U	1.8	4.7	2010	0.41 JX	3.1	2.7 U	96.6 J	9.7 UJ	25.7	NR
25-262-WR2	27.8	31.7	85.9	0.9 U	1.9 U	2.5	50.5	8130	0.37 JX	56.0	3.2 U	727 J	11.5 UJ	86.3	NR
BACKGROUND	0.8 UJX	18.9 J	117	3.5	5.1	1.9	13.5	8300	0.03	1480	4.5	93.2	9.4 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
25-262-WR1	0.02	0.62	0.03	-0.6	0.02	<0.01	<0.01	0.00	0.03
25-262-WR2	0.25	7.81	-1.69	-9.50	0.14	0.06	0.05	1.87	-3.56

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-262-AD1	0.23	11.7	50.7	4.0 UX	8.4 U	7.1	5.9 U	824	0.08 U	170	14.4 U	21.8 J	51.6 U	106 J	19.9
25-262-SW2	0.16	4.9	31.7	4.0 UX	8.4 U	6.8 U	5.9 U	222	0.08 U	55.1	14.4 U	5.0 J	51.6 U	86.9 J	18.9
25-262-SW3	0.15	2.5	41.5	4.3 JX	8.4 U	6.8 U	5.9 U	528	0.08 U	644	14.4 U	3.3 J	51.6 U	98.4 J	22.4
25-262-SW4	0.13	3.2	25.9	4.0 UX	8.4 U	6.8 U	5.9 U	268	0.08 U	351	14.4 U	3.8 J	51.6 U	164 J	47.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-262-AD1	33	<5	11	0.06	NR
25-262-SW2	406	<5	13	0.06	NR
25-262-SW3	54	<5	11	0.06	NR
25-262-SW4	84	<5	31	0.06	NR

LEGEND

SE1 - Upstream sediment in drainage.
SE2 - Below upper mine at outfall.
SE3 - Below lower dumps.
SE4 - Below Pearlen drainage.
WR1 - Composite of subsamples WR1A and 1B.
WR2 - Composite of subsamples WR2A, 2B, 3A, and 3B.
BACKGROUND - From the Pearlen Jenny/King Mine (25-006-SS1).
AD1 - Upper adit discharge (locked and gated); adit in Banner Creek.
SW2 - Same as sample 25-262-SE2.
SW3 - Same as sample 25-262-SE3.
SW4 - Same as sample 25-262-SE4.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Monte Cristo
Legal Description: T 8N R 5W
Mining District: Rimini
Latitude: N 46° 27' 4.7"
Longitude: W 112° 15' 59.6"
Land Status: Private
Quad: Three Brothers
Inspectors: Tuesday, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Lewis and Clark
Section(s): NW 1/4, NW 1/4, NW 1/4, Section 17
Mine Type: Hardrock/Au, Ag, Cu, Pb
Primary Drainage: Tenmile Creek
USGS Code: 10030101
Secondary Drainage: Ruby Creek
Date Investigated: July 25, 1994
P.A. # 25-275

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 5,935 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Silver: 23.6 mg/kg
  Arsenic: 243 to 540 mg/kg
  Chromium: 6.7 mg/kg
  Copper: 61.9 to 121 mg/kg
  Iron: 24,900 to 37,100 mg/kg
  Mercury: 0.11JX to 1.13JX mg/kg
  Lead: 1,370J to 3,610J mg/kg
  Antimony: 42.1J to 184J mg/kg

- One discharging adit was observed at the site. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium, copper and zinc were exceeded in the adit discharge. Additionally, the chronic aquatic life criteria for mercury and lead were exceeded in the adit discharge.
- The adit discharge flows over a waste rock dump and entered a swamp area. The acute and chronic aquatic life criteria for copper and the chronic aquatic life criteria for lead were exceeded in a surface water sample collected from the swamp. An intermittent drainage extended downstream from the swamp; however, the drainage was dry during the investigation.
- Potential safety hazards observed at the site included three open shafts and one open adit.

Monte Cristo PA# 25-275
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/25/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-275-WR1	1.9	243	79.4	1.9	4.4	6.7	61.9	24900	0.11 JX	441	6.0	1370 J	42.1 J	105	NR
25-275-WR2	23.6	540	129	4.2	2.8	3.3	121	37100	1.13 JX	511	2.6 U	3610 J	184 J	116	NR
BACKGROUND	0.8 UJX	18.9 J	117	3.5	5.1	1.9	13.5	8300	0.03	1480	4.5	93.2	9.4 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
25-275-WR1	0.02	0.62	3.87	3.25	<0.01	0.02	<0.01	0.62	3.25
25-275-WR2	0.06	1.87	-0.23	-2.1	0.06	<0.01	<0.01	0.00	-0.23

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-275-AD1	0.51	23.1	21.3	6.4 JX	8.4 U	6.8 U	147	140	0.09	34.9	14.4 U	11.7 J	51.6 U	93.8 J	56.4
25-275-SW1	0.36	20.5	19.4	4.0 UX	8.4 U	6.8 U	54.9	110	0.08 U	25.6	14.4 U	3.4 J	51.6 U	35.8 J	53.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-275-AD1	95	<5	12	0.13	NR
25-275-SW1	94	<5	10	0.06	NR

LEGEND

WR1 - Composite of subsamples WR1A, 1B, and 1C.
WR2 - Grab sample of the WR2 subsample.
BACKGROUND - From the Peaches Jenny/King Mine (25-00-881).
AD1 - Adit discharge onto WR1.
SW1 - Discharge after flowing through WR1 and into bog.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: National Extension
Legal Description: T 8N R 5W
Mining District: Rimini
Latitude: N 46° 27' 12"
Longitude: W 112° 12' 34"
Land Status: Private
Quad: Chessman Reservoir
Inspectors: Tuesday, Flammang, West
Organization: Pioneer Technical Services, Inc.

County: Lewis and Clark
Section(s): SE 1/4, SE 1/4, SW 1/4, Section 10
Mine Type: Hardrock/Unknown
Primary Drainage: Tenmile Creek
USGS Code: 10030101
Secondary Drainage: Beaver Creek
Date Investigated: August 10, 1994
P.A. # 25-287

- No mill tailings were observed at the site.

- The volume of waste rock observed at the site was estimated to be 7,530 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Silver: 31.1 to 58.5 mg/kg
  Arsenic: 2,760 to 2,820 mg/kg
  Copper: 83.3 to 419 mg/kg
  Mercury: 3.07 to 10.7 mg/kg
  Lead: 5,790 to 12,900 mg/kg
  Antimony: 28.2J mg/kg

- One discharging adit was observed at the site. The discharge eventually merged with an unnamed tributary to Beaver Creek. The MCLs for arsenic and cadmium and the acute and chronic aquatic life criteria for arsenic, cadmium, copper, and zinc were exceeded in the adit discharge. Additionally, the chronic aquatic life criteria for iron and mercury were exceeded in the adit discharge.

- An unnamed tributary to Beaver Creek flows through the center of the site. Observed releases to the tributary (sediment) were documented for arsenic and lead. The MCL for cadmium was exceeded both upstream and downstream from the site; the MCL for arsenic was exceeded upstream from the site. The acute and chronic aquatic life criteria for cadmium, copper, and zinc and the chronic aquatic life criteria for mercury and lead were exceeded both upstream and downstream from the site. The acute aquatic life criteria for lead was exceeded downstream from the site; this exceedance was directly attributable to the site.

- Potential safety hazards observed at the site included an open pit and an unstable slope above a collapsed adit.

National Extension PA# 25-287
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 08/10/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-287-SE1	1.5	486	62.5	14.2	9.6	3.3	293	11900	0.13	3320	2.9 U	991	10.4 UJ	716	NR
25-287-SE2	7.2 U	56.1 U	70.2	6.7 U	14.0 U	11.9	104	3910	0.33	2390	24.1 U	120	86.2 UJ	454	NR
25-287-WR1	58.5	2760	40.7	1.6	1.7 U	2.8	419	22500	10.7	761	3.0 U	12900	28.2 J	380	NR
25-287-WR2	31.1	2820	30.3	0.6	1.2 U	1.0	83.3	13300	3.07	21.7	2.1 U	5790	17.3 J	116	NR
BACKGROUND	0.8 UJX	18.9 J	117	3.5	5.1	1.9	13.5	8300	0.03	1480	4.5	93.2	9.4 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
25-287-WR1	0.71	22.2	-0.55	-23	0.57	0.02	0.12	0.62	-1.17
25-287-WR2	0.82	25.6	-3.20	-29	0.33	0.23	0.26	7.19	-10.4

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-287-AD1	0.29	400	42.4	30.0	8.4 U	6.8 U	173	8300	0.17	2000	14.4 U	395	51.6 U	4490	54.8
25-287-SW1	0.16	45.3	27.2	20.3	8.4 U	6.8 U	76.7	951	0.16	780	14.4 U	91.0	51.6 U	2490	39.9
25-287-SW2	0.12 U	78.8	113	14.6	8.4 U	6.8 U	115	1230	0.29	5840	15.8	80.0	51.6 U	798	109

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-287-AD1	43	<5	44	<0.05	NR
25-287-SW1	68	<5	36	<0.05	NR
25-287-SW2	<4.0	<5	6.0	<0.05	NR

LEGEND

SE1 - 75' downgradient of WR2.
SE2 - 250' above pond about 4' below spring which begins creek.
WR1 - Composite of subsamples WR1A, 1B, and 1C.
WR2 - Composite of subsamples WR2A, 2B, and 2C.
BACKGROUND - From the Pontiac Jarvis/King Mine (25-906-881).
AD1 - Discharge from adit associated with WR2, approx. 6" after emerging from ground.
SW1 - Same as sample 25-287-SE1.
SW2 - Same as sample 25-287-SE2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Monitor Creek Tailings
Legal Description: T 8N R 6W
Mining District: Rimini
Latitude: N 46° 25' 46"
Longitude: W 112° 17' 56"
Land Status: Private
Quad: Three Brothers
Inspectors: Tuesday, Bisch, Flammang, West
Organization: Pioneer Technical Services, Inc.

County: Lewis and Clark
Section(s): SE 1/4, NE 1/4, NW 1/4, Section 24
Mine Type: Millsite/Unknown
Primary Drainage: Tenmile Creek
USGS Code: 10030101
Secondary Drainage: Monitor Creek
Date Investigated: August 3, 1994
P.A. # 25-503

- The volume of tailings observed at the site was estimated to be 19,650 cubic yards. The tailings are located in two separate areas with approximately 6,740 cubic yards located directly in or very near the Monitor Creek drainage. The following elements were elevated to at least three times the background concentrations:
  Silver: 4.8J to 4.9J mg/kg
  Mercury: 1.79 mg/kg

- No waste rock dumps were observed at the site during the investigation; however, there was evidence of extensive placer workings in Monitor Creek both upstream and downstream from the site.

- An observed release to Monitor Creek (sediment) was documented for silver. No MCLs were exceeded in Monitor Creek; however, the acute and chronic aquatic life criteria for copper and zinc were exceeded both upstream and downstream from the site. Additionally, the chronic aquatic life criteria for mercury and lead were exceeded both upstream and downstream from the site.

- No hazardous openings or structures were observed at the site during the investigation; however, one tailings pile was being undercut by the stream, thus, creating an unstable bank.

Monitor Creek Tailings PA# 25-503
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 08/03/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-503-SE1	3.4 J	30.2	12.3	0.9 U	2.4 J	1.5 U	11.8	10100	1.00	236 JX	3.4	63.2	11.5 UJ	28.2	NR
25-503-SE3	4.2 J	9.8	2.6	0.9 U	1.8 UJ	1.5 U	3.1	3810	0.23	5.6 JX	3.2 U	28.9	11.3 UJ	7.6	NR
25-503-SE4	1.4 J	9.0 U	10.1	1.3	2.2 UJ	1.8 U	6.7	7090	0.08	9.4 JX	3.9 U	50.9	13.8 UJ	12.7	NR
25-503-TP1	4.8 J	15.2	11.4	0.8 U	1.8 UJ	1.4 U	6.2	9250	1.79	18.0 JX	3.0 U	51.9	10.8 UJ	17.9	<0.275
25-503-TP2	4.9 J	7.4 U	4.9	0.9 U	1.8 UJ	1.5 U	4.1	4750	0.38	3.3 JX	3.2 U	35.9	11.3 UJ	7.4	<0.275
BACKGROUND	1.0 U	84.1 J	67.8 J	1.0 UJ	2.5	2.5 J	55.9	7500 JX	0.24 JX	442 J	3.5 U	53.3	12.5 UJ	57.6	

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
25-503-TP1	0.02	0.62	1.22	0.59	0.02	<0.01	<0.01	0.00	1.22
25-503-TP2	0.01	0.31	0.03	-0.3	0.01	<0.01	<0.01	0.00	0.03

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-503-SW3	0.12 U	1.1 U	29.5	4.0 U	8.4 U	6.8 U	7.4	857	0.17 JX	183	14.4 U	12.2	51.6 U	204	26.5
25-503-SW4	0.12 U	1.1 U	28.2	4.9	8.4 U	6.8 U	9.6	687	0.08 JX	136	14.4 U	10.5	51.6 U	209	17.8

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-503-SW3	67	<5.0	35	0.05	NR
25-503-SW4	58	<5.0	33	0.09	NR

LEGEND

SE1 - Downstream end. in Tennile Cdc trib. west of TP1 where beach drains to Tennile Cdc.
SE3 - Downstream of TP2 in Monitor Creek.
SE4 - Upstream of TP2 in Monitor Creek, downstream of waste rock workings.
TP1 - Composite of TP1A-1, 1A-2, 1B-1, 1B-2, 1C-1, and 1C-2.
TP2 - Composite of TP2A-1 through 2A-4, 2B-1 through 2B-3, and 2C-1 through 2C-4.
BACKGROUND - From the Josephine Mine (22-031-SS1).
SW3 - Same as sample 25-503-SE3.
SW4 - Same as sample 25-503-SE4.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Bear Gulch
Legal Description: T 9N R 5W
Mining District: Rimini
Latitude: N 46° 32' 32"
Longitude: W 112° 15' 43"
Land Status: Private
Quad: MacDonald Pass
Inspectors: Tuesday, Bisch, West
Organization: Pioneer Technical Services, Inc.

County: Lewis and Clark
Section(s): NW 1/4, NE 1/4, NW 1/4, Section 17
Mine Type: Hardrock/Au
Primary Drainage: Tenmile Creek
USGS Code: 10030101
Secondary Drainage: Bear Gulch
Date Investigated: August 16, 1994
P.A. # 25-504

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 4,720 cubic yards. The following element was elevated to at least three times the background concentrations: Copper: 129 mg/kg
- One discharging adit was observed at the site. The discharge was contained in a small lined pond after flowing a short distance. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium and copper were exceeded in the adit discharge. Additionally, the chronic aquatic life criteria for mercury was exceeded in the adit discharge.
- Bear Gulch flows adjacent to the site on the south side. The MCL for cadmium, as well as the acute and chronic aquatic life criteria for cadmium, were exceeded in the downstream sample. The chronic aquatic life criteria for mercury was exceeded both upstream and downstream from the site. None of these exceedances were attributable to the site.
- No hazardous openings or structures were located at the site.

Bear Gulch Mine PA# 25-504
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 08/16/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-504-SE1	1.4 U	10.7 U	297	1.4	3.2	12.7	54.2	25000	0.13	508 J	13.9	14.1 U	16.5 U	47.9	NR
25-504-SE2	1.8 U	14.1 U	195	1.8	4.9	5.4	29.3	10200	0.16	366 J	7.8	34.6	21.6 U	53.8	NR
25-504-WR1	12.0	81.6	82.4	0.9	2.0	6.4	129	36100	0.11	268 J	3.1	229	7.4 U	44.0	NR
BACKGROUND	NR	87 J	84.6	2.5	11.9	7.4 J	21 J	16200	0.053	1130	8 J	144 J	6 UJ	167	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
25-504-WR1	0.45	14.1	10.1	-4	0.43	<0.01	0.02	0.00	10.1

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-504-AD1	0.12 U	1.1	5.5 U	8.1 JX	11.3	6.8 U	27.3	151	0.21	48.0	14.4 U	0.6	51.6 U	15.6 U	155
25-504-SW1	0.12 U	1.4	28.7	10.6 JX	12.3	6.8 U	5.9 U	149	0.21	4.0	14.4 U	0.8	51.6 U	15.6 U	43.1
25-504-SW2	0.12 U	1.2	30.3	4.0 UX	8.4 U	6.8 U	5.9 U	189	0.22	13.3	14.4 U	0.7	51.6 U	15.6 U	43.0

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-504-AD1	144	<5	78	<0.05	NR
25-504-SW1	35	<5	11	<0.05	NR
25-504-SW2	36	<5	12	<0.05	NR

LEGEND

SE1 - Downstream from dump in Bear Gulch.
SE2 - Upstream from mine in Bear Gulch.
WR1 - Composite of subsamples WR1A, 1B, 1C, and 1D.
BACKGROUND - From the Red Water Mine (25-007-SS1) (1993 Data).
AD1 - Adit discharge above waste rock dump 1, north of road and Bear Gulch.
SW1 - Same as sample 25-504-SE1.
SW2 - Same as sample 25-504-SE2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Jay Gould Mine and Millsite
Legal Description: T 13N R 7W
Mining District: Stemple
Latitude: N 46° 52' 44"
Longitude: W 112° 27' 19"
Land Status: Private
Quad: Stemple Pass
Inspectors: Tuesday, Belanger, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Lewis and Clark
Section(s): S 1/2, Section 14
Mine Type: Hardrock/Au, Ag
Primary Drainage: Virginia Creek
USGS Code: 10030101
Secondary Drainage: Gould Creek
Date Investigated: June 21, 1994
P.A. # 25-500

- The volume of tailings observed at the site was estimated to be 1,820 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Cadmium: 9.5J mg/kg
  Copper: 149 mg/kg
  Lead: 678 mg/kg
  Zinc: 562J mg/kg
  Mercury: 115JX mg/kg

- The volume of waste rock observed at the site was estimated to be 7,730 cubic yards; however, no elements were significantly elevated (>3X) above background concentrations.

- One discharging adit was observed at the site. No MCLs or aquatic life criteria were exceeded in the adit discharge.

- Gould Creek flows through the center of the site. Observed releases to Gould Creek (sediment) were documented for mercury and lead. No MCLs or aquatic life criteria were exceeded in Gould Creek.

- Potential safety hazards observed at the site included the collapsed mill building, several collapsed cabins, and a steep highwall located above the adit.

Jay Gould Mine/Mill PA# 25-500
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 06/21/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-500-SE1	18	10.0	29.3 J	0.6 U	2.1 U	2.5 J	19.1	5680	1.13	218 J	2.0 U	48.8	7.2 U	79.8	NR
25-500-SE2	42.7	16.8	41.6 J	0.6 U	2.1 U	5.4 J	26.5	9260	34.8	162 J	4.6	100	7.2 U	80.4	NR
25-500-SE3	1.2 U	11.6 U	93.9 J	1.1 U	3.8 U	7.2 J	11.5	7380	0.21	235 J	5.8	16.1 U	12.9 U	44.3	NR
25-500-TP1	20.9	23.3	92.7	9.5 J	1.6 U	5.6	149	10200	115 JX	941	1.5 U	678	21.2 J	562 J	21.6
25-500-WR1	3	18.6	132	0.6	3.7	5.9	44.3	8480	0.66 JX	547	7.6	47.2	4.6 UJ	53.6 J	NR
BACKGROUND	NR	21.3	145 JX	1.4 J	5.28	8.61	29.6	11900	0.758 JX	889	12.3 J	60.3 J	8.01 UJ	121	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
25-500-TP1	<0.01	0.00	169	169	<0.01	<0.01	<0.01	0.00	169
25-500-WR1	0.01	0.31	75.8	75.5	<0.01	0.01	<0.01	0.31	75.5

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-500-AD1	0.12 U	1.1 U	118	2.6 U	8.7 U	4.7 UX	4.6 U	9.4 U	0.11 U	4.4 U	8.0 U	1.8	29.4 U	13.2	114
25-500-SW1	0.12 U	1.5	78.1	2.6 U	8.7 U	5.7 JX	4.6 U	36.3	0.11 U	7.13	8.0 U	1.8	29.4 U	9.4	119
25-500-SW2	0.12 U	1.3	49.7	2.6 U	8.7 U	4.7 JX	4.6 U	20.5	0.11 U	7.1	8.0 U	1.5	29.4 U	4.67	109
25-500-SW3	0.12 U	1.3	38.4	2.6 U	8.7 U	4.7 UX	4.6 U	64.7	0.11 U	5.2	8.0 U	1.6	29.4 U	4.67	106

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-500-AD1	140	<5	5.0	0.13	NR
25-500-SW1	178	<5.0	<5.0	<0.05	NR
25-500-SW2	126	<5	<5	<0.05	NR
25-500-SW3	110	<5	<5	<0.05	NR

LEGEND

SE1 - Downstream of tailings in Gould Creek.
SE2 - Downgradient of mine and upstream of mill and tailings in Gould Creek.
SE3 - Upstream of mine in Gould Creek.
TP1 - Composite of subsamples TP2A and TP3A-1 through 3A-3.
WR1 - Composite of subsamples WR1A and 1B.
BACKGROUND - From the SE SW Sec. 10 Mine (25-212-SS1) (1993 Data).

AD1 - Adit discharge on WR1.
SW1 - Same as sample 25-500-SE1.
SW2 - Same as sample 25-500-SE2.
SW3 - Same as sample 25-500-SE3.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: New Jay Gould Millsite
Legal Description: T 13N R 7W
Mining District: Stemple
Latitude: N 46° 53' 24"
Longitude: W 112° 26' 31.4"
Land Status: Private
Quad: Stemple Pass
Inspectors: Tuesday, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Lewis and Clark
Section(s): NW 1/4, NW 1/4, SW 1/4, Section 13
Mine Type: Millsite/Unknown
Primary Drainage: Virginia Creek
USGS Code: 10030101
Secondary Drainage: Fool Hen Creek
Date Investigated: July 29, 1994
P.A. # 25-502

- The volume of tailings observed at the site was estimated to be 1,890 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Arsenic: 197J mg/kg
  Lead: 376 mg/kg
- No waste rock was observed at the site.
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
- Fool Hen Gulch flows adjacent to the site on the south side. No observed releases to Fool Hen Gulch were documented; however, concentrations of silver, barium, and mercury were significantly elevated (>3X) in downstream sediment when compared to upstream sediment. No MCLs or aquatic life criteria were exceeded in the stream.
- Potential safety hazards observed at the site included three collapsing cabins (low hazard potential).

New Jay Gould Mill PA# 25-502
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/29/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-502-SE1	14.1 JX	10.1 UJ	310	1.2 U	3.9	7.2	31.7	9670	0.57	205	7.9	74.6	15.5 UJ	117	NR
25-502-SE3	0.9 JX	5.7 UJ	86.9	0.7 U	2.5	2.9	15.6	11100	0.06	261	8.0	39.8	8.7 UJ	57.6	NR
25-502-TP1	6.1 JX	197 J	78.4	4.1	4.5	6.7	44.3	15300	0.67	527	8.2	376	10.5 UJ	325	0.331
BACKGROUND	NR	21.3	145 JX	1.4 J	5.28	8.61	29.6	11900	0.758 JX	889	12.3 J	60.3 J	8.01 UJ	121	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
25-502-TP1	0.99	30.9	76.3	45.4	0.03	0.20	0.76	6.25	70.1

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-502-SW1	0.12 U	1.7	417	4.0 UX	8.4 U	6.8 U	5.9 U	45.9	0.08 U	3.9	14.4 U	1.2	51.6 U	15.6 U	116
25-502-SW2	0.12 U	2.0	345	5.9 JX	8.4 U	7.6	5.9 U	12.3 U	0.08 U	3.9	14.4 U	1.5	51.6 U	15.6 U	82.6
25-502-SW3	0.12 U	1.3 U	443	4.0 UX	8.4 U	6.8 U	5.9 U	12.3 U	0.08 U	2.3 U	14.4 U	1.7	51.6 U	15.6 U	123

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-502-SW1	113	<5	10	0.11	0.01
25-502-SW2	112	<5	5.0	0.06	<0.005
25-502-SW3	4.0	<5	8.0	0.12	<0.005

LEGEND

SE1 - 100' downstream of site.
SE3 - At tunnel discharge.
TP1 - Composite of subsamples TP1A-1 and 1A-2.
BACKGROUND - From the SE SW Sec. 10 Mine (25-212-SS1) (1993 Data).
SW1 - Same as sample 25-502-SE1.
SW2 - 8" PVC pipe where TP1 flows into Pond #2.
SW3 - Same as sample 25-502-SE3.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Garnet Gold Mine
Legal Description: T 2S R 3W
Mining District: Pony
Latitude: N 45° 38' 42"
Longitude: W 111° 56' 07"
Land Status: Private
Quad: Pony
Inspectors: Flammang, Belanger, West
Organization: Pioneer Technical Services, Inc.

County: Madison
Section(s): SE 1/4, Section 23
Mine Type: Hardrock/Au, Cu, Ag, Zn, Pb
Primary Drainage: North Willow Creek
USGS Code: 10020005
Secondary Drainage: Cataract Creek
Date Investigated: July 8, 1994
P.A. # 29-035

- The volume of mill tailings observed at the site was estimated to be 23,450 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 8.1 to 14.6 mg/kg
  Barium: 471 mg/kg
  Mercury: 0.76J to 0.82J mg/kg
  Lead: 2,160 to 5,380 mg/kg
  Copper: 306 to 1,290 mg/kg

- The volume of waste rock observed at the site was estimated to be 21,640 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Copper: 105 to 194 mg/kg
  Mercury: 0.29J to 0.34J mg/kg
  Lead: 351 to 515 mg/kg

- One discharging adit was observed at the site. MCLs for cadmium and antimony were exceeded in the adit discharge. In addition, acute and chronic aquatic life criteria for copper and zinc and chronic aquatic life criteria for cadmium and lead were exceeded in the adit discharge.

- Cataract Creek flows directly through tailings at the site. Observed releases to Cataract Creek (sediment) were documented for copper, mercury, and lead.

- No MCLs were exceeded in Cataract Creek; however, the chronic aquatic life criteria for lead was exceeded in the downstream sample.

- Potential safety hazards observed at the site included two partially accessible adits and an open shaft.

Garnet Gold Mine PA# 29-035
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/09/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-035-SE1	0.4 U	3.9 U	26.6	0.4 U	1.4	2.8	4.9	5740	0.02 UJ	488	2.0	15.4	4.3 U	18.4	NR
29-035-SE2	0.7	5.9 U	75.5	0.6 U	1.9 U	2.5	149	5470	0.24 J	45.5	1.8 UJ	861	6.6 U	46.4	NR
29-035-TP1	8.1	5.8 U	196	0.6 U	1.9 U	1.0 U	306	9170	0.76 J	79.9	1.8 UJ	2160	6.5 U	109	NR
29-035-TP2	14.6	4.5 U	471	0.4 U	1.5 U	0.8 U	1290	10200	0.82 J	41.4	1.4 UJ	5380	5.0 U	110	NR
29-035-WR1	1.2	5.4 U	77.2	0.5 U	2.6	1.0 U	194	15900	0.29 J	1240	1.6 UJ	515	6.0 U	80.6	NR
29-035-WR2	0.5 U	5.1 U	42.4	0.5 U	2.4	1.4	105	7730	0.34 J	842	1.5 UJ	351	5.7 U	69.4	NR
BACKGROUND	0.6 U	5.9 U	140	0.6 U	3.6 B	9.2	12.3	11000	0.06 J	735	4.7 B	34.0	6.6 U	55.5	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29-035-TP1	0.12	3.75	0.06	-3.7	0.12	<0.01	<0.01	0.00	0.06
29-035-TP2	0.25	7.81	0.56	-7.3	0.2	0.03	0.02	0.94	-0.38
29-035-WR1	0.29	9.06	3.53	-5.5	0.22	0.01	0.08	0.31	3.22
29-035-WR2	0.05	1.56	6.27	4.71	0.02	0.01	0.02	0.31	5.96

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-035-AD1	0.12 U	1.2	27.2	8.2	8.7 U	4.7 U	205	241	0.11 U	4000	8.0 U	43.5 J	34.0 JX	440 JX	227
29-035-SW2	0.12 U	1.1 U	25.0	2.6 U	8.7 U	4.7 U	4.6 U	124	0.11 U	13.6	8.0 U	19.6 J	29.4 UX	4.9 JX	33.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-035-AD1	343	<5.0	157	0.11	NR
29-035-SW2	25	<5.0	<5.0	0.14	NR

LEGEND

SB1 - Upgradient of site, approx. 30' below reservoir dam face.
SB2 - Downgradient of lowest benched dam approx. 30'
TP1 - Composite of subsamples TP1A, 1B, 1C-1, and 1D-1.
TP2 - Composite of subsamples TP1C-2 and 1D-2.
WR1 - Composite of subsamples WR1A through 1D.
WR2 - Composite of subsamples WR3A, 3B, and 4.
BACKGROUND - From the Garnet Gold Mine (29-035-SB1).
AD1 - Discharge from adit #1.
SW2 - Same as sample 29-035-SB2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Chicago Mining Corp. Pony Millsite
Legal Description: T 2S R 3W ; T 2S R 2W
Mining District: Pony
Latitude: N 45° 39' 27"
Longitude: W 111° 54' 17"
Land Status: Private
Quad: Pony
Inspectors: Tuesday, Belanger, West
Organization: Pioneer Technical Services, Inc.

County: Madison
Section(s): SE 1/4, SE 1/4, Section 13; SW 1/4, SW 1/4, Section 18
Mine Type: Millsite/Au
Primary Drainage: North Willow Creek
USGS Code: 10020005
Secondary Drainage: North Willow Creek
Date Investigated: August 11, 1994
P.A. # 29-500

- No samples were collected at this site during the 1994 inventory; the team was unable to enter the locked premises.
- One tailings pond was observed at the site; however, the tailings were not bored or sampled. and the volume is unknown.
- Cyanide has been detected in the groundwater downgradient from this facility in a spring and a residential well. Cyanide concentrations detected in November of 1994 did not exceed drinking water standards.
- No discharging adits or filled shafts were observed at the site.
- Pony Creek flows adjacent to the site on the north side, and North Willow Creek flowed adjacent to the site on the southeast side. Surface water data collected in 1994 indicated that no metals were elevated downstream in North Willow Creek compared to upstream concentrations. No 1994 surface water data was available for Pony Creek downstream from the site.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: U.S. Grant
Legal Description: T 6S R 3W
Mining District: Virginia City
Latitude: N 46° 24' 58.8"
Longitude: W 112° 18' 40.6"
Land Status: Private
Quad: Virginia City
Inspectors: Flammang, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Madison
Section(s): NW 1/4, SW 1/4, Section 26
Mine Type: Hardrock, Millsite/Au, Ag
Primary Drainage: Granite Creek
USGS Code: 10020003
Secondary Drainage: Alder Gulch
Date Investigated: July 18, 1994
P.A. # 29-095

- The volume of tailings observed at the site was estimated to be 20,930 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 22.6 to 28.9 mg/kg
  Arsenic: 143 mg/kg
  Copper: 125 to 759 mg/kg
  Iron: 108,000 mg/kg
  Mercury: 0.27J mg/kg
  Lead: 468 to 13,700 mg/kg
  Antimony: 124J mg/kg
  Zinc: 338 to 13,100 mg/kg

- The volume of waste rock observed at the site was estimated to be 3,305 mg/kg. The following elements were elevated to at least three times the background concentrations:
  Silver: 6.8 to 39.9 mg/kg
  Arsenic: 31.6 mg/kg
  Cadmium: 4.9 mg/kg
  Mercury: 0.38J to 0.42J mg/kg
  Lead: 855 to 1,100 mg/kg
  Copper: 74.7 to 127 mg/kg

- One discharging adit was observed at the site. The flow from this adit eventually merged with Alder Gulch. No MCLs were exceeded in the adit discharge; however, the chronic aquatic life criteria for mercury was exceeded.

- Two groundwater wells were sampled during the investigation. The MCL for antimony was exceeded in a monitoring well located at the base of the dam at TP-1. No MCLs were exceeded in a residential well located on-site.

- Alder Gulch flows through the center of the site. An observed release to Alder Gulch was documented for copper. No MCLs were exceeded in Alder Gulch; however, the acute and chronic aquatic life criteria for copper were exceeded in the downstream sample. These exceedances were directly attributable to the site.

- Potential safety hazards observed at the site included five open adits, a collapsing loadout structure, and a pit with a 40-feet tall highwall.

U.S. Grant PA# 29-095
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - FLAMMANG
INVESTIGATION DATE: 07/18/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-095-SE1	1.4 U	10.5 U	202	1.3 U	19.8	78.0	45.6	28000	0.35 J	520	60.8	53.6	16.2 UJ	114	NR
29-095-SE2	0.9 U	6.9 U	190	0.8 U	25.6	81.7	36.6	35100	0.31 J	609	90.7	36.7	10.6 UJ	97.9	NR
29-095-TP1	22.6	143	87.8	0.8 U	3.6	10.0	759	108000	0.16 J	680	4.5	13700	124 J	13100	1.715
29-095-TP2	28.9	10.0	123	1.6	6.6	16.9	125	17700	0.27 J	299	14.3	468	10.4 UJ	338	<0.276
29-095-WR1	6.8	31.6	181	1.8	13.2	30.4	74.7	23600	0.42 J	743	23.7	1100	9.2 UJ	224	NR
29-095-WR2	39.9	10.9	73.7	4.9	8.0	10.1	127	15900	0.38 J	421	7.6	855	9.5 UJ	265	NR
BACKGROUND	0.8 U	9.2	210	0.7 U	8.6	37.1 JX	19.5 JX	19700	0.06 J	678	24.6 JX	14.8	9.0 UJ	101 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29-095-TP1	0.20	6.25	40.4	34.2	0.13	0.02	0.05	0.62	39.8
29-095-TP2	0.04	1.25	19.6	18.3	0.03	<0.01	0.01	0.00	19.6
29-095-WR1	0.01	0.31	19.4	19.0	0.01	<0.01	<0.01	0.00	19.4
29-095-WR2	0.16	5.00	61.3	56.3	0.06	0.01	0.09	0.31	61.0

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-095-AD1	0.12 U	1.4	39.3	4.0 U	8.4 U	6.8 U	5.9 U	12.3 U	0.08	2.3 U	14.4 U	0.7	51.6 U	15.6 U	126
29-095-GW1	0.12 U	2.9	83.1	4.0 U	8.4 U	6.8 U	10.6 JX	26.5	0.16	4.6	14.4 U	1.1 U	55.8	15.6 U	177
29-095-GW2	0.12 U	4.3	83.4	4.0 U	8.4 U	6.8 U	7.2 JX	19.5	0.18	5.2	14.4 U	1.1 U	51.6 U	15.6 U	178
29-095-GW3	0.12 U	1.1	77.1	4.0 U	8.4 U	6.8 U	9.8	196	0.09	4.4	14.4 U	2.3	51.6 U	524	175
29-095-GW4	0.12 U	1.1 U	5.5 U	4.0 U	8.4 U	6.8 U	5.9 U	12.3 U	0.09	2.3 U	14.4 U	0.4 U	51.6 U	15.6 U	0.1
29-095-SW1	0.12 U	1.1 U	76.5	4.0 U	8.4 U	6.8 U	5.9 U	547	0.08	34.1	14.4 U	0.9	51.6 U	16.1	164
29-095-SW2	0.12 U	1.2	78.5	4.0 U	8.4 U	6.8 U	160	384	0.08 U	46.0	14.4 U	0.9	51.6 U	15.9	163

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-095-AD1	244	<5	18	1.1	NR
29-095-GW1	185	<5	11	0.06	<0.005
29-095-GW2	246	<5	10	0.06	<0.005
29-095-GW3	218	<5	14	0.07	<0.005
29-095-GW4	NR	NR	NR	NR	<0.005
29-095-SW1	195	<5	12	0.07	<0.005
29-095-SW2	159	<5	9	0.08	<0.005

LEGEND

SE1 - Upgradient 260' above mill building.
SE2 - Downgradient, across from Fairweather/Memorial, approx. 360' from base of TP1.
TP1 - Composite of subsamples TP1A-1 through 1A-4.
TP2 - Composite of subsamples TP2A, 2B-1, and 2B-2.
WR1 - Composite of subsamples WR1 through 3.
WR2 - Composite of subsamples WR4A and 4B.
BACKGROUND - From the Belle Mine (29-095-SB1).
AD1 - Collected at portal of Adit #1.
GW1 - Monitoring well at center of base of TP1 dam.
GW2 - Duplicate of GW1.
GW3 - Drinking well sampled from outside fence.
GW4 - QA/QC sample.
SW1 - Same as sample 29-095-SE1.
SW2 - Same as sample 29-095-SE2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Belle
Legal Description: T 6S R 3W
Mining District: Virginia City
Latitude: N 45° 16' 8.6"
Longitude: W 111° 56' 6.8"
Land Status: Private
Quad: Virginia City
Inspectors: Flammang, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Madison
Section(s): NE 1/4, SW 1/4, Section 35
Mine Type: Hardrock/Au, Ag
Primary Drainage: Granite Creek
USGS Code: 10020003
Secondary Drainage: Alder Gulch
Date Investigated: July 19 and 20, 1994
P.A. # 29-098

- The volume of tailings observed at the site was estimated to be less than 5 cubic yards. The tailings were located in two separate piles on the mill foundation. The literature indicates that tailings were shipped off-site for processing. No tailings samples were submitted for analysis due to the small volume involved.

- The volume of waste rock observed at the site was estimated to be 7,645 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Silver: 3.0 to 80.5 mg/kg
  Barium: 895 mg/kg
  Cadmium: 2.8 to 8.1 mg/kg
  Cobalt: 26.2 to 34.1 mg/kg
  Copper: 170 to 1,870 mg/kg
  Mercury: 0.24J to 1.31J mg/kg
  Nickel: 83.5 mg/kg
  Lead: 313 to 1,040 mg/kg
  Zinc: 367 to 991 mg/kg

- No discharging adits, seeps, or springs were observed at the site.

- Alder Gulch flows adjacent to the site on the east side, and a tributary to Alder Gulch flows adjacent to the site on the south side. No observed releases to surface water were documented during the investigation. No MCLs were exceeded in either of the streams; however, the chronic aquatic life criteria for mercury was exceeded in both streams upstream and downstream from the site.

- Potential safety hazards observed at the site included one open adit and several collapsing wooden structures.

Belle Mine PA# 29-098
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - FLAMMANG
INVESTIGATION DATE: 07/20/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-098-SE1	1.0 U	7.7 U	45.4	0.9 U	5.6	22.4 JX	12.7 JX	11300	0.05 J	147	17.7 JX	17.2	11.8 UJ	39.1 JX	NR
29-098-SE2	0.8 U	6.2 U	76.8	0.7 U	6.5	36.4 JX	14.8 JX	11400	0.10 J	174	23.7 JX	8.17 U	9.5 UJ	40.5 JX	NR
29-098-SE3	0.9 U	6.9 U	135	0.8 U	9.1	37.8 JX	13.7 JX	21900	0.06 J	549	22.6 JX	10.6	10.7 UJ	39.5 JX	NR
29-098-WR1	2.0	26.6	167	1.1	34.1	86.1	170	35300	0.76 J	713	83.5	313	10.3 UJ	367	NR
29-098-WR2	80.5	24.8	895	8.1	8.1	10.4	1870	26100	1.31 J	679	11.9	1040	8.7 UJ	991	NR
29-098-WR3	3.0	19.4	210	2.8	26.2	64.9 JX	194 JX	33300	0.24 J	945	64.5 JX	607	8.8 UJ	377 JX	NR
BACKGROUND	0.8 U	9.2 B	210	0.7 U	8.6	37.1 JX	19.5 JX	19700	0.06 J	678	24.6 JX	14.8	9.0 UJ	101 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29-098-WR1	0.10	3.12	30.4	27.3	<0.01	0.02	0.09	0.62	29.8
29-098-WR2	0.25	7.81	25.2	17.4	0.10	0.03	0.12	0.94	24.3
29-098-WR3	0.01	0.31	15.5	15.2	<0.01	<0.01	0.02	0.00	15.5

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-098-SW1	0.12 U	1.1 U	66.2	4.0 U	8.4 U	6.8 U	7.8	188	0.10	9.8	14.4 U	1.0	51.6 U	15.6 U	157
29-098-SW2	0.12 U	1.1 U	70.0	4.0 U	8.4 U	6.8 U	5.9 U	12.5	0.11	3.7	14.4 U	1.3	51.6 U	15.8 U	171
29-098-SW3	0.12 U	1.1 U	60.9	4.0 U	8.4 U	6.8 U	5.9 U	639	0.12	18.5	14.4 U	1.3	51.6 U	16.6	107

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-098-SW1	192	<5	11	0.06	NR
29-098-SW2	188	<5	10	0.06	NR
29-098-SW3	264	<5	7	0.61	NR

LEGEND

SS1 - Downgradient in Alder Gulch, approx. 200' from north end of mill.
SS2 - Upgradient of site and confluence of unnamed trib. with Alder Gulch.
SS3 - Upgradient of WR5, WR6 in unnamed trib., just above where road ends.
WR1 - Composite of subsamples WR1A through 1C.
WR2 - Grab sample of the WR2A subsample.
WR3 - Composite of subsamples WR5A, 5B, and 6A.
BACKGROUND - From the Belle Mine (29-098-SS1).

SW1 - Same as sample 29-098-SS1.
SW2 - Same as sample 29-098-SS2.
SW3 - Same as sample 29-098-SS3.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Prospect Mine and Millsite
Legal Description: T 6S R 3W
Mining District: Virginia City
Latitude: N 45° 17' 30"
Longitude: W 111° 57' 45"
Land Status: Private
Quad: Virginia City
Inspectors: Flammang, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Madison
Section(s): SE 1/4, Se 1/4, Section 21; NW 1/4, NW 1/4, Section 27
Mine Type: Hardrock; Millsite/Au, Ag, Pb, Zn, Cu
Primary Drainage: Granite Creek
USGS Code: 10020003
Secondary Drainage: Alder Gulch
Date Investigated: July 19, 1994
P.A. # 29-136

- Areas of the mine were being actively re-worked during the investigation.

- The volume of tailings observed at the site was estimated to be 17,440 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Silver: 4.5 to 6.0 mg/kg
  Arsenic: 50.0 to 59.6 mg/kg
  Barium: 2,950 to 3,250 mg/kg
  Mercury: 0.73J to 0.77J mg/kg
  Lead: 467 to 698 mg/kg
  Copper: 76.4 to 80.1 mg/kg

- The volume of waste rock observed at the site was estimated to be 18,590 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Arsenic: 38.4 mg/kg
  Lead: 147 mg/kg

- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.

- Intermittent Barton Gulch (dry during investigation) flows through the center of the site. Tailings make up the majority of the surface sediment in Barton Gulch for at least 1,200 feet downstream from the site. Observed releases to Barton Gulch (sediment) were documented for silver, barium, copper, mercury, and lead.

- Potential safety hazards observed at the site included several undercut banks along tailings piles located near Barton Gulch.

Prospect PA# 29-136
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - FLAMMANG
INVESTIGATION DATE: 07/19/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-136-SE1	5.8	19.2	823	0.8	4.7	20.4	47.3	12300	0.27 J	267	16.1	315	9.0 UJ	79.2	NR
29-136-SE2	0.6 U	7.5	92.2	0.6 U	7.0	23.2	12.9	10200	0.07 J	217	17.8	10.8	7.7 UJ	28.9	NR
29-136-TP1	4.5	50.0	2950	0.7 U	3.6	36.7	76.4	20800	0.77 J	200	22.3	467	8.8 UJ	81.6	0.563
29-136-TP2	6.0	59.6	3250	0.9 U	3.9	40.6	80.1	20700	0.73 J	197	24.6	698	11.1 UJ	146	0.699
29-136-WR1	0.8 U	38.4	108	0.7 U	14.6	79.2	38.5	27200	0.12 J	216	59.7	147	9.6 UJ	80.4	NR
BACKGROUND	0.8 U	9.2	210	0.7 U	8.6	37.1 JX	19.5 JX	19700	0.06 J	678	24.6 JX	14.8	9.0 UJ	101 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29-136-TP1	0.07	2.19	10.6	8.38	0.07	<0.01	<0.01	0.00	10.6
29-136-WR1	0.01	0.31	18.9	18.6	0.01	<0.01	<0.01	0.00	18.9

LEGEND

SB1 - Downgradient of breached TP2 dam approx. 50'.
SB2 - Approx. 15' downgradient of monitoring well.
TP1 - Composite of subsamples TP1A-1 and 1A-2.
TP2 - Composite of subsamples TP2A-1, 2A-2, 2B-1, and 2B-2.
BACKGROUND - From the Bella Mine (29-114-SB1).

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Gold Chrome
Legal Description: T 18N R 30W
Mining District: St. Regis
Latitude: N 47° 20' 45"
Longitude: W 115° 22' 40"
Land Status: Public
Quad: McGee Peak/DeBorgia South
Inspectors: Tuesday, Bisch, West
Organization: Pioneer Technical Services, Inc.

County: Mineral
Section(s): SW 1/4, NE 1/4, Section 2
Mine Type: Hardrock/Unknown
Primary Drainage: St. Regis River
USGS Code: 17010204
Secondary Drainage: Deer Creek
Date Investigated: August 15, 1994
P.A. # 31-037

- The volume of tailings observed at the site was estimated to be 980 cubic yards. The tailings appeared to have been reclaimed and were well vegetated. No elements were significantly elevated (>3X) above background concentrations.
- No waste rock was observed at the site.
- One discharging adit was observed at the site. The discharge seeped into the ground after flowing a short distance. No MCLs were exceeded in the adit discharge; however, the chronic aquatic life criteria for mercury and lead were exceeded.
- Deer Creek flows adjacent to the site on the east side. Surface water samples were not collected from Deer Creek due to the significant flow in the stream and likely high dilution. Sediment samples were collected upstream and downstream from the site; however, metals concentrations were not elevated in the downstream sample when compared with the upstream sample.
- No hazardous openings or structures were observed at the site.

Gold Chrome PA# 31-037
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 08/15/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
31-037-SE1	0.8 U	6.5 U	33.6	0.8 U	1.6 U	1.7	3.0	7000	0.09	164 J	5.3	8.6 U	10.0 U	19.2	NR
31-037-SE2	0.7 U	5.3 U	35.8	0.6 U	1.6	1.5	3.7	5660	0.08	175 J	4.8	7.0 U	8.2 U	18.7	NR
31-037-TP1	0.8 U	6.6 U	216	0.8 U	3.7	1.7	16.2	7610	0.14	135 J	7.6	8.7 U	10.1 U	18.8	<0.288
BACKGROUND	NR	4.52 U	241	0.5 U	6.09	4.83	16.2 J	12500	0.047 J	1020	9.02	22.2 J	5.89 U	59.3	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
31-037-TP1	<0.01	0.00	0.62	0.62	<0.01	<0.01	<0.01	0.00	-0.62

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
31-037-AD1	0.12 U	1.2	48.5	4.0 UX	10.1	6.8 U	5.9 U	95.4	0.20	2.3 U	14.4 U	2.0	51.6 U	15.6 U	14.1

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
31-037-AD1	28	<5	<5	<0.05	NR

LEGEND

SE1 - Downstream Deer Creek; 100' off road cut.
SE2 - Upstream Deer Creek.
TP1 - Composite of subsample TP1A.
BACKGROUND - From the Saltese Consolidated Mine (31-021-SS1) (1993 Data).
AD1 - Adit discharge at north end of site.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Wallace Creek Millsite
Legal Description: T 12N R 17W
Mining District: Clinton
Latitude: N 46° 47' 44"
Longitude: W 113° 40' 27"
Land Status: Private
Quad: Clinton
Inspectors: Bisch, Flammang, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Missoula
Section(s): SW 1/4, SE 1/4, Section 24
Mine Type: Millsite/Au, Ag, Cu, Pb
Primary Drainage: Clark Fork River
USGS Code: 17010201
Secondary Drainage: Wallace Creek
Date Investigated: June 30, 1994
P.A. # 32-019

- The volume of tailings observed at the site was estimated to be 10,020 cubic yards. The following elements were elevated to at least three times the background concentrations (cyanide was detected in the tailings at 0.281 mg/kg):
  Arsenic: 67.5J to 118J mg/kg
  Barium: 300 mg/kg
  Cadmium: 1.8J mg/kg
  Mercury: 1.05 to 4.52 mg/kg
  Lead: 322 to 544 mg/kg
  Antimony: 12.8 mg/kg
  Zinc: 242J to 442J m/kg

- No waste rock was observed at the site.

- There were no discharging adits or filled shafts observed at the site. A spring that emanated near the mill complex was sampled. No MCLs or acute or chronic aquatic life criteria were exceeded. Another spring located approximately 800 feet downstream from the site was piped to a residence and used as a drinking water source. Using the spring located near the mill complex as the upgradient sample, and the drinking water spring as the downgradient sample, observed releases to groundwater were documented for zinc and cyanide; however, no MCLs were exceeded in the drinking water spring.

- Intermittent Wallace Creek flows adjacent to the site on the north side. Water was flowing in Wallace Creek for a short distance downstream from the site; however, no water was present in the drainage upstream from the site. No observed releases to Wallace Creek were documented, and no MCLs or aquatic life criteria were exceeded.

- Potential safety hazards observed at the site included the collapsing mill building and various scattered debris.

Wallace Creek Millsite PA# 32-019
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BISCH
INVESTIGATION DATE: 06/30/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
32-019-SE1	1.6 JX	6.9 UJ	256	0.7 UJ	2.3 U	5.3 J	52.9 J	5040	0.09	166 J	20.7 JX	17.8	7.7 U	54.9 J	NR
32-019-SE2	0.5 UJX	6.0 J	314	1.6 J	8.6 J	12.0 J	49.5 J	10500	0.08	628 J	9.6 JX	31.2	4.9 U	31.7 J	NR
32-019-TP1	3.6 JX	67.5 J	276	0.5 J	1.4 U	6.0 J	34.5 J	9590	1.05	695 J	2.6 JX	322	4.9 U	242 J	0.281
32-019-TP2	11.8 JX	118 J	300	1.8 J	2.9 J	12.9 J	52.7 J	14000	4.52	988 J	14.6 JX	544	12.8	442 J	<0.222
BACKGROUND	NR	17 JX	95	0.5 U	1.9 J	5.4 J	17.6	8760 J	0.081	747	9 J	63 J	4 U	57 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
32-019-TP1	0.09	2.81	437	434	<0.01	0.13	0.15	4.06	433
32-019-TP2	0.06	1.87	383	382	<0.01	0.14	0.03	4.37	379

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
32-019-GW1	0.12 U	1.3 UX	301	2.6 U	8.7 U	4.7 U	21.3	30.0	0.11 U	4.4 U	8.0 U	1.2	29.4 U	930 J	81.8
32-019-SW1	0.12 U	1.3 UX	295	2.6 U	8.7 U	4.7 U	4.6 U	11.1	0.11 U	4.4 U	8.0 U	1.1 U	29.4 U	5.0 J	92.9
32-019-SW3	0.12 U	1.3 UX	252	2.6 U	8.7 U	4.7 U	4.6 U	9.4 U	0.11 U	4.4 U	9.4	1.1 U	29.4 U	4.5 U	74.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
32-019-GW1	90	<5.0	7.0	0.09	0.01
32-019-SW1	124	<5.0	7.0	0.07	<0.005
32-019-SW3	86	<5.0	8.0	0.07	<0.005

LEGEND

SE1 - Downstream from the site in Wallace Creek.
SE2 - Upstream in Wallace Creek under power line (no water).
TP1 - Composite of subsamples TP1A-A through 1A-C and 1B-A through 1B-B.
TP2 - Composite of subsamples TP2A and 2B.
BACKGROUND - From the Linton Mine (32-017-SE1) (1993 Data).
GW1 - Residential spring from JD Welding and residence located 800' downgradient of site; used as a drinking water source.
SW1 - Same as sample 32-019-SE1.
SW3 - Spring 80' north of lab building.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Copper Cliff
Legal Description: T 12N R 15W
Mining District: Copper Cliff
Latitude: N 46° 48' 0.0"
Longitude: W 113° 27' 14.7"
Land Status: Private
Quad: Union Peak
Inspectors: Bisch, Flammang, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Missoula
Section(s): NW 1/4, SW 1/4, Section 11
Mine Type: Hardrock/Cu, Ag, Au
Primary Drainage: Union Creek
USGS Code: 17010203
Secondary Drainage: Union Creek
Date Investigated: June 28, 1994
P.A. # 32-001

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 3,490 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Arsenic: 175J to 2,590J mg/kg
  Chromium: 61.0J mg/kg
  Copper: 462J to 5,200J mg/kg
  Iron: 79,900 mg/kg
  Mercury: 0.40 mg/kg
  Nickel: 40.1JX mg/kg
  Lead: 48.4 to 167 mg/kg
- An intermittent drainage (dry during the investigation) meandered through the site before merging with Union Creek. Observed releases to the intermittent drainage (sediment) were documented for arsenic, copper, mercury, and lead.
- Potential safety hazards observed at the site included an unstable metal loadout structure and scattered wooden and metal debris in the area of the collapsed shaft.

Copper Cliff PA# 32-001
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BISCH
INVESTIGATION DATE: 06/28/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
32-001-SE1	0.6 UJX	135 J	103	0.5 UJ	10.6 J	12.9 J	1140 J	21000	0.22	208 J	27.0 JX	50.9	5.8 U	76.0 J	NR
32-001-SE2	0.4 UJX	17.4 J	225	0.6 J	10.5 J	12.9 J	49.5 J	24000	0.04	482 J	19.7 JX	16.1	4.6 U	46.9 J	NR
32-001-WR1	0.6 JX	250 J	74.3	0.5 UJ	1.8 U	6.29 J	548 J	14800	0.09	67.4 J	4.3 JX	167	8.4	11.6 J	NR
32-001-WR3	0.6 UJX	175 J	303	0.6 UJ	3.2 J	34.7 J	462 J	79900	0.09	59.3 J	21.9 JX	130	6.7 U	61.9 J	NR
32-001-WR4	0.6 UJX	2580 J	90.5	0.6 UJ	10.3 J	61.0 J	5200 J	45000	0.40	102 J	40.1 JX	48.4	6.7 U	38.2 J	NR
BACKGROUND	0.4 UJX	3.9 UJ	219	0.4 UJ	6.5 J	14.4 J	12.4 J	18900	0.04	442 J	9.4 JX	8.6	4.4 U	33.5 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
32-001-WR1	1.09	34.1	-0.55	-35	<0.01	0.02	1.16	0.62	-1.17
32-001-WR3	0.25	7.81	-8.16	-16.0	0.14	0.02	0.09	0.62	-8.78
32-001-WR4	0.99	30.9	-3.43	-34	0.77	0.07	0.15	2.19	-5.61

LEGEND

SE1 - Approximately 50' downstream of WR3.
SE2 - Upstream of site just below confluence with a dry drainage from the east.
WR1 - Composite of subsamples WR1A and 1B.
WR3 - Composite of subsamples WR 3A and 3B.
WR4 - Grab sample of the WR4 subsample.
BACKGROUND - From the Copper Cliff Mine (32-001-SS1).

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Frogs Diner
Legal Description: T 12N R 15W
Mining District: Copper Cliff
Latitude: N 46° 48' 44"
Longitude: W 113° 27' 00"
Land Status: Private
Quad: Union Peak
Inspectors: Bisch, Flammang, Clark, West
Organization: Pioneer Technical Services, Inc.

County: Missoula
Section(s): SE 1/4, NW 1/4, Section 11
Mine Type: Hardrock/Unknown
Primary Drainage: Union Creek
USGS Code: 17010203
Secondary Drainage: Union Creek
Date Investigated: June 28, 1994
P.A. # 32-027

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 315 cubic yards. The following elements were elevated to at least three times the background concentrations:
  Arsenic: 129J mg/kg
  Cobalt: 37.0J mg/kg
  Copper: 203J mg/kg
  Iron: 59,300 mg/kg
  Mercury: 0.70 mg/kg
  Nickel: 36.1JX mg/kg
  Lead: 34.7 mg/kg
- One discharging adit was observed at the site. No MCLs were exceeded in the adit discharge; however, the chronic aquatic life criteria for iron was exceeded.
- Union Creek flows through the center of the site. An observed release to Union Creek was documented for iron; however, no MCLs or acute or chronic aquatic life criteria were exceeded in the stream.

Frogs Diner PA# 32-027
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BISCH
INVESTIGATION DATE: 06/28/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
32-027-SE1	1.4 JX	53.3 J	166	0.5 UJ	15.8 J	22.2 J	203 J	24300	0.04	365 J	33.9 JX	24.1	5.2 U	63.3 J	NR
32-027-SE2	2.0 JX	74.4 J	167	0.5 UJ	38.1 J	17.7 J	281 J	18800	0.03	416 J	38.4 JX	22.7	7.1	62.9 J	NR
32-027-WR1	0.5 UJX	129 J	138	0.5 UJ	37.0 J	6.2 J	203 J	59300	0.70	556 J	36.1 JX	34.7	5.5 U	66.0 J	NR
BACKGROUND	0.4 UJX	3.9 UJ	219	0.4 UJ	6.5	14.4 J	12.4 J	18900	0.04	442 J	9.4 JX	8.6	4.4 U	33.5 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
32-027-WR1	0.84	26.2	-2.92	-29	0.17	0.08	0.59	2.50	-5.42

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
32-027-GW1	0.12 U	20.2 JX	12.4	2.6 U	12.2	4.7 U	12.5	14200	0.11 U	273	25.3	1.1 U	29.4 U	21.3 J	136
32-027-SW1	0.12 U	3.2 JX	97.3	2.6 U	8.7 U	4.7 U	6.8	472	0.11 U	13.2	12.4	1.1 U	29.4 U	5.6 J	138
32-027-SW2	0.12 U	1.3 UX	98.6	2.6 U	8.7 U	4.7 U	5.9	94.8	0.11 U	6.13	8.0 U	1.1 U	29.4 U	4.5 U	135

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
32-027-GW1	171	<5.0	89	<0.05	NR
32-027-SW1	155	<5.0	17	0.05	NR
32-027-SW2	155	<5.0	14	0.07	NR

LEGEND

SE1 - 75' downstream in Union Creek from confluence with adit discharge.
SE2 - 50' upstream in Union Creek from road crossing.
WR1 - Composite of subsamples WR1A and 1B.
BACKGROUND - From the Copper Cliff Mine (32-001-SE1).
GW1 - Adit #1 discharge.
SW1 - Same as sample 32-027-SE1.
SW2 - Same as sample 32-027-SE2.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY

Mine/Site Name: Great Republic Smelter
Legal Description: T 9S R 14E
Mining District: New World
Latitude: N 45° 00' 59"
Longitude: W 109° 56' 13"
Land Status: Private/Public
Quad: Cooke City
Inspectors: Tuesday, Bisch, West
Organization: Pioneer Technical Services, Inc.

County: Park
Section(s): SW 1/4, NE 1/4, NW 1/4, Section 36
Mine Type: Smelter, Au, Ag, Cu, Pb, Zn
Primary Drainage: Soda Butte Creek
USGS Code: 10070001
Secondary Drainage: Woody Creek
Date Investigated: August 17, 1994
P.A. # 34-000

- No mill tailings were observed at the site; however, the volume of smelter slag observed e was estimated to be 3,840 cubic yards. The following elements were elevated to at least three times the background concentrations in the slag:

  Arsenic: 1,150 mg/kg
  Cadmium: 23.9 mg/kg
  Copper: 939 mg/kg
  Iron: 81,400 mg/kg
  Manganese: 68,700J mg/kg
  Lead: 38,200 mg/kg
  Antimony: 91.0J mg/kg
  Zinc: 23,700 mg/kg

- The volume of waste rock observed at the site was estimated to be 15 cubic yards. The following elements were elevated to at least three times the background concentrations:

  Arsenic: 9,220 mg/kg
  Cadmium: 210 mg/kg
  Copper: 1,600 mg/kg
  Iron: 121,000 mg/kg
  Mercury: 1.17 mg/kg
  Manganese: 69,000J mg/kg
  Lead: 42,100 mg/kg
  Antimony: 95.7J mg/kg
  Zinc: 18,300 mg/kg

- There were no discharging adits, filled shafts, seeps, or springs observed at the site during the investigation.

- Woody Creek flows adjacent to the site on the north side. The slag pile was on the bank of Woody Creek and was being actively undercut by the stream. No observed releases were documented. The chronic aquatic life criteria for iron, mercury, and lead were exceeded both upstream and downstream from the site.

- The severely undercut slag pile was the only safety hazard observed at the site.

Great Republic Smelter PA# 34-000
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 08/17/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-000-SE1	0.7 U	5.6 U	157	1.0	13.2	19.7	24.8	21800	0.07	374 J	34.4	7.4 U	8.7 UJ	44.2	NR
34-000-SE2	1.8	7.0 U	152	1.4	13.9	20.8	24.3	20800	0.06	371 J	39.7	9.2 U	10.8 UJ	41.8	NR
34-000-SL1	86.0	1150	187	23.9	4.4	23.9	939	81400	0.02 U	68700 J	2.9 U	38200	91.0 J	23700	NR
34-000-WR1	97.3	9220	70.0	210	15.7	17.0	1600	121000	1.17	69000 J	3.2 U	42100	95.7 J	18300	NR
BACKGROUND	NR	14.6 J	89	0.4 U	10.5 J	30.7	40	23300	0.058 J	1450 J	20.7	158 J	5.17 U	181	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
34-000-WR1	2.32	72.5	25.1	-47	<0.01	2.17	1.82	67.8	-42.7

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
34-000-SW1	0.12 U	1.7 JX	17.1	4.0 U	8.4 U	10.0	6.2	1800	0.24	18.1	22.0 JX	2.8	51.6 U	15.6 U	58.4
34-000-SW2	0.12 U	1.7 JX	21.9	4.0 U	8.4 U	6.8 U	5.9 U	2340	0.22	33.5	14.4 UX	2.7	51.6 U	17.4	60.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
34-000-SW1	8	<5	7.0	<0.05	NR
34-000-SW2	10	<5	7.0	<0.05	NR

LEGEND

SE1 - Woody Creek downstream from site; above bridge.
SE2 - Woody Creek upstream from site; approx. 15ft.
SL1 - Composite of subsamples SL1A and SL1B.
WR1 - A grab sample from subsample WR1.
BACKGROUND - From the Little Daisy Mine (34-000-SS1) (1993 Data).
SW1 - Same as sample 34-000-SE1.
SW2 - Same as sample 34-000-SE2.

6.0 REFERENCES

MBMG, Well Log Database, July 14, 1994.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/WQB, Circular 7, July 15, 1994.

Pioneer, 1994a. Sampling and Analysis Plan for the Abandoned Mines Hazardous Materials Inventory, May 1994.

Pioneer, 1994b. Quality Assurance Project Plan for the Abandoned Mines Hazardous Materials Inventory, May 1994.

Pioneer, 1994c. Laboratory Analytical Protocol for the Abandoned Mines Hazardous Materials Inventory, May 1994.

Pioneer, 1994d. Health and Safety Plan for the Abandoned Mines Hazardous Materials Inventory, May 1994.

Pioneer, 1994e. Abandoned Hardrock Mines Project Report for the Abandoned Hardrock Mine Priority Sites, December 1994.

GLOSSARY

Abandoned Mine; Abandoned Workings - Excavations, either open, caved, or sealed, that are deserted and in which further mining is not intended.

Acid Mine Water - Mine water which contains sulfuric acid, mainly due to the oxidation of iron pyrite.

Acidity - Estimate of the capacity for a neutral water to neutralize caustic wastes without disturbing biological activities.

Activator (floatation mill) - A reagent that facilitates floatation of selected mineral species in a flotation cell.

Acute Aquatic Life Criteria - EPA's maximum acute toxicity concentrations for protection of aquatic life and its uses as established under Section 304(a)(1) of the Clean Water Act, as amended.

Adit - A horizontal or nearly horizontal passage driven in rock from the surface of the working or dewatering of a mine.

Alkalinity - Estimate of the capacity for a neutral water to neutralize acidic wastes without disturbing biological activities.

Alluvium - Sediments deposited on land by streams and rivers.

AIMSS - Abandoned and Inactive Mines Scoring System.

Amalgamation - The process by which mercury is alloyed with some other metal to produce an amalgam. Used at one time for the extraction of gold and silver from pulverized ores.

Attribution - To document an observed release of a hazardous substance(s) to the environment, the presence of the hazardous substance(s) must be attributable to a waste source at the site. For example, if an observed release to surface water can be established for copper, the concentration of copper in any waste source at the site must exist at greater than three times the background concentration of copper to establish attribution to the site.

BLM - United States Department of Interior, Bureau of Land Management.

Ball Mill - A rotating horizontal cylinder in which nonmetallic materials are ground using various types of grinding media such as quartz pebbles, porcelain balls, or steel balls.

Barren Solution - Leaching solution that has been chemically stripped of metal values. Typically, the barren solution is recharged with leaching agent and recycled.

Benefication - The processing of ores for the purpose of (1) regulating the size of a desired product, (2) removing unwanted constituents, and (3) improving the quality, purity, or assay grade of a desired product.

Bore Hole - An exploratory or prospecting hole made by drilling.

CECRA - The Comprehensive Environmental Cleanup and Responsibility Act.

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980, also known as Superfund: Amended in 1986 by the Superfund Amendments and Reauthorization Act (SARA).

Chronic Aquatic Life Criteria - EPA's maximum chronic toxicity concentrations for protection of aquatic life and its uses as established under Section 304(a)(1) of the Clean Water Act, as amended.

Claim - An area of land claimed by an individual or corporation for the ultimate purpose of mineral extraction. The dimensions of a lode claim are 600 by 1,500 feet; for a placer claim, 600 by 1,320 feet.

Collar - The term applied to the timbering or concrete around the mouth or top of a shaft. The junction of a mine shaft with the surface.

Collector (floatation mill) - A reagent that aids or facilitates the attraction of mineral particles to the froth in a floatation cell.

Comminution - To reduce solids to minute particles by crushing and grinding to liberate metals.

Concentrate - To separate metal or ore from the associated gangue or barren rock.

Concentrate (mineral concentrate) - Enriched ore after the removal of waste in a benefication mill.

Concentrator - Mill or plant in which ore is concentrated by removing unwanted constituents.

Containment - Engineered structures designed to prevent releases to groundwater, such as liners, covers, and run-on diversions.

Country Rock - General term applied to the rock surrounding and penetrated by mineralized veins; in a wider sense applied to the rocks invaded by and surrounding an igneous intrusion.

Cribbing - A method of timbering used primarily to rectify the removal of too great a percentage of the rock on the advance, and has the effect of replacing part of the rock.

Crosscut - (1) a passageway driven at right angles to the main entry to connect it with a parallel entry of air course. (2) A horizontal opening driven across the course of a vein or in general perpendicular to the direction of the main workings.

Crusher - A machine for crushing rock or other materials. Among the various types of crushers are the ball-mill, gyratory crusher, Hadsel mill, jaw crusher, rod mill, rolls, stamp mill, and tube mill.

Cyanide - A salt or ester of hydrocyanic acid. In aqueous solution, cyanide is used to dissolve metal from gangue material for later recovery.

Cyclone - A device for classification by centrifugal means of fine particles suspended in water, whereby the coarser grains collect and are discharged at the apex of the vessel, while the finer particles are eliminated with the bulk of the water at the discharge orifice.

DNRC - Montana Department of Natural Resources and Conservation.

Depressant (floatation mill) - A reagent that causes selected mineral species to sink in a floatation cell.

Drainage Basin Code - Code assigned to each discrete hydrologic unit by the U.S. Geological Survey.

Drift - A horizontal passage underground. A drift follows the vein, as distinguished from a crosscut, which intersects it.

Dump - A pile or heap of waste rock material or other non-ore refuse near a mine.

Electrowinning - Recovery of a metal from an ore or solution by electrochemical processes.

EPA - United States Environmental Protection Agency.

Face - the surface exposed by excavation. the working face, front, or forehead is the face at the end of the tunnel heading, or at the end of the full size excavation.

Floatation - The method of mineral separation which a froth created in water by a variety of reagents floats some finely crushed minerals, whereas other mineral sink.

Floatation Cell - Device in which froth floatation of ores is performed. It has provisions for receiving conditioned pulp, aerating the pulp, and for separate discharge of the resulting mineralized froth and impoverished tailings.

Floodplain - An alluvial plain caused by the overbank deposition of alluvial material. They typically appear as flat expanses of land bordering a stream or river. Most floodplains are accompanied by a series of alluvial terraces of varying levels.
Fluvial - Pertaining to or produced by the action of a stream or river.

Frother - A reagent which serves to stabilize the froth in a floatation cell until it can be scraped off into the concentrate launder.

Glory Hole - Large, open hole typically associated with a mined-out or widened shaft.

Gravity Mill - A process in which heavy metals or minerals are separated from waste by the action of agitation and gravity on materials suspended in a liquid, usually water.

Grizzly - A devise used for coarse screening of bulk materials. A rugged screen for rough sizing at a comparatively large size (for example, 6-inches); it can comprise fixed or moving bars, disks, or shaped tumblers or rollers.

HRS - EPA's Hazard Ranking System (Federal Register, Vol. 55, No. 241, pp. 51532-51667).

Hand Auger - A large tool modeled after the carpenter's drill used in soil sampling.

Hazardous Substance - CERCLA hazardous substances, pollutants, and contaminants as defined in CERCLA Sections 101(14) and 101(33).

Headframe - The vertical steel or timber frame at the top of a shaft, which carries the sheave or pulley for the hoist.

Heavy Metal - Principally the metals zinc, copper, cobalt, and lead; however, may include one or more of the following metals: bismuth, cadmium, gold, indium, iron, manganese, mercury, nickel, palladium, silver, thallium, and tin (often included, though not a metal).

Highwall - The unexcavated face of exposed overburden and coal or ore in an open-cast mine or the face or bank on the uphill side of contour strip mine excavation.

Hoist - (1) A drum on which wire rope is wound in the engine house, as the cage or skip is raised in the hoisting shaft. (2) An engine with a drum used for winding up a load from a shaft.

Inclined Shaft or Incline - A non-vertical shaft; usually along the dip of a vein.

Intermittent Stream - A stream or stretch of stream which flows only at certain times of the year when it receives water from springs, snow melt or storm runoff.

Jaw Crusher - A primary crusher designed to reduce large rocks or ores to sizes capable of being handled by a secondary crusher. It consists of a moving jaw, hinged at one end, which swings toward and away from a stationary jaw in a regular oscillatory cycle.

Jig (Mineral Jig) - A machine in which the feed is stratified in water by means of a pulsating motion and from which the stratified products are separately removed, the pulsating motion usually being obtained by alternate upward and downward currents of water.

Latitude - The angular distance north or south from the equator of a point on the earth's surface, expressed in degrees.

Leaching - (1) The removal in solution of the more soluble minerals by percolating waters. (2) Extracting a soluble metallic compound from an ore by selectively dissolving it in a suitable solvent, such as water, sulfuric acid, hydrochloric acid, cyanide, etc.

Legal Description - The Township, Range, Section, and typically quarter/quarter section location.

Level - A main underground roadway or passage driven along the level course to afford access to the stopes or workings and to provide ventilation and haulageways for the removal of ore.

Loadout - A receptacle for ore awaiting treatment or shipment, also referred to as an ore bin.

Longitude - An angular distance east or west from the meridian of some particular place to the prime meridian at Greenwich, England.

MBMG - Montana Bureau of Mines and Geology.

MCL - Maximum contaminant level: Established under the Safe Drinking Water Act.

MCLG - Maximum contaminant level goal: Established under the Safe Drinking Water Act.

MDHES/SHWB - Montana Department of Health and Environmental Sciences, Solid and Hazardous Waste Bureau.

MDHES/WQB - Montana Department of Health and Environmental Sciences, Water Quality Bureau.

MDSL/AMRB - Montana Department of State Lands, Abandoned Mine Reclamation Bureau.

Master Inventory - Inventory of all identifiable abandoned or inactive hardrock mine sites in Montana conducted by the MDSL/AMRB.

Mesh - The number of openings per unit area of a screen (sieve).

Mill - A mineral treatment plant in which crushing, grinding, and further processing of ore is conducted to produce a product.

Milling - The processing of ore to produce a product.

Mine - Excavation of earth for the extraction of ore or other economic minerals.

Mine Development - The term used to describe the operations involved in preparing a mine for ore extraction. These operations may include tunneling, sinking, crosscutting, drifting, and raising.

Mineral - An inorganic substance occurring in nature, though not necessarily of inorganic origin, which has (1) a definite chemical composition or, more commonly, a characteristic range of composition, and (2) distinctive physical properties or molecular structure.

Mineral Deposit - A surface or underground body of mineral matter that may be utilized for its industrial mineral or metal content.

Mineral Dressing - Physical and chemical concentration of raw ore into a product from which a metal can be recovered for a profit.

Observed Release - Concentration of hazardous substance(s) has increased significantly (greater than three times) above the background concentration for the site for that specific type of sample. For example, to document an observed release to surface water, a contaminant concentration detected in a surface water sample collected downstream from a site must exceed the concentration detected in a surface water sample collected upstream from the site by more than three times. See also "Attribution".

Open Pit Mining - A form of operation designed to extract minerals that lie near the surface.

Open Stope Method - Stoping in which no regular artificial method of support is employed, although occasional props or cribs may be used to hold local patches of insecure ground. Usually confined to relatively small, narrow ore bodies.

Ore - A mineral, or mineral aggregate, containing precious or useful metals, and which occurs in such quantity, grade, and chemical combination as to make extraction commercially profitable.

Ore Bin - A receptacle for ore awaiting treatment or shipment, also referred to as a loadout.

Ore Body - A solid and fairly continuous mass of ore, which may include low-grade ore and waste, as well as high-grade material.

Ore Deposit - A general term applied to rocks containing minerals of economic value in such amount that they can be profitably tracted.

Oxidation/Reduction Potential - The hypothetical electron activity at equilibrium. A measurement of the relative tendency (potential) of a solution to accept or transfer electrons, measured in volts.

PRP - Potentially Responsible Party.

PA No. - Problem Area Number established by the MDSL/AMRB.

Perennial Stream - A stream or stretch of a stream that flows continuously throughout the year.

pH - A measure of the degree of acidity or basicity of a solution. At 25°C, a pH of 7 is neutral. Acidity increases as measurements decrease below 7, and basicity increases as measurements increase above 7.

Placer - A mineral concentration resulting from weathering processes, usually involving water. Placer deposits are typically composed of heavy minerals, with gold, platinum, tin, and diamonds being the most important.

Ponded - A condition in which free water covers the soil surface, as in a closed depression.

Portal - (1) The surface entrance to a drift, tunnel, or adit; (2) The entrance to a mine.

Pregnant Solution - Metal-laden solution (cyanide, acid, etc.) resulting from a leach process.

Primary Drainage - The primary drainage is the smallest named stream segment/drainage basin that is locatable on the USGS Hydrologic Unit Map within which the mine site is located.

Prospect - (1) A mineral property, the value of which has not been proved by exploration. (2) Non-producing mining property under development or considered worthy of such attention.

Pulp - A mixture of ground ore and water capable of flowing through suitably graded channels as a fluid.

QA/QC - Quality Assurance/Quality Control.

Raise - A vertical or inclined opening driven upward from a level to connect with the level above, or to explore the ground for a limited distance above one level.

Reagent - A chemical or solution used to produce a desired chemical reaction; a substance used in assay or floatation.

Rod Mill - A mill for fine grinding, employing long steel rods to grind the material.

Secondary Drainage - The secondary drainage is the smallest named stream segment/drainage that is locatable on the USGS Quadrangle Map within which the mine site is located.

Sediment - Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, or ice and has come to rest on the earth's surface either above or below the water level.

Sedimentation - The settling of solid particles of soil, coal, or mineral from liquid as a result of gravity or centrifuging.

Shaft - An excavation of limited area compared with its depth, made for access to underground mine workings.

Sluice (Sluice Box) - A long trough-like box set at an incline of about 1:20 through which placer gravel is carried by a stream of water. The gravel is washed away while most of the gold or other heavy materials are caught by riffles or blankets on the floor of the sluice.

Slurry - Fine solid particles suspended in a liquid, typically water, of a consistency that allows flow by gravity or pumping.

Source - Any area where a hazardous substance has been deposited, stored, disposed, or placed, plus those soils that have become contaminated from migration of a hazardous substance.

Specific Conductance - The specific conductance or conductivity of water (or other substance measured) is the electrical conductance of the material between opposite sides of a cube 1 centimeter in each direction.

Stamp Mill - An apparatus in which rock is crushed by a stamp battery.

Stope - An underground excavation from which ore has been removed.

Subsidence - A sinking down of a part of the earth's surface due to the collapse of underlying underground openings.

Surface Mining - The mining in surface excavations, including placer mining, mining in open pits, mining and removing ore from open cuts by hand or with mechanical excavating and transportation equipment, and the removal of overburden to uncover the ore.

Tailings - The refuse material resulting from the washing, concentration, or treatment of ground ore.

Tailings Pond - A pond with a constraining wall or dam to which mill effluents are run.

Tunnel - A horizontal or nearly horizontal underground passage that is open to the atmosphere at both ends.

USFS - United States Department of Agriculture, Forest Service.

USGS - United States Department of Interior, Geological Survey.

Waste - The rock that is too low in grade to be of economic value.

Waste Dump (Spoil Pile) - The area where mine wastes or spoil materials are discarded.

Wetlands - Areas that under normal circumstances have hydrophytic vegetation, hydric marshes, and wetland hydrology. It includes landscape units such as bogs, marshes, and lowlands covered with shallow ephemeral or intermittent waters. Permanent waters of streams and water deeper than 9 feet in lakes or reservoirs are not considered wetlands.

Winze - A vertical or inclined opening, or excavation, connecting two levels in a mine, differing from a raise only in construction. A winze is driven downward and a raise is excavated upward.

X-ray Fluorescence (XRF) Spectrometer - Instrument used for metals analysis of solid media by energy dispersive X-ray fluorescence.