Gay Mine Reclamation
Final Phase

Shoshone – Bannock Lands, Idaho

October 2000

Contents

Gay Mine Reclamation Final Phase

Section 1.0 Introduction

This report presents a summary of the final reclamation phase at the Gay Mine. Included is a discussion of reclamation alternatives for partial backfill of four remaining mine pit lakes. The approaches being evaluated are consistent with the Selenium Working Group and include implementation of Best Management Practices (BMPs) to limit selenium exposure in the environment.

1.1 Statement of Situation

In the early 1990s the Gay Mine complex was running out of economically extractable ore and the operations diminished until no further mining was possible. The years 1992, 1993, and 1994 were devoted primarily to reclamation efforts that included the demolition of mine buildings and mitigation of petroleum impacted soils in the mine yard area. Discussions between the BIA, the BLM, Simplot and FMC regarding final mine reclamation, bond release and relinquishment of the leases have been on-going. This process included an assessment by BIA and BLM of reclamation status at the mine site in 1996. A summary of this inspection was presented in the report, *Status of Reclamation Compliance at Gay Mine, Fort Hall Agency, Idaho* (Koehler and Hernandez, 1996-1997 attached in the appendix).

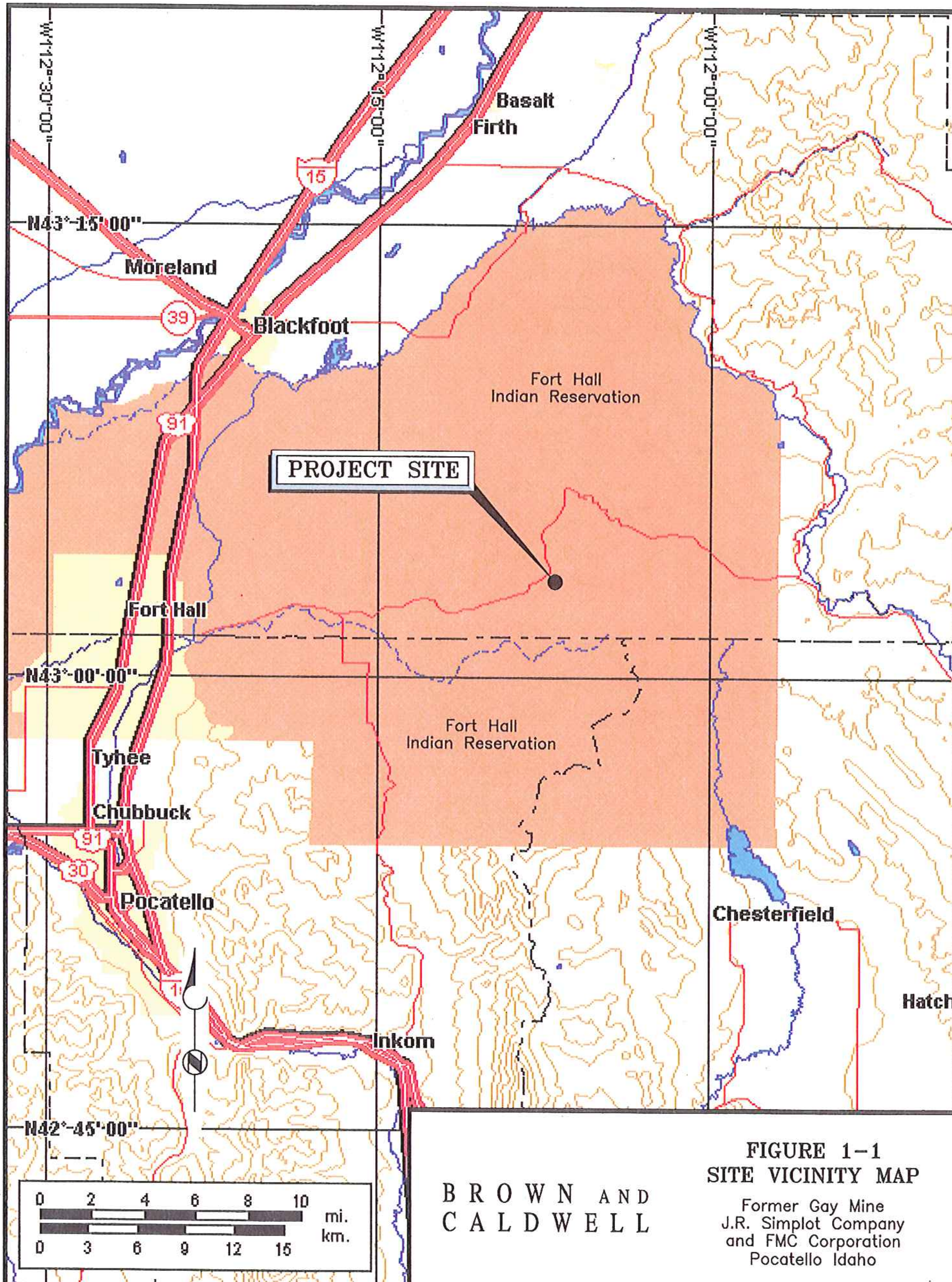
Reclamation discussions had advanced to a point where the issues for additional work were listed and generally agreed upon (May 1, 1998 letter with attachments to Arnold Appenay included in appendix) when the occurrence of selenium in the environment from mine waste became a concern in the phosphate mining region (also referred to as the Southeast Idaho Phosphate Resource Area (Resource Area)).

In response to potential selenium issues at active and inactive phosphate mines, the Idaho Mining Association established a Selenium Subcommittee to identify the origin and environmental characteristics of selenium and other metals found in the Resource Area. The work from the Selenium Subcommittee identified areas within the Gay Mine that have potentially elevated selenium concentrations. Preliminary sampling results at the Gay Mine are summarized in Section 2.0.

Simplot and FMC requested that Brown and Caldwell initiate an evaluation of reclamation options for the remaining pit lakes at the Gay Mine. This evaluation complements the reclamation work previously completed and previous negotiations for the final phase of reclamation. This document is a summary of initial ideas based on sound field, technical, geologic and engineering best practices. This document will continue to be revised as additional input is incorporated. Additional efforts will be made to ensure that all work is consistent with the on-going area-wide and site specific selenium studies in southwestern Idaho. This would include BMP's, monitoring programs, data assessment, etc.

1.2 Site History

In June 1945, the Simplot Fertilizer Company was founded to satisfy the growing market demand for agricultural phosphate fertilizers in the western states. This demand soon outstripped the available supply of raw materials required for fertilizer production, prompting Simplot to seek additional supplies of phosphate ore. In June 1946, the Simplot Fertilizer Company, the Bureau of Indian Affairs (BIA), and the U.S. Geological Survey (USGS) reached an agreement with the Shoshone-Bannock Tribes on land lease and royalty rates for open-pit phosphate mining on the Fort Hall Indian Reservation. The Gay Mine was dedicated in 1948 and was one of the first open-pit phosphate mines to begin operation in southeast Idaho.



BROWN AND CALDWELL

FIGURE 1-1
SITE VICINITY MAP

Former Gay Mine
J.R. Simplot Company
and FMC Corporation
Pocatello Idaho

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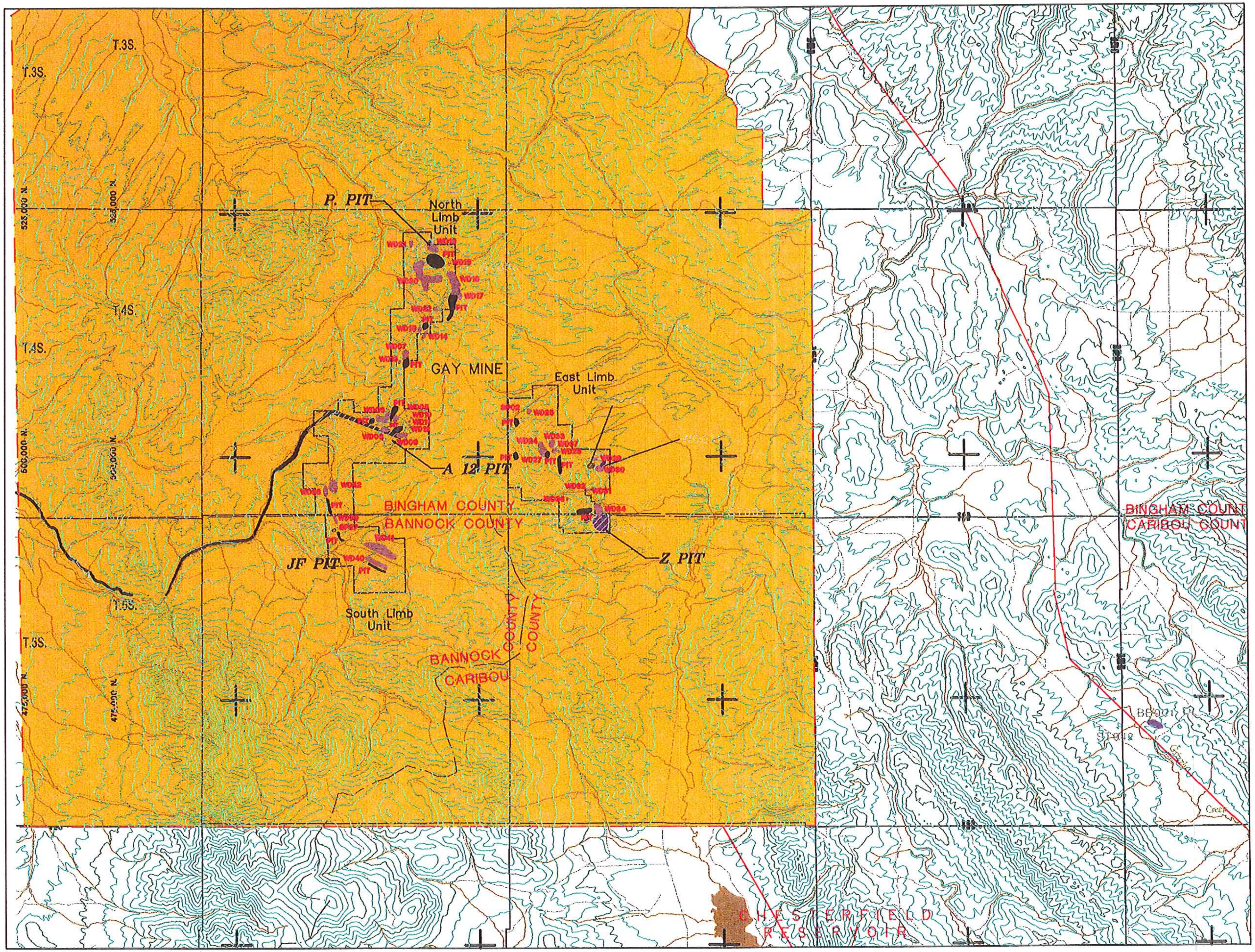
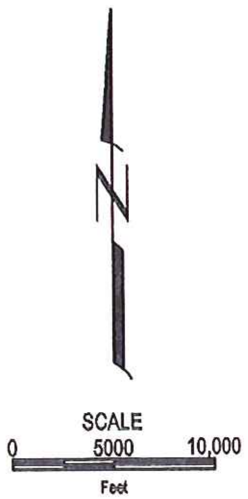


LEGEND

- CREEKS/RIVERS
- COUNTY LINE
- ROADS
- RAILROAD
- TOWNSHIP-RANGE LINE
- FORT HALL INDIAN RESERVATION
- FMC CORPORATION AND J.R. SIMPLOT COMPANY
- STREAM OR SURFACE WATER MONITORING LOCATION
- PIT
- SP01
- WD01



REV-DESO-1

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1	Issued for Submittal	8/24/99	J.WELNMAR	K.COONRAD	J.WELNMAR
0	Issued for Review	7/21/99	J.WELNMAR	K.COONRAD	J.WELNMAR

Figure 1-2
Site Plan

PROJECT: **1999-2000 Regional Investigation Sampling and Analysis Plan**

DRAWING TITLE: **GAY MINE SURFACE WATER MONITORING LOCATIONS**

BROWN AND CALDWELL
DENVER, COLORADO

Sheet 1 Of 1 Sheets
SCALE: As Shown
DWG/FIG No. 4-1

During the period of 1948 to 1949 operations at the Gay Mine rapidly expanded. Twenty-one miles of standard gauge rail line connecting Fort Hall to the mine was completed in 1948. In the following year, the Westvaco Chemical Division of FMC opened an elemental phosphorus plant for the processing of phosphate shale. Two grades of phosphate-bearing ore were taken from the Gay Mine. The lower (or furnace) grade "phosphate shale" was used by FMC in an electric furnace where the phosphate is reduced to its elemental form; the higher (or acid grade) "phosphate rock" was shipped to the Simplot plant (Don Plant) for fertilizer production.

Simplot and FMC continually upgraded the technology of mining operations, transportation, pit design, and reclamation, throughout the operation of the Gay Mine. Pits were typically 10 to 20 acres in size and 200 to 300-feet deep. In the 1980s and early 1990s, Simplot and FMC began to phase out production at the Gay Mine. Operation of the mine ended in the fall of 1993.

1.3 General Setting

The Gay Mine is located approximately 17 miles east of Fort Hall, Idaho (Figures 1-1 and 1-2). The majority of the mine is in Township 4 South, Range 37 East and Township 4 South, Range 38 East, Boise Meridian of the Lincoln Park quadrangle in southeast Idaho. It is found on the north end of the Portneuf Mountain Range, and on the east edge of the Columbia Plateau physiographic province. The climate is semi-arid with an annual precipitation average of 16.3 inches.

1.3.1 Geology and Hydrogeology

The Gay Mine area is part of the Idaho phosphate region, a large geologic region that includes portions of Bannock, Bear Lake, Bingham, Bonneville, Fremont, Teton and Madison Counties in southeastern Idaho. The Permian age Phosphoria Formation underlies a large portion of this area. The Meade Peak Member of the Phosphoria Formation contains commercially valuable phosphate deposits that are widely mined in the region. It is approximately 200-feet thick and consists of interbedded mudstone, phosphorite, and argillite. The Wells Formation, a Pennsylvanian age limestone, is located beneath the Meade Peak Member. Overlying the Meade Peak is the Rex Chert Member of the Phosphoria Formation, a 155 to 160-foot thick sequence of cherty mudstone and limestone. Triassic age and Quaternary age alluvial deposits of the Thaynes and Dinwoody Formations are intermittently encountered overlying the Rex Chert Member (Ralston, 1986 and BLM, 1999).

The Fort Hall region is located along the southwestern edge of the Idaho-Wyoming fold and thrust belt. The belt is composed primarily of sedimentary rocks of Mississippian through Tertiary age, including the Phosphoria and Wells Formations. Subsequent post-Cretaceous folding has resulted in northwest trending structures along the fold belt. Quaternary alluvium is typically found in the valleys of these northwest trending ridges.

The Gay Mine is encompassed in the Fort Hall district of the Idaho phosphate region (USGS, 1978). At the Gay Mine, the primary structure is a north-trending, south-plunging, overturned syncline (Miller, 1977 and Mariah, 1986). Syncline limbs, containing the accessible phosphate reserves for mining, dip at approximately 15 to 30 degree angles. The fold is displaced by multiple high angle, normal faults, usually paralleling the strike of the formation. Minor smaller scale normal and reverse faults parallel the major normal faults and complicate the phosphate ore removal. Depth to the phosphatic formation varies significantly due to the folding of the formation. The valley area between the two limbs of the fold consists of Tertiary and Quarternary gravels. These gravels may extend to a depth of up to 300 feet (Mariah, 1986).

The Gay Mine area shows no evidence of a "regional water table". The area is located between two large regional groundwater systems, the Portneuf Valley aquifer to the east and the Snake River aquifer to the west (USGS, 1978). Localized occurrence of groundwater in the area is determined by the water transmitting ability of the individual formations and the structural setting (Ralston, 1986). The Gay Mine area appears to consist of a multiple level, structurally controlled groundwater system. Ralston (1986) discussed the groundwater contacts and resulting variations in static water levels encountered during drilling activities in the East Gay Mine area and the Gay Mine Extension. Groundwater was encountered in the Dinwoody Formation in several of the borings at depths ranging from 75 to 120 below ground surface (bgs), but was not continuous across the sites. Hydraulic connection between this shallow alluvium and the deeper water systems does not appear to exist. Groundwater was often encountered in the Phosphoria Formation during exploratory drilling operations. There appears to be lower hydraulic conductivity zones within the Phosphoria Formation that cause a perched water system to exist at a static water level approximately 350 feet higher than in the Wells Formation

1.4 Mining and Reclamation

The phosphate mineral cryptocrystalline carbonate-fluorapatite occurs in strata that is generally steeply sloped and often interrupted by faults. Ore bodies frequently occurred in beds that were overturned or blocked by faults. The extraction of the ore body at the Gay Mine required removal of large deposits of overburden that consisted of chert, shales, and limestone.

As described in agency-approved mining and reclamation plans, the mining sequence was to complete the reclamation of each area as the mine operations moved on to new pits. Because of the relatively small size of the typical fault block ore deposit at the Gay Mine, there were usually two or three pits in various stages of mining at one time. The multiple pit method help facilitate backfilling, an important step in mine land reclamation. The general pattern of mining was for removal and stockpiling of topsoil and alluvium for future reclamation. Then, overburden (chert, shales, and limestone) was removed by ripping and blasting. This overburden was used to fill previously mined pits and remaining overburden went to external dumps. This approach resulted in concurrent reclamation as the mining progressed throughout the various deposits within the mine leases. This "backfill as you go" type system left the final pit in a series with minimal backfill and the final reclamation plan usually included shaping and revegetation that best suited the specific area.

Low-grade phosphatic shale (mill shales) have been stockpiled on-site in several locations. The shales have potential for beneficiation into a product, depending on economic conditions.

The 1986 *Environmental Assessment Report, Gay Mine Expansion Area, Fort Hall Reservation, Idaho* (Mariah, 1986) describes the history of reclamation at the Gay Mine, which has included cooperative efforts with the Natural Resource Conservation Service, the BIA, the Bureau of Land Management (BLM), the Tribe, and university researchers. The general reclamation sequence, as described in the Environmental Assessment (EA), is summarized:

- Step 1. Placement of rock core material at base of waste dumps to provide drainage.
- Step 2. Backfilling of mine pits, shaping of dumps to smooth contours and final grading.
- Step 3. Topsoil placement.
- Step 4. Primary tillage in the form of shallow ripping. Deep ripping of compacted areas such as haul roads.
- Step 5. Spreading of fertilizer and disking or harrowing.
- Step 6. Seeding.
- Step 7. Monitoring of revegetation success.

As described above, reclamation activities were conducted concurrently with mining activities throughout the mine life at the Gay Mine. Discussions regarding final reclamation activities and relinquishment of leases are on-going between Simplot, FMC, the BLM, and BIA, and the Tribe.

1.4.1 Leases and Royalties

There are two basic types leases at the Gay Mine:

Mining leases – for the removal or physical extraction of overburden and phosphate ore for specified sites.

Business leases – for road and other facility construction and placement and storage of materials.

Some leases were held jointly by Simplot and FMC while others where held separately. A compilation of bonds and leases are further described in Section 4.0.

1.4.2 Mining Regulatory Oversight

In 1984, the BIA (Portland) and BLM (Alaska, Oregon/Washington, Idaho, and Montana offices) signed a Memorandum of Understanding that states:

> *Federal involvement will begin when a Federal decision is needed regarding surface disturbances, access, confirmation of mineral rights, or approval of permits, leases, and plans, under Titles 25 and 43 of the Code of Federal Regulation. The BLM has responsibility for supervision of mineral developments including leasing of Federal lands, and trust responsibility for approval and management of mineral exploration and mine plans on Indian mineral lands. The BIA has the lead Federal trust responsibility for issuance and general administration of mineral-permits, leases and bonds on Indian mineral lands*

Prior to 1974 there were no specific requirements in the federal regulations for land reclamation subsequent to mining. In 1973, the Indian Trust Lands were brought under protection and jurisdiction of the National Environmental Policy Act (NEPA) of 1969. NEPA mandates that all Federal agencies protect and enhance the quality of the environment and submit all proposed actions on Federal lands to a described analytical process. Environmental Assessments (EAs) were required on all public land action that could cause environmental impacts not previously analyzed. Environmental Impact Statements were required for any Federal action significantly affecting the quality of the environment. The first EA for the Gay Mine was prepared in 1974.

Section 1.0 has presented a brief description of site history at the Gay Mine, a summary of the mining sequence and reclamation activities, and a brief description of the selenium issues. Section 2.0 further describes selenium issues and potential mitigation approaches. Section 3.0 describes pit lakes at the Gay Mine that are candidates for reclamation. In addition, potential strategies for final reclamation are described. Pertinent lease information is described in Section 4.0. Finally, recommendations and discussion for moving forward toward final reclamation are presented in Section 5.0.

Section 2.0
Geochemical Considerations for Pit Backfill

2.1 Background

In 1996, several horses being pastured near Maybe Creek in southeast Idaho, downstream of a historic phosphate mine, were diagnosed with chronic selenosis. In response to elevated selenium levels in soils and surface water in the area, the Selenium Sub-committee, a voluntary, ad hoc committee of the Idaho Mining Association, was formed in spring 1997. The Selenium Sub-committee consists of five mining companies (FMC Corporation, J.R. Simplot Company, Nu-West, Rhodia, Inc. and P4 Production LLC) that are currently mining or who have recently mined phosphate ore in southeast Idaho (Montgomery Watson, 1999a).

In addition to the Selenium Sub-committee, the Selenium Working Group, comprising the committee member companies and involved federal, state, local, and tribal agencies, was formed. The Selenium Working Group has moved forward with characterization of the impacts from selenium associated with the phosphate mining facilities. This characterization includes:

- Identification of possible mine sources
- Description of the extent and magnitude of selenium impacts to surface water, groundwater, soil, vegetation, aquatic life and wildlife
- Evaluation of transport mechanisms.

A regional investigation (the Selenium Project) consisting of sampling and analysis of mine pits, waste rock dumps, seeps, streams and other potential sources has been undertaken since the fall of 1997 to evaluate the existing impacts (Montgomery Watson, 1999a). This project is on going, with additional sample collection expected in 2000. Part of these sampling activities has included surface water, vegetation, and soils in and around the Gay Mine.

2.1.1 Selenium Release Mechanism

Selenium is a naturally occurring element found in phosphate ore and associated with shale waste rock. Based on recent study results, the middle waste shale within the Meade Peak Phosphatic Shale appears to be a major source of selenium. When this shale is exposed to air and water, oxidation of the selenium may occur resulting in the formation of selenate, a highly soluble and mobile form of selenium that can be readily available for uptake by plant root systems (Montgomery Watson, 1999b). The selenium in these shales is naturally occurring and is not a waste product of mining. Rather, mining activities have exposed this shale material to oxygen and water resulting in the enhancement of the oxidation process where selenium is converted to its more mobile form.

The 1998 data collected by the Selenium Working Group has shown elevated levels of selenium associated with the following phosphate-mining facilities:

- Seeps/springs influenced by surface water runoff or infiltration at mine waste rock piles
- Water flow from drains below waste rock piles
- Ponds located in mine pits, constructed on or from waste rock, or receiving runoff from waste rock
- Vegetation growing on waste rock piles or growing downgradient from water flow from waste work piles.

2.1.2 Regulatory Criteria for Selenium

Selenium is recognized as a required micronutrient by fish, birds, mammals (including humans). In fact, selenium is often supplemented in livestock diets in areas where selenium is deficient in forage (including much of southeastern Idaho). At high levels, however, selenium can cause chronic or acute selenosis. The U.S. EPA has established a human health drinking water standard (Maximum Contaminant Levels (MCL)) for selenium at 50 micrograms per liter, µg/l (parts per billion). The Aquatic Biota Cold Water Standard (ABCWS) for protection of aquatic life has been set by the U.S. EPA at 5 µg/l.

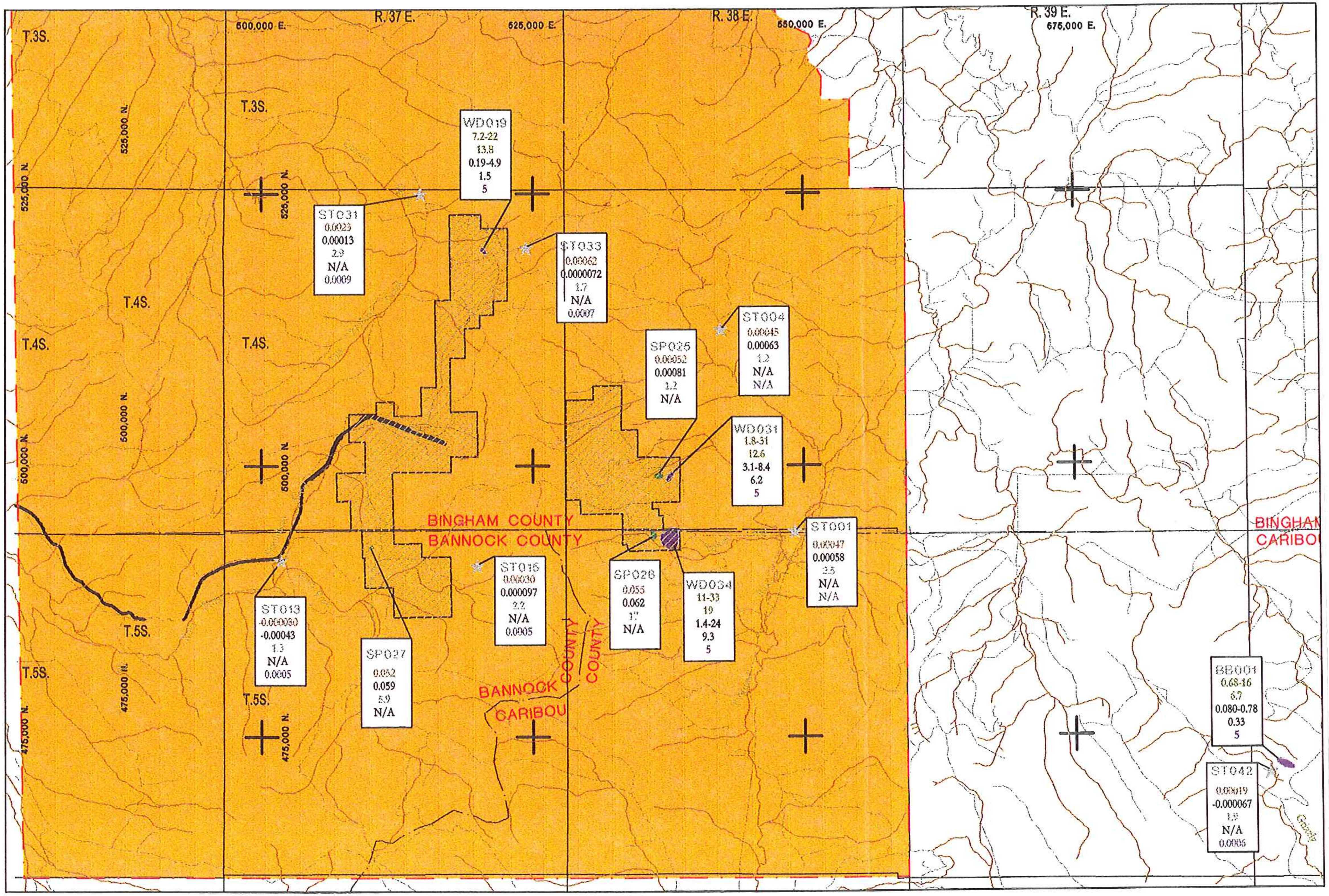
2.2 Gay Mine Sampling and Analysis

The Selenium Project has identified active and inactive phosphate mines in southeast Idaho, where potential selenium concerns may occur. The Gay Mine was identified as an inactive phosphate mine. Thirty potential stream sampling locations for the Gay Mine were identified in the Sampling and Analysis Plan (SAP) (Montgomery Watson, 1998). These locations were selected to characterize surface water quality on both the upstream and downstream stream sections in relationship to the mine. Four locations were sampled in 1997 and six locations were sampled in 1998. Sediment samples were also collected from these locations. The SAP explains sampling methodology, analytical methods and quality control/quality assurance criteria. A summary of analytical laboratory test results is presented in Table 2-1 for selenium and cadmium. Additional surface water sampling locations including pit lakes, waste rock dumps, seeps, french drain systems and stock ponds as identified in the SAP. Two pit lakes were sampled in 1997. During the 1998-sampling season, three pit lakes and three waste rock dumps at the Gay Mine were sampled for water and soil. Analytical laboratory test results are summarized in Tables 2-2 and 2-3, respectively for selenium and cadmium. Sample locations are illustrated on Figure 2-1.

Surface water results from the stream samples and pit lake samples were evaluated against the ABCWS for selenium of 0.005 milligrams per liter (mg/l) (this is equivalent to 5 µg/l, ppb) developed by the U.S. EPA under the Clean Water Act. None of the analytical laboratory test results from the stream segment locations associated with the Gay Mine exceeded the ABCWS in 1997 or 1998. Sample results from Gay Mine Z Pit Lake (SP026) and JF Pit Lake (SP027) exceeded the standard for each sample analyzed. Selenium sediment sample results from these two areas (Z Pit Lake = 17 mg/kg and JF = 17 mg/kg) were evaluated against the Upper Confidence Limit (UCL) of background samples (see Montgomery Watson (1998a and b) for discussion of background sample determination). (Note: References to JD Pit Lake by Montgomery Watson is the same location referred to as JF by Brown and Caldwell in this report.)

Cadmium water concentration results are also included in Tables 2-1 and 2-2. The cadmium ABCWS is a water hardness dependent value that is developed based on information collected during the sampling event (Montgomery Watson, 1999a). These values are listed in italics adjacent to the analytical test results in the tables. Laboratory test results of the May 1998 sampling event indicate three of the six stream segment samples exceeded the appropriate cadmium standard. No exceedance was reported for the stream samples during the September 1998 sampling. Cadmium sediment sample results from September 1998 were evaluated against the background UCL developed for cadmium (8.8 mg/l). Analytical laboratory test results were below the UCL for all six-stream sediment samples. Pit Lake water and sediment sample results for cadmium were evaluated in a similar manner. Two of the three samples in May 1998 and one of the three samples in September 1998 exceeded the applied hardness dependent standard. The Z Pit Lake and JF Pit Lake sediment results exceeded the cadmium UCL.

Waste rock samples were collected from five locations within each of the three waste rock dumps totaling 15 samples. Since there is no promulgated standard for evaluation, analytical laboratory results were compared to the UCL of



LEGEND

- CONTOURS
- CREEKS/RIVERS
- ROADS
- RAILROAD
- COUNTY LINE
- FT. HALL INDIAN RESERVATION
- FMC CORPORATION
- STREAM OR SURFACE WATER MONITORING LOCATION
- STOCK PONDS AND WASTE ROCK DUMP SEEPS
- WD SOIL AND VEGETATION MONITORING LOCATION (WASTE DUMPS)
- BB SOIL AND VEGETATION MONITORING LOCATION (BACKGROUND STATIONS)

N

SCALE
0 10,000 20,000
Feet

SAMPLE RESULTS

Water, Sediment, and Fish Sample Results

Station ID
Water (May '98), mg/L
Water (Sept. '98), mg/L
Sediment (Sept. '98), mg/kg (dry wt.)
Fish Muscle (Sept. '98), mg/kg (wet wt.)
Water (Sept. '97), mg/L

Negative numbers indicate a non-detect result

Soil and Vegetation Sample Results

Station ID
Soil (July '98) min/max values, mg/kg
Soil (July 1998) average value, mg/kg
Vegetation (July '98) min/max values, mg/kg
Vegetation (July '98) average value, mg/kg
Number of Samples

Negative numbers indicate a non-detect result

MAP KEY

REV. No.	REVISIONS	DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY
1	Issued for Report	12/8/99	J.Wehman	K.Conrad	A.Sabb
0	Issued for Review	9/14/99	J.Wehman	K.Conrad	J.Wehman

Figure 2-1
Sample Location

PROJECT: 1998 REGIONAL INVESTIGATION REPORT

DRAWING TITLE: 1998 SELEMIUM DATA FROM WESTERN DISTRICT

BROWN AND CALDWELL
DENVER, COLORADO

Sheet 1 Of 1 Sheet
SCALE: As Shown
DWG/FIG No. 4-1

the background soil samples. Background soil samples were collected from three locations with five samples collected in each location. Using a value of 8 milligrams per kilogram (mg/kg) for evaluation, 12 of the 15 samples collected from the Gay Mine Waste Rock Dumps exceeded the UCL for selenium (Montgomery Watson, 1999a). Two of the five samples from East Limb Dump 4E and one sample from the North Limb O/P Fill Dump were below the UCL. Thirteen of the fifteen waste rock dump soil sample cadmium results exceed the background UCL of 23 mg/kg.

2.3 Pit Lake Evaluation

The mining sequence at the Gay Mine included the backfilling of pits concurrently with active mining. The pits described in Section 3.0 were generally at the end of the mining sequence, where overburden was not readily available for backfilling. Options for partial backfilling and descriptions for backfill materials are described in Section 3.0. Pits JF and Z were sampled and have selenium concentration values above ABCWS. The goal is to partial backfill these pits so that there is no surface water and to reclaim the sites with low selenium bearing surface material to support vegetation.

Simplot and FMC have extensive experience in the reclamation of mine pits at the Gay Mine, including pits containing water. In the past, reclamation of pits has been in accordance with approved reclamation plans. Further action related to the remaining pits will require consideration of selenium and possibly cadmium. Pit lake reclamation options have been addressed during the Environmental Impact Statements (EIS) activities at the Dry Valley Mine and the Smokey Canyon Mine. These EIS activities have included consideration of groundwater quality associated with pit backfilling.

An important consideration in pit lake partial backfilling and reclamation is understanding the source of pit lake water. Depending upon pit location and topography, water in pits may be a result of surface water, subsurface water, or a combination of both. Final reclamation of pits involves recontouring the pit area so that surface water accumulation on top of the reclaimed pit is minimized. Subsurface water sources that may enter a pit include seeps, springs, localized perched water tables or area wide groundwater. An understanding of the source of this water is important to predict water rebound in the reclaimed pit and also to predict groundwater outflow. Influent groundwater chemistry, backfill type and degree of weathering, and the concentrations of dissolved oxygen and carbon dioxide in the pit water will control the quality of groundwater moving through pit backfill.

2.3.1 Characterization of Pit Water

As described above, it will be necessary to develop an understanding of the source of water in each of the pits. This evaluation may be accomplished as follows:

- Characterize vertical profile of water in each pit lake through sampling and geochemical analysis, and monitoring activities. Laboratory analysis should include major ions, nutrients, total metals, and dissolved metals. Field analysis should include temperature, pH, redox potential, electric conductivity, and dissolved oxygen. Knowledge of the vertical profile will help develop an understanding of water sources (e.g., groundwater versus stormwater).

Install groundwater-monitoring wells up and down gradient of the pit to determine depth to groundwater and evaluate possible

Table 2-1. Summary of Stream Sampling Data for 1998 at the Gay Mine, Fort Hall Region, Idaho

Station Number[1]	Drainage	Description	Selenium Concentrations in Water (mg/l[2])			Selenium Concentrations in Sediments (mg/kg[3])
			September 1997	May 1998	September 1998	September 1998
ST001	Portneuf River	Downstream of Bakers Creek	NA[4]	0.00047	0.00058	2.5
ST004		Upstream of U Creek	NA	0.00045	0.00063	1.2
ST013	Ross Fork	Downstream of Danielson Creek	0.0005	-0.000080	-0.00043	1.3
ST015		Upstream of South 40 Unit	0.0005	0.00030	0.000097	2.2
ST031	Lincoln Creek	Downstream of Dry Hollow Creek	0.0009	0.0023	0.00013	2.9
ST033		Upstream of North Limb Unit	0.0007	0.00062	0.0000072	1.7
Aquatic Biota Cold Water Standard[5]			*0.005*	*0.005*	*0.005*	
Sediment Upper Confidence Limit[6]						*2.3*

Station Number	Drainage	Description	Cadmium Concentrations in Water/ Cold Water Criteria (mg/l)[7]		Cadmium Concentrations in Sediments (mg/kg)
			May 1998	September 1998	September 1998
ST001	Portneuf River	Downstream of Bakers Creek	0.00047/*0.0029*	0.00058/*0.0028*	2.5
ST004		Upstream of U Creek	0.0019/*0.0023*	0.0018/*0.0022*	2.4
ST013	Ross Fork	Downstream of Danielson Creek	0.0021/*0.00098*	-0.00061/*0.0014*	2.5
ST015		Upstream of South 40 Unit	0.0035/*0.0030*	-0.0012/*0.0031*	5.7
ST031	Lincoln Creek	Downstream of Dry Hollow Creek	0.0030/*0.0033*	-0.00013/*0.0031*	5.7
ST033		Upstream of North Limb Unit	0.0040/*0.0025*	0.00029/*0.0023*	3.1
Sediment Upper Confidence Limit[6]					*8.8*

Explanation
1—Sample location shown on Figure 2-1
2—mg/l is milligrams per liter, which is equal to parts per million
3—mg/kg is milligrams per kilogram, which is equal to parts per million
4—NA is not analyzed
5—Aquatic Biota Cold Water Standard for Selenium as established by EPA
6—Upper confidence limit based on the 95% upper confidence limit on the 95th percentile of the background data (Montgomery Watson, 1999a)
7—Cold water criteria is a hardness dependent value (Montgomery Watson, 1999a).

Table 2-2. Summary of Pit Lake Sampling Data for 1998 at the Gay Mine, Fort Hall Region, Idaho

Station Number[1]	Facility Type	Facility Name	Selenium Concentrations in water (mg/l[2])			Selenium Concentrations in Sediments (mg/kg[3])
			September 1997	May 1998	September 1998	September 1998
SP025	Stock Pond	Gay Mine W Pit Lake	0.0004	0.00052	0.00081	1.2
SP026	Stock Pond	Gay Mine Z Pit Lake	0.06	0.055	0.062	17
SP027	Stock Pond	Gay Mine JD Pit Lake	NA[4]	0.052	0.059	17
Aquatic Biota Cold Water Standard[5]			*0.005*	*0.005*	*0.005*	
Sediment Upper Confidence Limit[6]						*2.3*

Station Number	Facility Type	Facility Name	Cadmium Concentrations in water/ Cold Water Criteria (mg/l)[7]		Cadmium Concentrations in Sediments (mg/kg)
			May 1998	September 1998	September 1998
SP025	Stock Pond	Gay Mine W Pit Lake	0.0035/*0.0020*	0.0036/*0.0024*	6.4
SP026	Stock Pond	Gay Mine Z Pit Lake	0.0023/*0.0024*	0.0014/*0.0022*	32
SP027	Stock Pond	Gay Mine JD Pit Lake	0.0052/*0.0032*	0.00084/*0.0030*	32
Sediment Upper Confidence Limit[6]					*8.8*

Explanation

1—Sample location shown on Figure 2-1

2—mg/l is milligrams per liter, which is equal to parts per million

3—mg/kg is milligrams per kilogram, which is equal to parts per million

4—NA is not analyzed

5—Aquatic Biota Cold Water Standard for Selenium as established by EPA

6—Upper confidence limit based on the 95% upper confidence limit on the 95th percentile of the background data (Montgomery Watson, 1999a)

7—Cold water criteria is a hardness dependent value (Montgomery Watson, 1999a).

Table 2-3. Summary of Waste Dump Soil Sampling Data for 1998 at the Gay Mine, Fort Hall Region, Idaho

Station Number[1]	Facility Type	Facility Name	Selenium Concentrations in soil (mg/kg[2])	Cadmium Concentrations in soil (mg/kg[2])
WD-19-1	Waste-Rock Dump	Gay Mine North Limb O/P Fill	7.2	26
WD-19-2	Waste-Rock Dump	Gay Mine North Limb O/P Fill	15	44
WD-19-3	Waste-Rock Dump	Gay Mine North Limb O/P Fill	22	44
WD-19-4	Waste-Rock Dump	Gay Mine North Limb O/P Fill	8.7	40
WD-19-5	Waste-Rock Dump	Gay Mine North Limb O/P Fill	16	35
WD-31-1	Waste-Rock Dump	Gay Mine East Limb Dump 4E	18	65
WD-31-2	Waste-Rock Dump	Gay Mine East Limb Dump 4E	2.3	15
WD-31-3	Waste-Rock Dump	Gay Mine East Limb Dump 4E	31	76
WD-31-4	Waste-Rock Dump	Gay Mine East Limb Dump 4E	10	37
WD-31-5	Waste-Rock Dump	Gay Mine East Limb Dump 4E	1.8	19
WD-34-1	Waste-Rock Dump	Gay Mine East Limb Dump 19	33	41
WD-34-2	Waste-Rock Dump	Gay Mine East Limb Dump 19	17	64
WD-34-3	Waste-Rock Dump	Gay Mine East Limb Dump 19	17	72
WD-34-4	Waste-Rock Dump	Gay Mine East Limb Dump 19	17	77
WD-34-5	Waste-Rock Dump	Gay Mine East Limb Dump 19	11	63
Background Station Samples[3]		*Upper Confidence Limit[4]*	*8*	*23*

Explanation
1—Sample location shown on Figure 2-1
2—mg/kg is milligrams per kilogram, which is equal to parts per million
3—Sample locations outside area of potential impact
4—No promulgated standard, value represents 95% confidence limit on the 95th percentile of background data (Montgomery Watson, 1999a)

- outflow from the current pit lakes. Groundwater analyses should be the same as those for the pit lake water. These wells would also serve for post reclamation monitoring.

2.3.2 Characterization of Backfill Material

The characterization of backfill material may be necessary in order to predict water quality in the reclaimed pit. Based on data collected in conjunction with the Selenium Working Groups regional investigation, it appears that backfilling and submerging of waste shale material into pit water decreases the potential for oxidation and mobilization of selenium in the backfill. This approach also allows for recovery of waste shale overburden from nearby dumps and consolidation as pit backfill. In area plant uptake, non-shale material would be used as growth medium over the pit water backfill. The choice of backfill material will require further evaluation given that the degree of weathering of waste shale material is expected to vary depending upon the age of the material. Extraction tests of overburden material (e.g., SPLP procedure) may be warranted to provide an estimate of pit lake water quality following backfilling.

2.3.3 Predicting Water Quality Following Partial Backfill and Reclamation

There are two potential approaches for characterizing water quality associated with partial backfill and reclamation:

- Develop a detailed hydrogeochemical model of groundwater-backfill interaction for the purpose of predicting interstitial water quality. Such a model will require data regarding the geochemistry and lithologic distribution of fill in each pit.
- The second option is to sample groundwater from historically backfilled pits to assess actual quality.

The sampling and analysis of groundwater in the backfilled portion of existing reclaimed pits provides actual data representative of in-situ geochemical interactions. Based on discussions with former mine personnel, there are several reclaimed pits that would be expected to have water within the backfill material. It may be possible to sample several pits, each representing a different backfilling period. Knowledge of lithology is important so that water quality in the pit can be correlated with rock type. This information will be valuable in designing final partial backfill for the four pits described in Section 3.0.

For the Dry Valley EIS evaluation for backfilling pit lakes, this approach was used by completing a monitoring well into backfilled Pit B. In addition, there were several upgradient and downgradient monitoring wells. The data from this study indicated that water within the pit backfill exceeded MCLs for antimony, cadmium, and nickel. Secondary MCLs were exceeded for TDS, sulfate, and manganese. Selenium ranged from 8 to 43 μg/l, below the MCL of 50 μg/l. It was concluded from the EIS that as water migrates from the pit, chemical constituents would be subject to dilution and attenuation mechanisms. These factors will likely be sufficient to reduce concentrations of constituents in groundwater to levels that meet water quality standards.

This experience suggests that this approach could provide useful information for predicting water quality in partially backfilled pits.

2.3.4 Amendments to Partial Backfill

If water quality in proposed reclaimed pits becomes a concern, the addition of an organic amendment to the pit lakes during backfilling operations may be a viable option. The addition of such an amendment enhances reduced conditions (low oxygen) thus favoring the removal of selenium and other metals from solution. This approach has been implemented at several hard rock mines where anoxic conditions were desired to remove oxidation of sulfide bearing waste rock. The University of Idaho in cooperation with Simplot is currently conducting research using organic amendments for surface water treatment of selenium.

2.4 Summary

The general approaches toward pit lake reclamation described in Sections 2 and 3 are consistent with the Best Management Practices (BMPs) that have been developed by the Selenium Working Group. The purpose of the BMPs, and the pit lake reclamation strategies described herein, is to address and control the release of selenium into the environment. In addition, the significant reclamation efforts made by Simplot and FMC at the Gay Mine are consistent with BMP recommendations presented by the Selenium Work Group in the document, Draft Existing Best Management Practices at Operating Mines, December 1999 (prepared by Montgomery Watson).

Section 3.0
Pit Reclamation Strategies

The following pits were evaluated for partial backfilling and reclamation:

- OP Pit
- A-12 Pit
- JF Pit
- Z Pit

Based on sampling activities, it is anticipated that OP Pit, A-12 Pit, JF Pit, and Z Pit have elevated levels of selenium (Montgomery Watson, 1999a). General reclamation strategies for each pit are presented below. Methodology and general assumptions used for pit backfill volume calculations are also described below.

3.1 Methodology and General Assumptions

Brown and Caldwell was unable to locate as-built reclamation drawings and survey data for the study pits as they exist today. Some of the last pit maps for Z and A-12 Pits were used to estimate the final pit dimensions, but it still did not provide a plan of how the pits were reclaimed.

The preliminary design criteria considered and include input from all of the following areas.

- A design that is consistent with and takes into account the remaining items of reclamation listed in the May 1998 letter to Appenay. (Appendix).
- Minimization of land disturbance in either the cut or fill areas.
- Revegetation of all redistributed areas with the seed mix that has been recommended by the work of the Selenium Study.
- Optimization of cuts and fill areas to balance the onsite work functions.
- Location of fill borrow areas that's efficient for construction practices and that provides proper material characteristics.
- Best engineering practices for each specific area.
- All considerations focused on immediate results that provide long term solutions.
- Eventually arriving at an overall plan that will return all lands back to the full control of the owners.

Brown and Caldwell inspected each pit and made visual estimates of pit dimensions and visual estimates on the availability of fill material. The on-site inspections were also useful in appreciating the unique setting of each area and the realization that each pit requires its own specific plan. More detailed surveys will be required to support a more detailed reclamation design.

3.2 OP Pit Area

This investigation focused on the OP-Pit, also referred to as the P-Pit. The visit to the P Pit area also allowed review of the K, R, C and O-Pits. Photos were taken of the pits, though selenium concerns are primarily limited to the P Pit. The area is shown in Photos 3.2-1 through 3.2-13 and Drawing P. The area is at the northern end of the North Limb and represents the northern extent of mining. Lincoln Road and Blackfoot can be seen from the northwest end of the P Pit. The P Pit has water in the bottom with evidence of water level fluctuations throughout the year. There was also evidence of livestock and wildlife access in the area.

Photograph No. 3.2-1
O Pond looking to P Pit
3/2/00

Photograph No. 3.2-2
Small trapped pond at O Area. No outlet. Water area for cows.
3/2/00

Photograph No. 3.2-3
P Pit and pond
3/2/00

Photograph No. 3.2-4
P Pit from NW end
3/2/00

Photograph No. 3.2-5
P Pit NE wall
3/2/00

Photograph No. 3.2-6
P Pit NE wall from SE end
3/2/00

Photograph No. 3.2-7
P-Pit looking from NW end looking SE
3/2/00

Photograph No. 3.2-8
P Pit from above
3/2/00

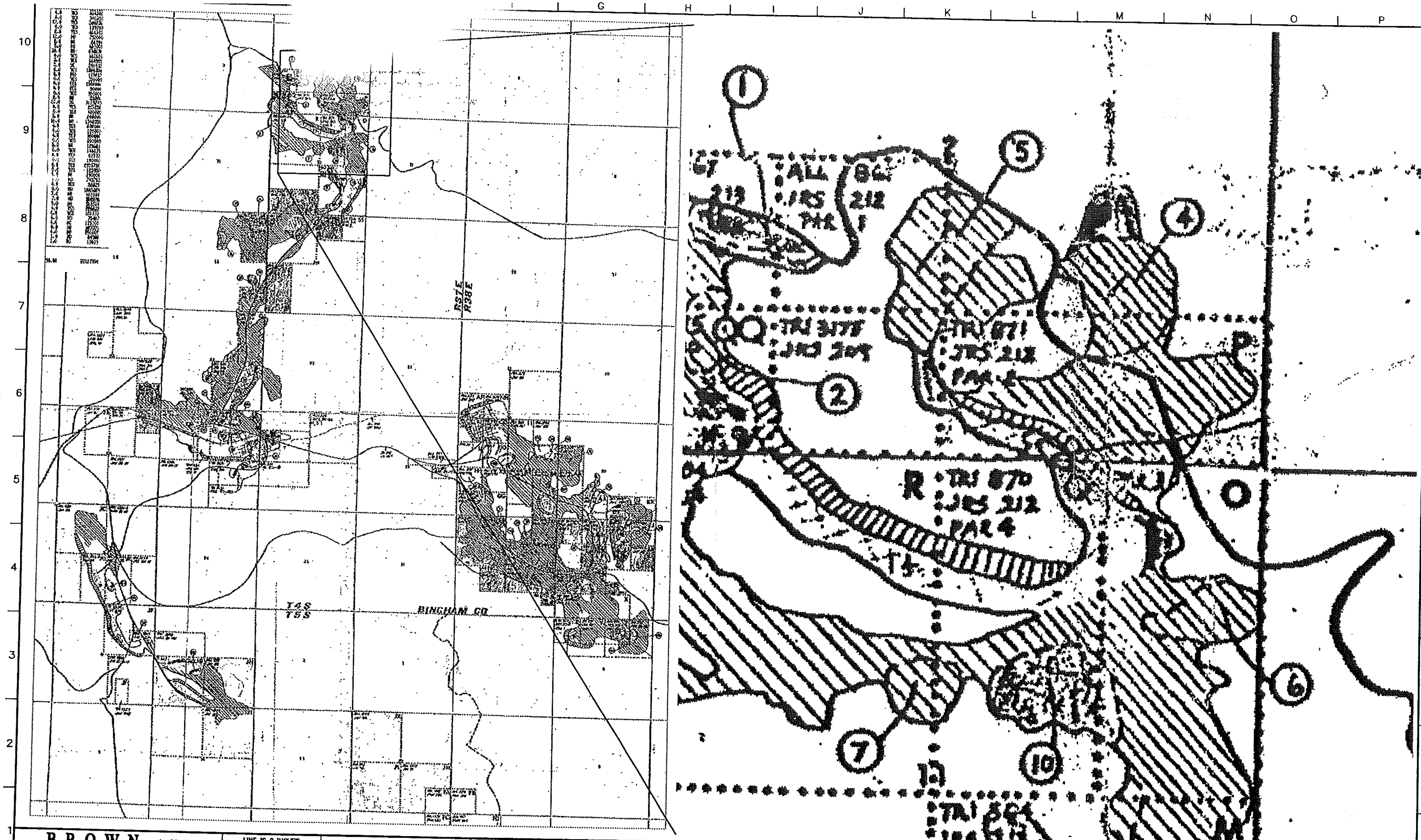
Photograph No. 3.2-9
P Pit SE end from above
3/2/00

Photograph No. 3.2-10
P Pit from above
3/2/00

Photograph No. 3.2-11
P Pit looking NW as potential drainage area
3/2/00

Photograph No. 3.2-12
Lincoln Road from NW end of P Pit
3/2/00

Photograph No. 3.2-13
NW to Blackfoot potential drainage from P Pit
3/2/00



BROWN AND CALDWELL

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REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.

O-P PITS LOCATION MAP FROM GAYMINE RECLAMATION MAP APRIL 2000

DATE 04/11/00
CADFILE F1874117
OPERATOR TBL
CLIENT FILE NUMBER
DRAWING NUMBER P
SHEET NUMBER

The O Pit has been reclaimed and has a small pond that is accessed by livestock. The pond is in a low lying area where stormwater appears to accumulate. Pond volume appears to seasonally fluctuate. It has not been determined whether this pond water has elevated selenium concentrations. If future sampling defines a problem, then the pond can be easily filled from the surrounding material. The general observation is that the water in the pond is on reclaimed material and is not in contact with the selenium bearing material. If this pond has selenium below regulatory aquatic standards, then it should be left as a water source for livestock and wildlife.

The P Pit pond samples have shown elevated levels of selenium and the reclamation may include a system that eliminates the pond or covers the selenium bearing seams. The pit has two highwalls with seam outcrops on the north wall. Several options were considered and are described below.

Option 1 — Fill Above the Exposed Seams

This option is based on the premise that the seams that are visible on Photos 3.2-3 and 3.2-5 will need to be covered with fill material and the top layer of the fill compacted to reduce infiltration of water. The height of the fill required to cover the seams and leave the final slope at a 3:1 angle will raise the floor level of the pit such that the water may drain out to the northwest and no pond will occur in the pit. The water will follow the natural drainage and join Lincoln Creek (see Photos 3.2-11, 12, and 13). Another alternative would be to drain this water away from Lincoln Creek and establish a stormwater retention structure. The final fate of this water would depend partly on predicted water quality.

The method of filling would be to add fill to the bottom of the pit until a 3:1 slope could be developed to cover the seams. In this option, the fill will be pushed from the north highwall into the pit using dozers. The material of the highwall may need to be ripped or even blasted to enable the dozers to move the amount of fill necessary. An average push distance of 250 feet was assumed for this option. The other required work for this option includes revegetation of the fill and borrow areas and the development of the drainage ditch in the new pit bottom.

The summary of the functions specific to this option is as follows:

- Ripping and minimal blasting
- Dozer pushing from the north highwall
- Revegetate the fill/borrow areas
- Develop the drainage ditch

Option 2 — Drill, Load and Cast Blast the North Highwall

The configuration of the north highwall may allow the use of cast blasting technology. In this option, the north highwall would be drilled and cast blasted into the P Pit. The material would be shaped using a dozer (approximately 40,000 loose cubic yards (lcy)) and the blasted/fill areas will be revegetated. A drainage ditch would be developed in the new pit bottom to convey water to the Lincoln Creek drainage or to a retention pond. The summary of the functions specific to this option is as follows:

- Drill, load and blast the north highwall
- Dress and slope with a dozer
- Revegetate the fill/blast areas
- Develop the drainage ditch

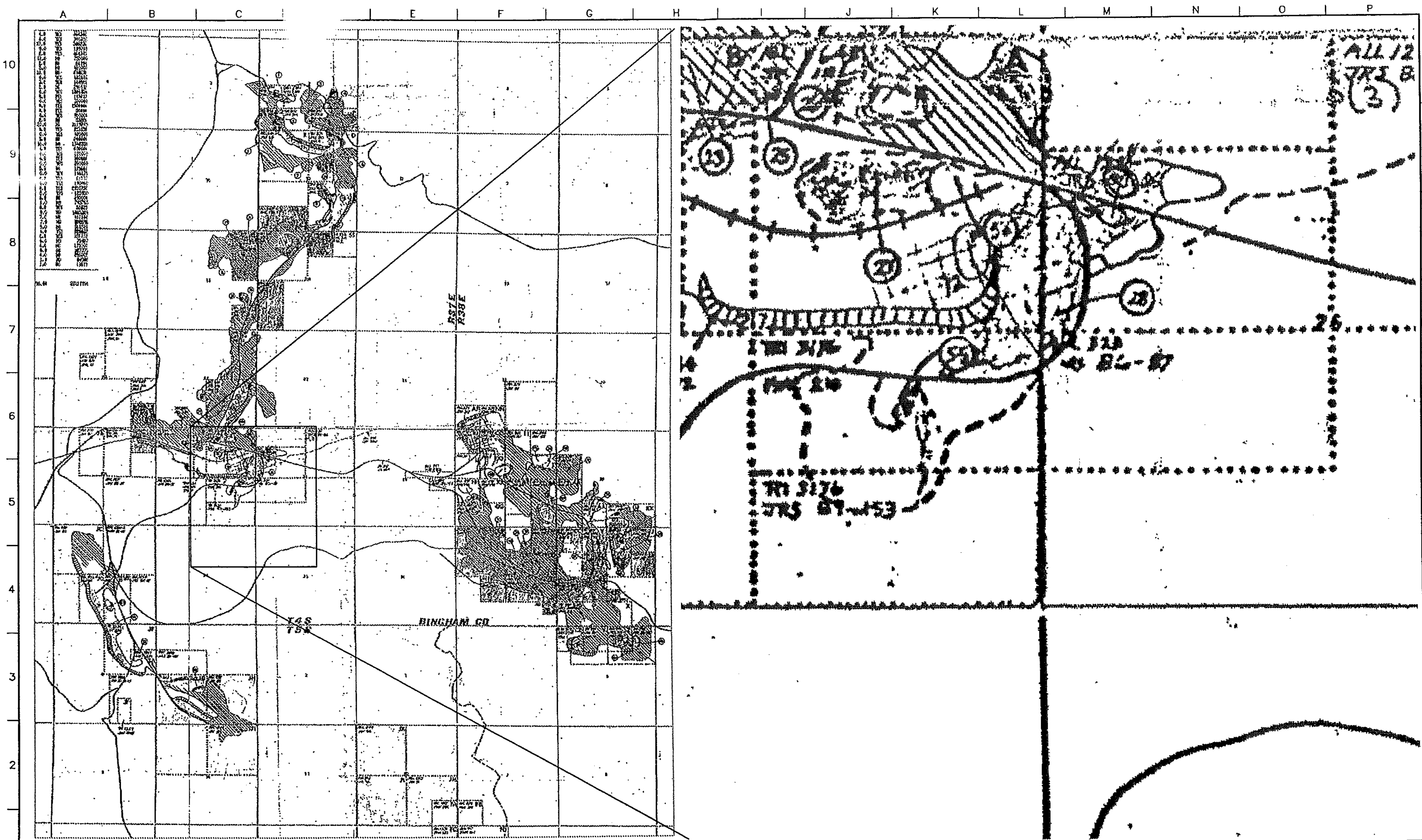
Option 3 — Fencing

Installation of a wildlife fence above the high-water line of the pond. This does not mitigate the selenium concerns within the pond, but keeps livestock and large grazing wildlife away from the water.

3.3 The A-12 Pit Area

The A-12 Pit area is shown on Photo 3.3-1 and Drawing A 12. This pit is close to the Mine Camp facilities and has a very large pond in the eastern area of the pit. The water level of the pond varies seasonally. The water sources for this pond are from spring fed ponds to the east of A-12 and

Photograph No. 3.3-1
A 12 Pit
3/2/00



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ZONE	REV.	DESCRIPTION	BY	DATE	APP.

A12 PIT LOCATION MAP FROM GAYMINE RECLAMATION MAP APRIL 2000

DATE 04/11/00
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OPERATOR TBL
CLIENT FILE NUMBER
DRAWING NUMBER A12

water seeps along the east and south highwalls. The flow into the A-12 pond has caused erosion features in the east and north highwalls.

The reclamation for the area was completed to an approved plan, but some of the water inflows to the pond have caused erosion problems that can be mitigated. Many of these specific corrections were being addressed between Simplot and FMC and BIA/BLM in the negotiations from 1995 through 1998. The 1997 Selenium Sampling Study found that the water in the A-12 Pit pond contained elevated levels of selenium The A-12 pond contains approximately 44.5 to 89.0 million gallons of water depending on the time of the year. This volume of water is a major complication for any type of backfilling plan. The backfill volumes for even part of the required fill can not be obtained from pushing from the surrounding highwalls. Furthermore, pushing from the highwalls is less desirable due to the wet area in the south highwall where the majority of material is located. During the mining and reclamation work, the mining operations could not work equipment in the south highwall area and often had large dozers partially buried in the mud.

Another complicating factor is that the Sho-Ban Tribes' intended use for the Mine Camp area is for recreational purposes. Thus, any major work around the perimeter of A-12 must be sensitive to the Tribe's intended use of the Mine Camp area. The water from the spring fed ponds above A-12 is good quality and only comes in contact with the selenium bearing material when it runs into A-12. Diversion of this water would allow use down stream and reduce the amount of water in the pond. In fact, the water from the springs previous to mining flowed out past the Mine Camp area and into the natural drainage.

Several options were developed for mitigation of the A-12 pit.

Option 1 — Backfill Above the Seams, Divert the Water and Compact

This option essentially places a compacted fill in the pond bottom that will keep the water from contacting selenium bearing material. The volume of water in the pond complicates this backfilling process. Another problem is the amount of fill required to cover the seams. The continuing flow of water into the pit pond from the ponds above plus the water from the seeps in the south highwall also impacts the option.

The execution of this option requires that the inflowing water be diverted and the water in the A-12 pond be removed prior to the backfill operation. This option will also require that the material for the backfill be hauled from approximately 3,000 feet from the south. The material in the waste pile to the south and near the old gravel pit seems an appropriate source of fill, but sampling and Procter testing will be required before this material is used.

The sequence of work would be:

- Build a permanent ditch that will divert the water from the ponds above A-12 and carry the water beyond the Mine Camp. A pond could also be constructed in the Mine Camp area for livestock and/or recreational use be consistent with others
- Pump the water in A-12 to the C Pit for holding until the backfilling is complete
- Build the haul road
- Place the backfill and shape the new bottom of the pond
- Compact the top layer of the backfill
- Dress up the highwalls, the haul roads and the borrow areas
- Pump the water back from the C Pit
- Revegetate all the effected areas
- Fence as required

The pumping of water out of the pit into another pit and then back to the A-12 pit will require further evaluation based on water quality data. Other alternatives for water discharge, such as treatment and direct discharge into nearby drainages or land application of water, should also be considered.

Option 2 — Divert Water and Fence

Photograph No. 3.4-1
NE Side of J culverts fix or pull out for fill
3/2/00

Photograph No. 3.4-2
NE side of J culverts fix or use for fill
3/2/00

Photograph No. 3.4-3
SW side of J culverts fix or use for fill
3/2/00

Photograph No. 3.4-4
SW side of J culverts
3/2/00

Photograph No. 3.4-5
JF Pit Waste Dump use to fill lower part of pond
3/2/00

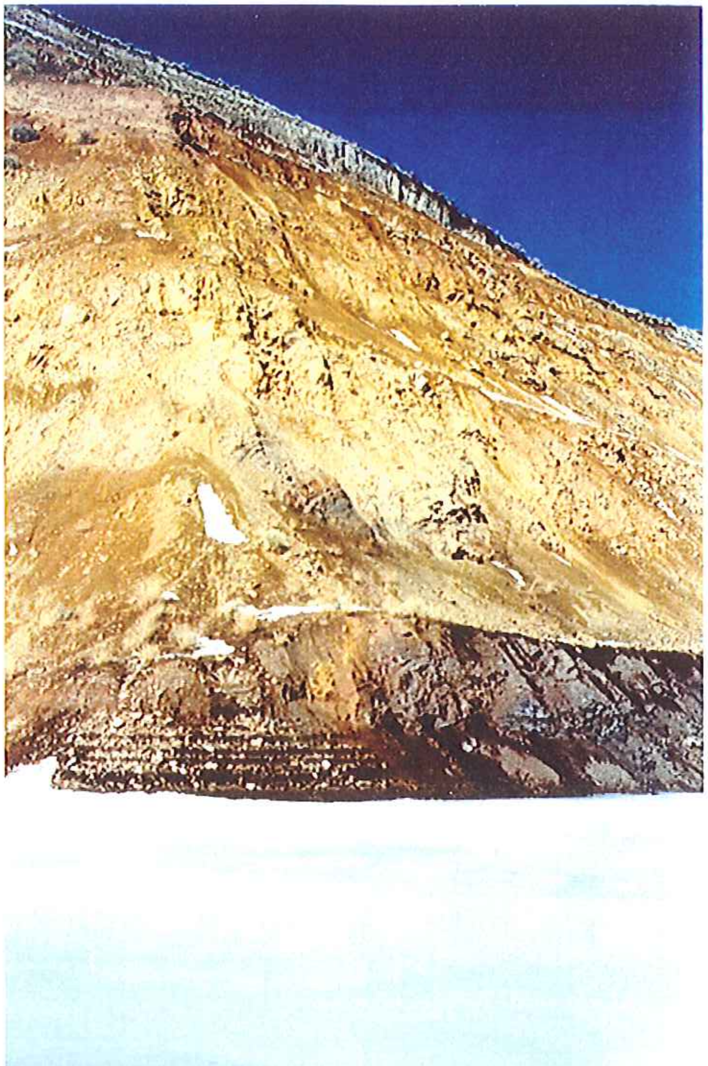
Photograph No. 3.4-6
JF Pit Pond
3/2/00

Photograph No. 3.4-7
JF fill area-push to bottom
3/2/00

Photograph No. 3.4-8
Barren Material "Plug" JF Pit
3/2/00

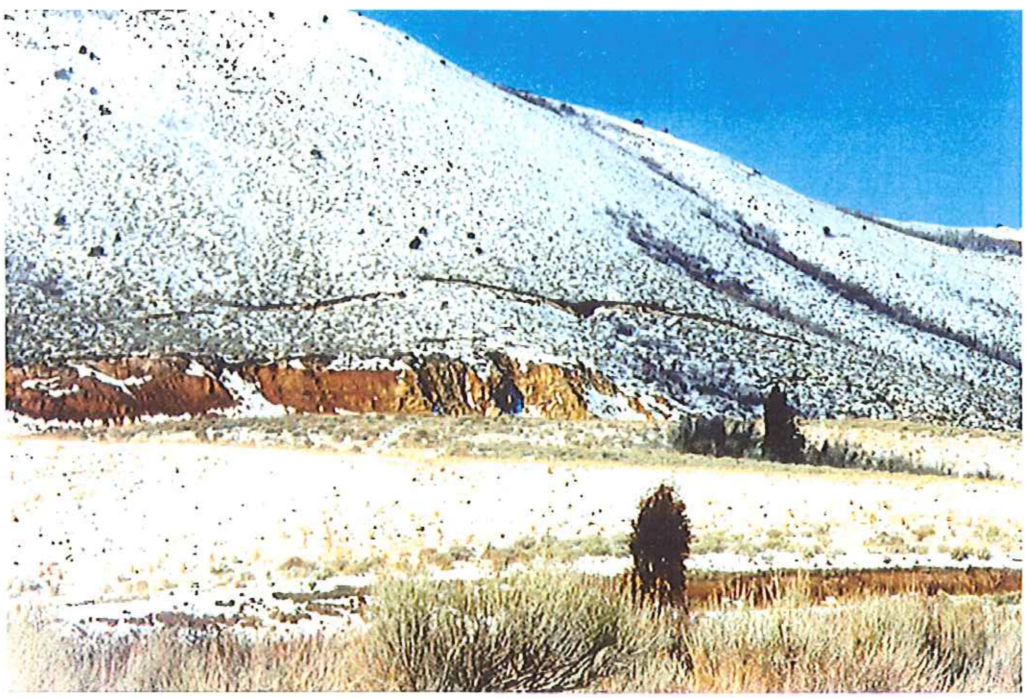
Photograph No. 3.4-9
NW looking up along J Pit
3/2/00

Photograph 3.4-10
Looking N. into JF Pit
3/2/00



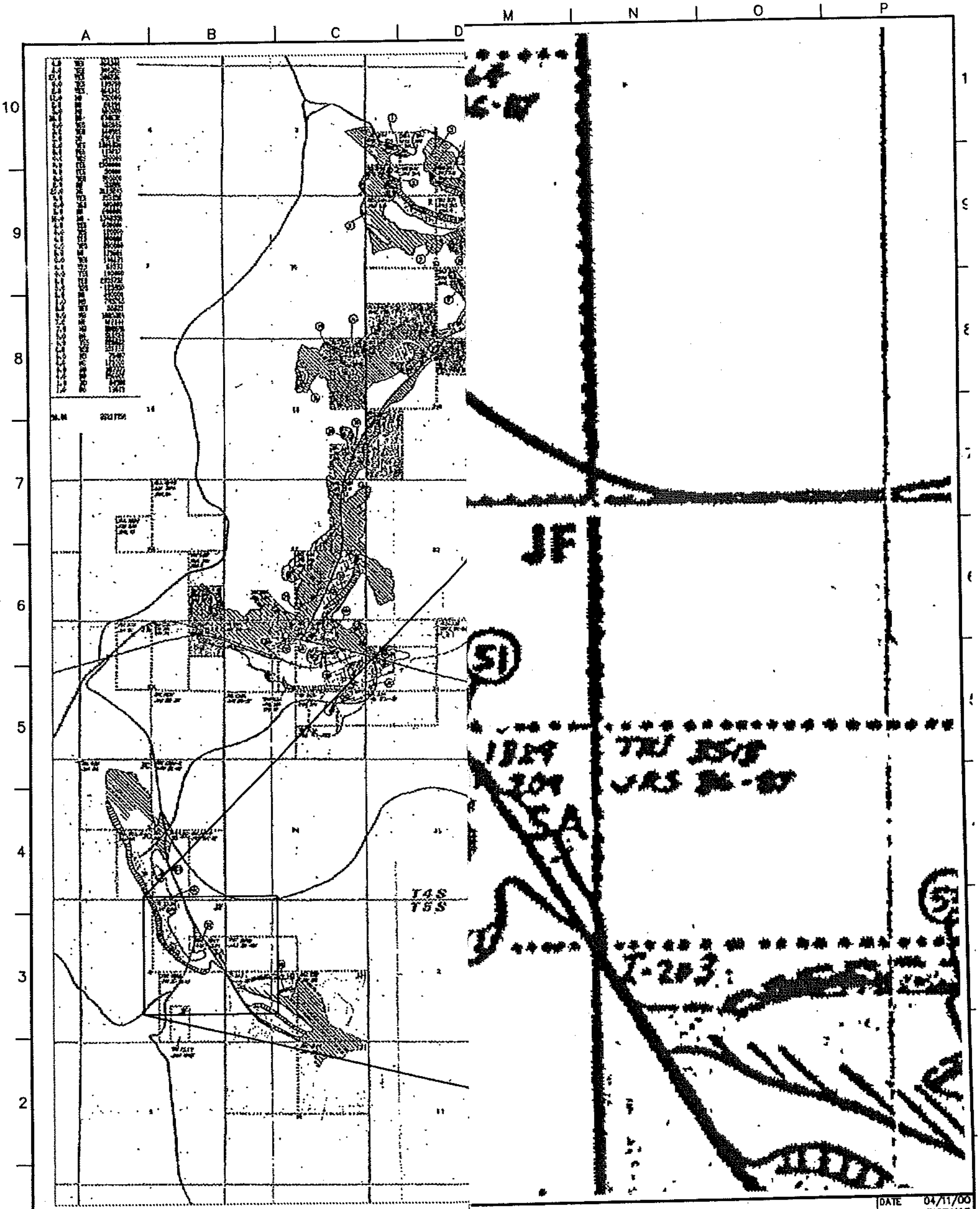
Photograph No. 3.4-11
JF Pond fault area-raises seam material 25' above other areas
3/2/00

Photograph No. 3.4-12
West side of J Pits
3/2/00



Photograph No. 3.4-13
West of J Pits
3/2/00

Photograph No. 3.4-14
West side of J Pits
3/2/00



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JF PIT LOCATION MAP FROM GAYMINE RECLAMATION MAP APRIL 2000

DATE 04/11/00
CADFILE F1874115
OPERATOR TBL

CLIENT FILE NUMBER

DRAWING NUMBER

JF

SHEET NUMBER

The large area of the A-12 Pond and the large volume of required backfill may be offset by diverting the inflowing water, dressing up the highwalls and fencing the perimeter of the high-water level. If the major source of water for the A-12 pond is diverted, the level of the pond should decrease (the remaining water source would be seeps). It is possible that the pond may dry up during part of the year and that fencing could be used to keep large grazing wildlife and livestock away from remaining water. A complication of this approach is that evaporation of pond water may take a long period of time. Therefore, the fencing would need to extend beyond the current high-water line in order to keep the stock away until the water level drops.

The required steps to complete Option 2 are:

- Divert the water from the upper ponds.
- Dress up the erosion channels in the highwall.
- Fence around the perimeter and south highwall.
- Revegetate as required.

3.4 The JF Pit Area

The South 40 or the J Series pits were one of the last areas to be mined. The mining and reclamation methods were consistent with the other mining areas, essentially the previous pit was backfilled using overburden from the active pit. The JG area was reclaimed, but the haul road and associated culverts were left in place. The final pit, in a long series of pits, was the JF Pit. The JF Pit pond contains water that was shown to have elevated levels of selenium content when sampled in 1998. Photos 3.4-1 through 3.4-14 and Drawing JF show the location of the JF Pit and illustrate the current conditions of the area.

Previous discussions with the BIA/BLM outlined their concerns with the JF highwalls and the erosion on the haul road near the culverts. Both of these areas are shown in the photos. An area at the north end of the JF Pit was left with a slope steeper than 3:1 plus some of the material on the face of the existing slope may contain selenium-bearing material. Filling assumes using selenium bearing material (waste shales) for lower fill and covering this material with "clean" fill material. The existing slope should be reduced for any option that is selected.

Option 1 — Backfill Above the Selenium Bearing Material and Fix the Culvert Area

Much of the fill material required to cover the selenium bearing zones may be available near the pit. The north end of the pit will provide approximately 40,000 lcy of fill and another 20,000 lcy may be available on the east and southwest sides of the pit. The total required fill is approximately 150,000 lcy, resulting in the need for an additional 90,000 lcy of material.

This option requires that the material from the haul road and culvert area be hauled approximately 3,000 feet and used as the remainder of the fill for JF Pit. Culverts and haul roads would be reclaimed to allow the natural drainage of Willow Creek to be redeveloped. The sequence of work would be:

- Push the selenium bearing material from the north end of the pit into the bottom of the existing pond.
- Push the non-selenium bearing material from the north, east, and southwest sides of the pit to cover the bottom of the pond.
- Transport the fill material from the haul road and place it in the pond to cover the selenium bearing seams.
- Reclaim the fill and borrow areas.

As mentioned, this option solves several of the existing concerns of the stakeholders by covering the pond, reducing the slope, reduction of some parts of the highwalls and removing the culverts. The final gradient of the pit bottom may be high enough to eliminate the pond and provide a drainage path through the pits.

Option 2 — Push Fill from the North End and Cast Blast from the East Wall

The idea of reducing the highwall by cast blasting has been discussed for the J Series Pits (field notes from site visit with BLM/BIA and Larry

Raymond). This discussion suggested that the material in the east highwall is not consolidated enough for cast blasting. Excavation of material from the west highwall would likely result in slope failure (Photos 3.4-12 through 3.4-14). The east highwall has some loose material on the top and at the toe of the slope within the pit. Cast blasting is not effective when the material is loose or there is loose material at the toe of the slope. The cast blasting option may be effective if the loose material is removed from the top and toe. The merits of this option requires an evaluation by a blasting contractor. The work sequence for this option is:

- Push the fill from the north end of the pit to the west side of the pond.
- Push the loose material from the east side and toe of the slope off the solid rock in the east highwall.
- Cast blast the east highwall into the pit.
- Dress all areas with dozers.
- Reclaim the fill, blast and borrow areas.

Obtaining onsite input from blasting experts would be useful and possibly may make this the option of choice for this pit. The cast blasting option does not fix the problem with the haul road and culverts. The final configuration of the pit may eliminate the pond and provide access along the pit bottom.

Option 3 — Push Fill from North End and Fence

This option is similar to the fencing options for the other areas except that the material in the north is re-sloped to a 3:1 gradient to comply with the Reclamation Plan. It has the problem of fence maintenance and will not keep all wildlife out. The sequence for this option is:

- Push the fill in the North to 3:1 slope
- Fence the perimeter (approximately 1,540 feet)

3.5 The Z Pit Area

The Z Pit is located on the eastern boundary of the Gay Mine leases. The physical appearance is presented in Photos 3.5-1 through 3.5-10 and Drawing Z. The pit bottom is mostly covered with water and the sides of the pit are a combination of rock highwalls and fill material. The west side has a large fill area that is dumped at the angle of repose (Photo 3.5-2) with exposed seams (Photo 3.5-8). The circumference of the pond is approximately 1,021 feet and the top of the seam on the west side is 45 feet above the water level. On the east side, the seam is covered by fill material, but the seam is probably 10 feet above the water level.

The potential fill sources for the pit are the chert beds above the seam on the west and the fill areas on the east and south. If there is insufficient material on the highwalls, then material will need to be hauled approximately 3,000 feet and placed in to the pit bottom. The water will need to be pumped out of the pit bottom prior to backfilling.

Option 1 — A 3:1 Slope on the West and 12 foot cover on the East

The pit bottom and fill zones volumes were estimated from a final pit profile map that was generated by the Gay Mine. The profile was assumed to be the final mined levels and the fill was calculated by splitting the fill area into two halves and using end area geometry for the volumes. The actual volumes of fill may be less when the actual dimensions can be calculated from survey data or new maps. Reductions in fill volumes may allow all of the required material to be pushed in from the highwalls or at least reduce the volume that needs to be hauled to the pit.

The sequence of work for this option would be:

- Pump the water to the Y Pit for holding until backfill is complete.
- Push the material from the west highwalls to develop a 3:1 slope that starts above the seams.
- Load, haul and place the east side fill.
- Compact the top 1-foot of fill in the pond bottom.
- Pump water back from Y Pit.
- Revegetate all borrow and fill areas.

Option 2 — All Dozer Pushing from the Highwalls

This option assumes that pushing with dozers can move in all the required material. The average push length becomes 300 feet and there is still a need to remove the water prior to backfilling. The work sequence would be:

- Pump the water to Y Pit for storage.
- Push the 132,000 lcy from the west side of the pit.
- Push the remainder of the fill from the east and south highwalls and then Revegetate all areas.
- Compact the top 1-foot of the fill area.
- Pump the water back from the Y Pit.

Option 3 — Fencing the Area

Again, the option is to fence off the pond area and dress up the erosion areas with dozers.

Photograph No. 3.5-1
Z Pit from north extenstion
3/2/00

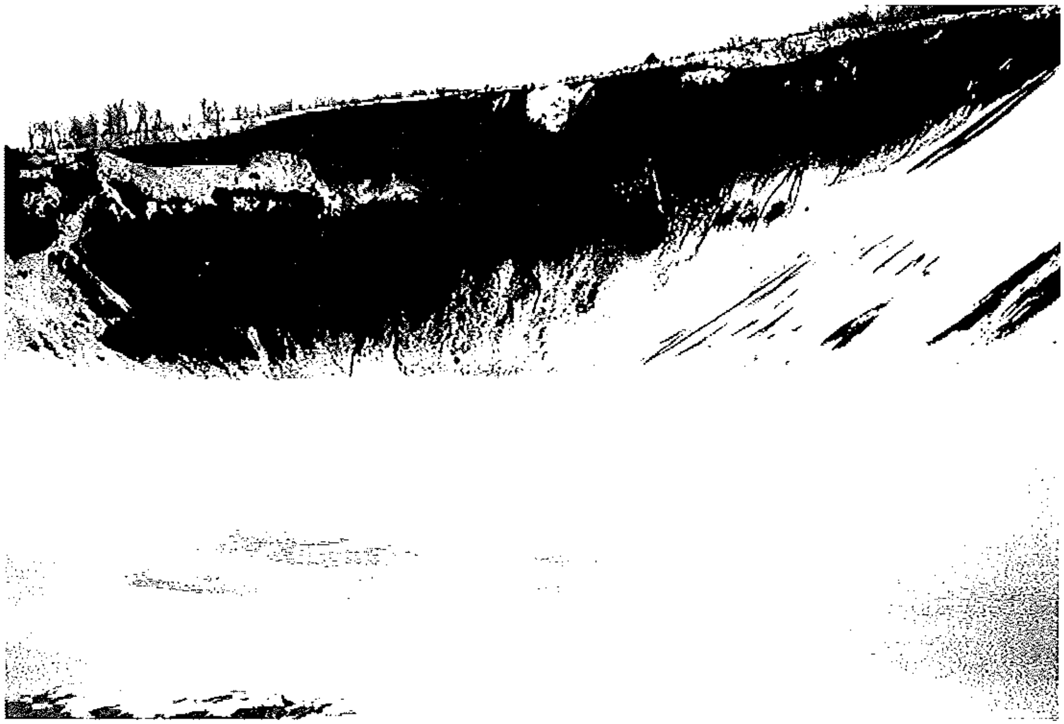
Photograph No. 3.5-2
Z Pit looking west to Y pits
3/2/00

Photograph No. 3.5-3
Millshale pile on east side of Z Pit
3/2/00

Photograph No. 3.5-4
Z Pit looking west at back-fill wall
3/2/00

Photograph No. 3.5-5
Z Pit shows seam in west high wall
3/2/00

Photograph No. 3.5-6
Z Pit south wall
3/2/00



Photograph No. 3.5-7
Z Pit looking south from north edge of water level
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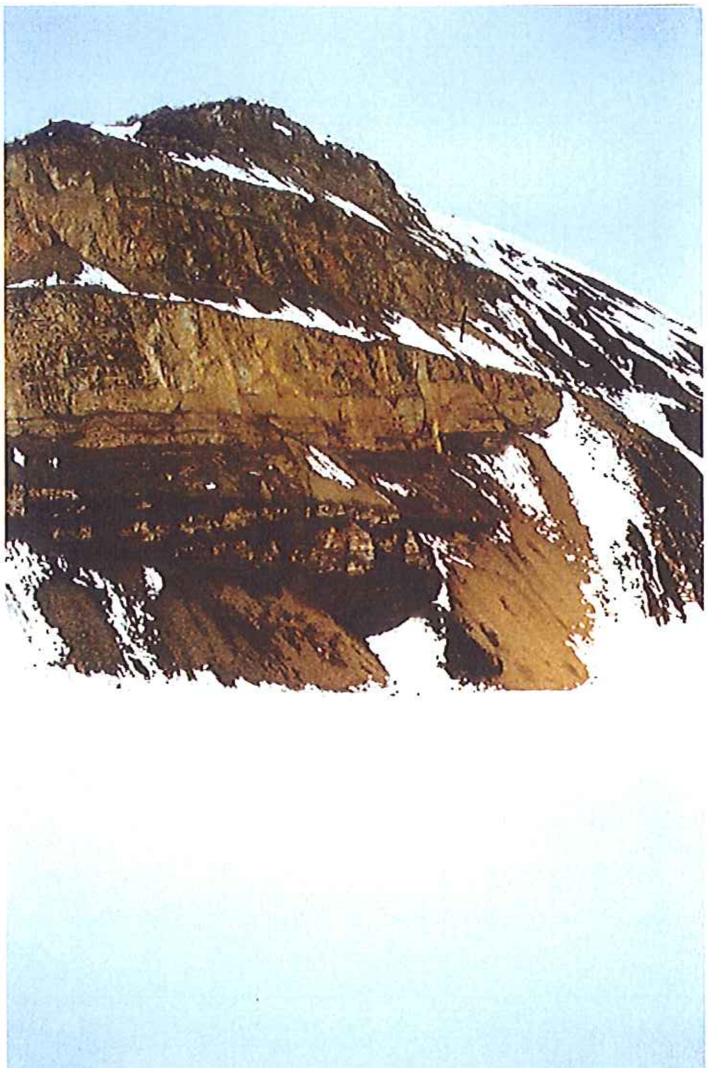
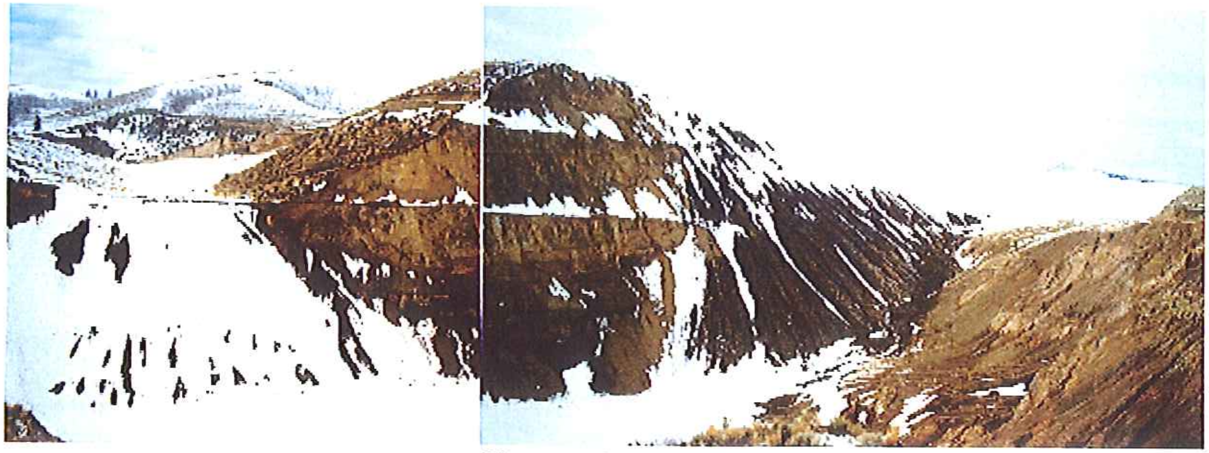
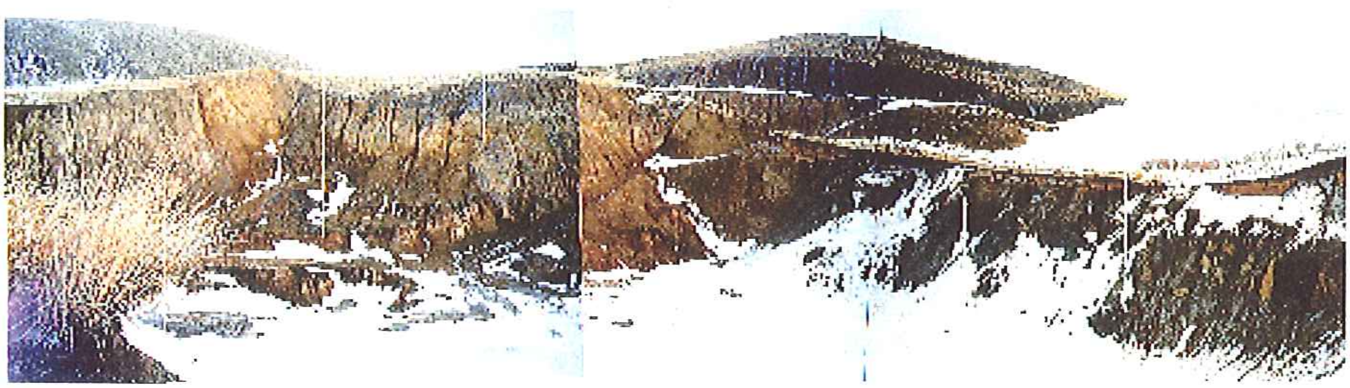


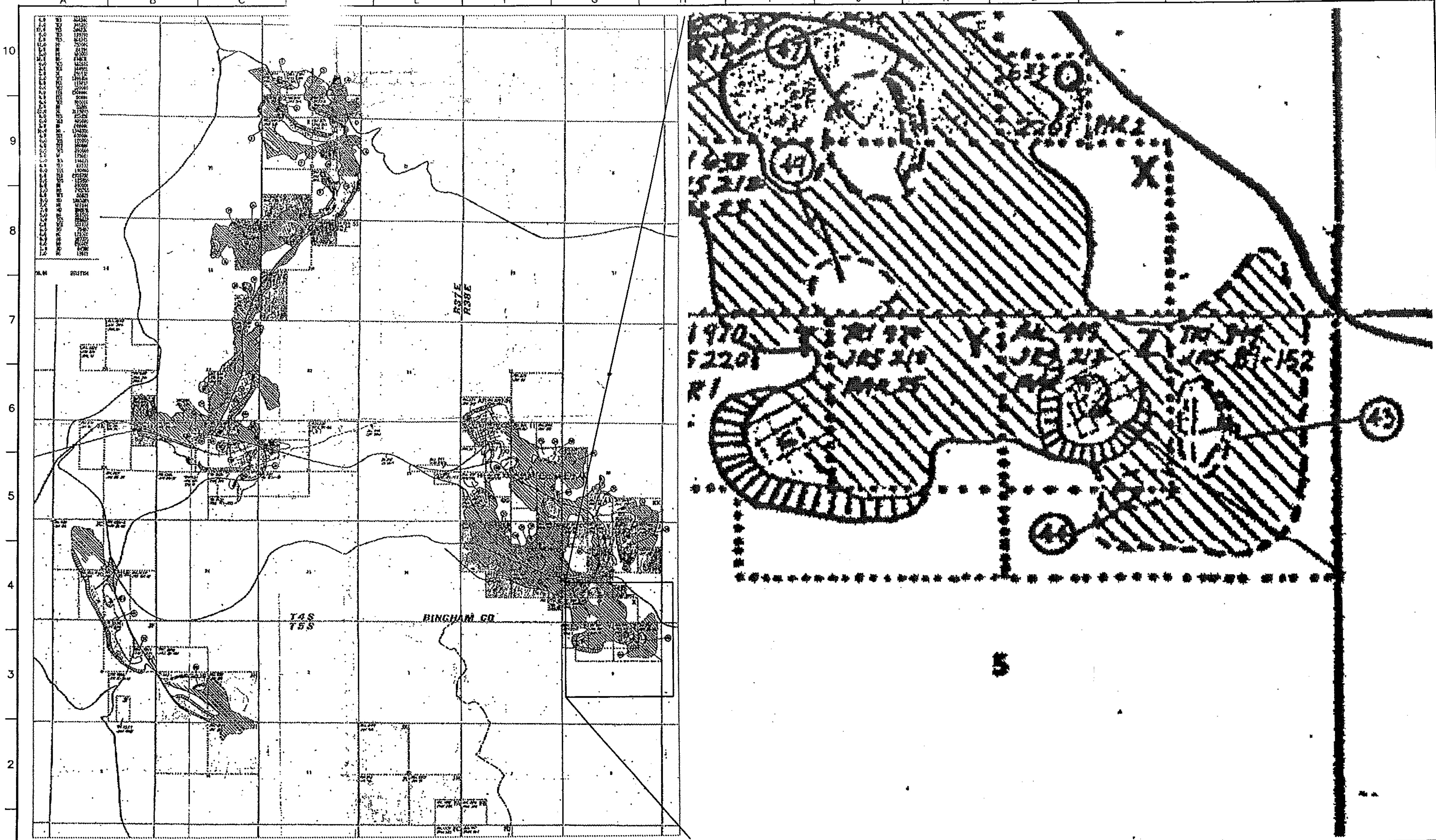
Photograph No. 3.5-8
Z Pit west wall showing chert above seam
3/2/00



Photograph No. 3.5-9
Z Pit looking west from top of east wall
3/2/00



Photograph No. 3.5-10
Z Pit looking east
3/2/00



BROWN AND CALDWELL

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Z PIT LOCATION MAP FROM GAYMINE RECLAMATION MAP APRIL 2000

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OPERATOR TBL
CLIENT FILE NUMBER
DRAWING NUMBER
Z
SHEET NUMBER

Section 4.0
Gay Mine Lease Holding Summary

The Gay Mine's lease holdings are complex and numerous. The mine area is on Tribal lands and various individuals of the Tribes are allocated parcels of land within the Tribal boundaries. The Gay Mine consists of approximately 60 leases that cover over 8,500 acres. On some of the leases there was never any mining activity and on many others the land has been reclaimed to approved plans yet none of the leases have been approved for relinquishment. There are several areas where additional reclamation has been requested prior to the release of the land, but this applies to less than half of the acreage.

Simplot and FMC held the leases either jointly or individually. An approach to the release of the lands is to categorize each lease by status of land use i.e., never used, reclaimed, still in progress, etc.

Based on a preliminary analysis, the leases can be separated into four categories:

> Category I. — Areas that were never mined.
>
> Category II. — Near mined areas, but minimal disturbance.
>
> Category III. — Areas that were reclaimed to plans or were pre-NEPA.
>
> Category IV. — Areas where the status is in question.

The leases in each category are presented in Tables 4-1, 4-2, 4-3, and 4-4 and the general location of each category is shown on Figures 4-1 and 4-2. A more detailed study needs to be completed to define the specifics of each lease, but the tables and the map defines significant areas that were never disturbed or have been reclaimed. From this preliminary analysis, the leases could be released in groups with the timing being:

> Categories I and II. — Immediate release possible.
>
> Category III. — On-site visit with Agency and Tribal representatives to confirm that the reclamation is complete.
>
> Category IV. — After the area is completed to an approved final plan.

This partial release sequence will help expedite the final reclamation phase and rightfully returns the land to the owners. The approximate number of acres released is included in Tables 4-1 through 4-4.

Table 4-1. Gay Mine Lease Categories
Category I: Areas That Were Never Mined

Owner	Lease Number	Allotment/Tract	Acres
FMC	182	1813	40
FMC	183	1376	40
FMC	184	355	20
FMC	185	356	20
FMC	200	388	40
FMC	201	967	80
FMC	213	683 parcel 3	40
Joint	91	1813	120
Joint	92	844	160
Joint	93	845	160
Joint	155	1010	160
Joint	158	968	160
Joint	208	1329	150.78
JR Simplot	212	1256 parcel 10	80
JR Simplot	212	305 parcel 11	160
JR Simplot	212	1334 parcel 13	40
JR Simplot	212	1346 parcel 12	120
JR Simplot	212	683 parcel 3	40
		Total	**1,360.78**

Table 4-2. Gay Mine Lease Categories
Category II: Near Mined Areas But Minimal Disturbance

Owner	Lease Number	Allotment/Tract	Acres
FMC	198	975	40
FMC	199	971	80
Joint	80	838 JI	160
Joint	85	233 JH	160
Joint	86	628 JB	80
Joint	97	278	160
JR Simplot	86-87	NA	720
JR Simplot	88-86	122 & 125	260
		Total	1,660

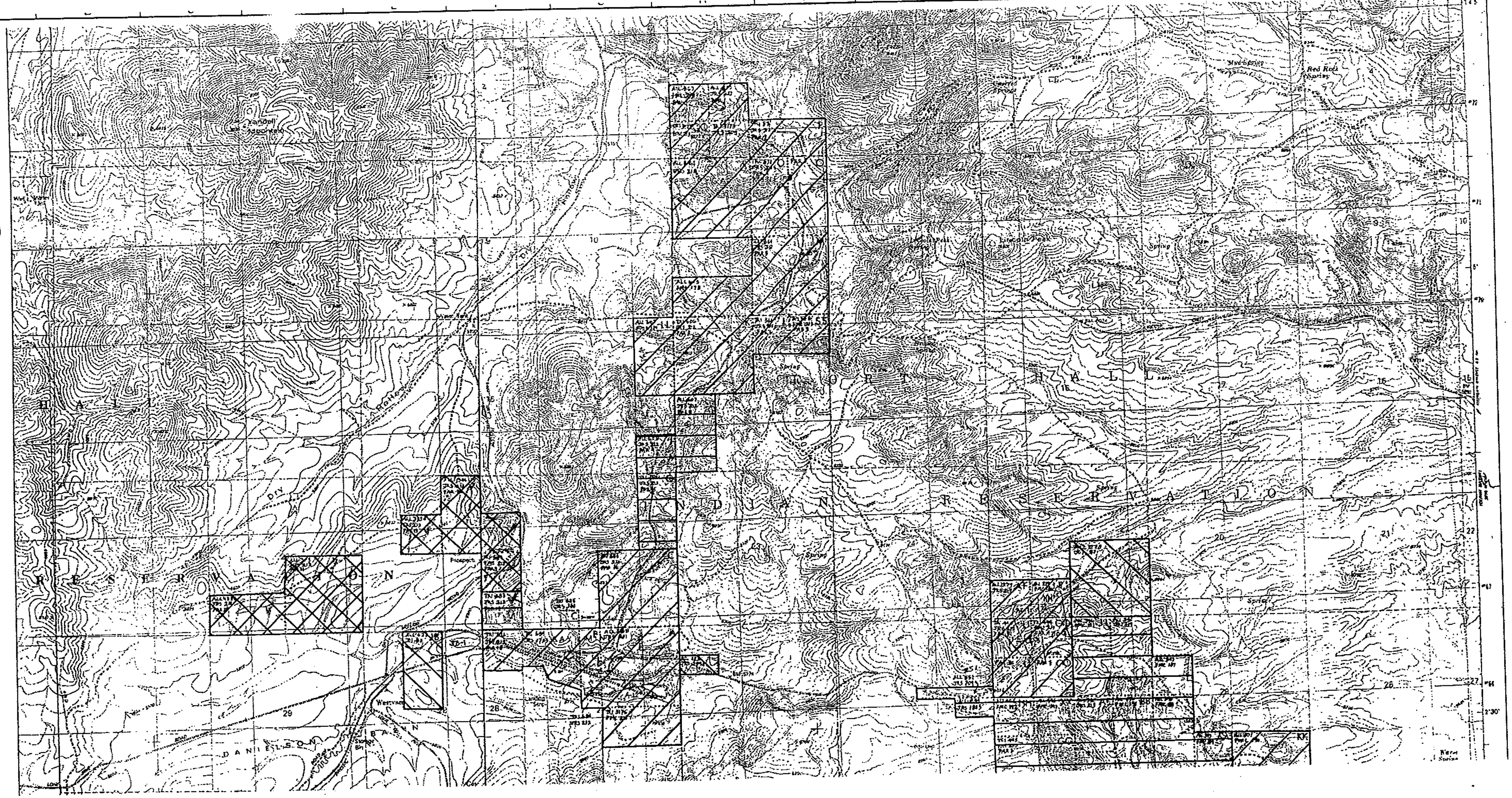
**Table 4-3. Gay Mine Lease Categories
Category III: Areas That Were Reclaimed to Plan and/or Pre-NEPA**

Owner	Lease Number	Allotment/Tract	Acres
FMC	187	345	40
FMC	188	348	40
FMC	189	348	80
FMC	191	346	120
FMC	192	495	40
FMC	193	495	40
FMC	195	350	80
FMC	195	352	80
FMC	196	352	40
FMC	197	636	160
FMC	213	495 parcel 6	80
FMC	213	351 parcel 8	80
Joint	1203	Acquired	440
Joint	82	1064	80
Joint	83	625	160
Joint	119	346	40
JR Simplot	209	NA	194.22
JR Simplot	212	351 parcel 9	80
JR Simplot	212	351 parcel 22	40
JR Simplot	212	607 parcel 8	80
JR Simplot	212	1801 parcel 15	80
JR Simplot	212	683 parcel 14	40
		Total	**2,114.22**

Table 4-4. Gay Mine Lease Categories
Category IV: Areas Where The Status Is In Question

Owner	Lease Number	Allotment/Tract	Acres
FMC	178	605	80
FMC	179	603	80
FMC	186	350	40
FMC	190	801	80
FMC	210	NA	120
Joint	84	826.5	80
Joint	211	NA	50
JR Simplot	86-41	684	120
JR Simplot	91-113	826B	20
JR Simplot	2645	971	10
JR Simplot	2201	NA	80.48
JR Simplot	217	279	40
JR Simplot	180	685	10
JR Simplot	181	648	160
JR Simplot	214	604	160
JR Simplot	89-152B	T949	80.58
JR Simplot	89-153B	T3176	80
JR Simplot	89-154B	849	20
JR Simplot	2214B	848	0.15
JR Simplot	95-104B	648B	30
		Total	**1,341.21**

Note: The remaining acreage is contained in Leases 212 and 213.



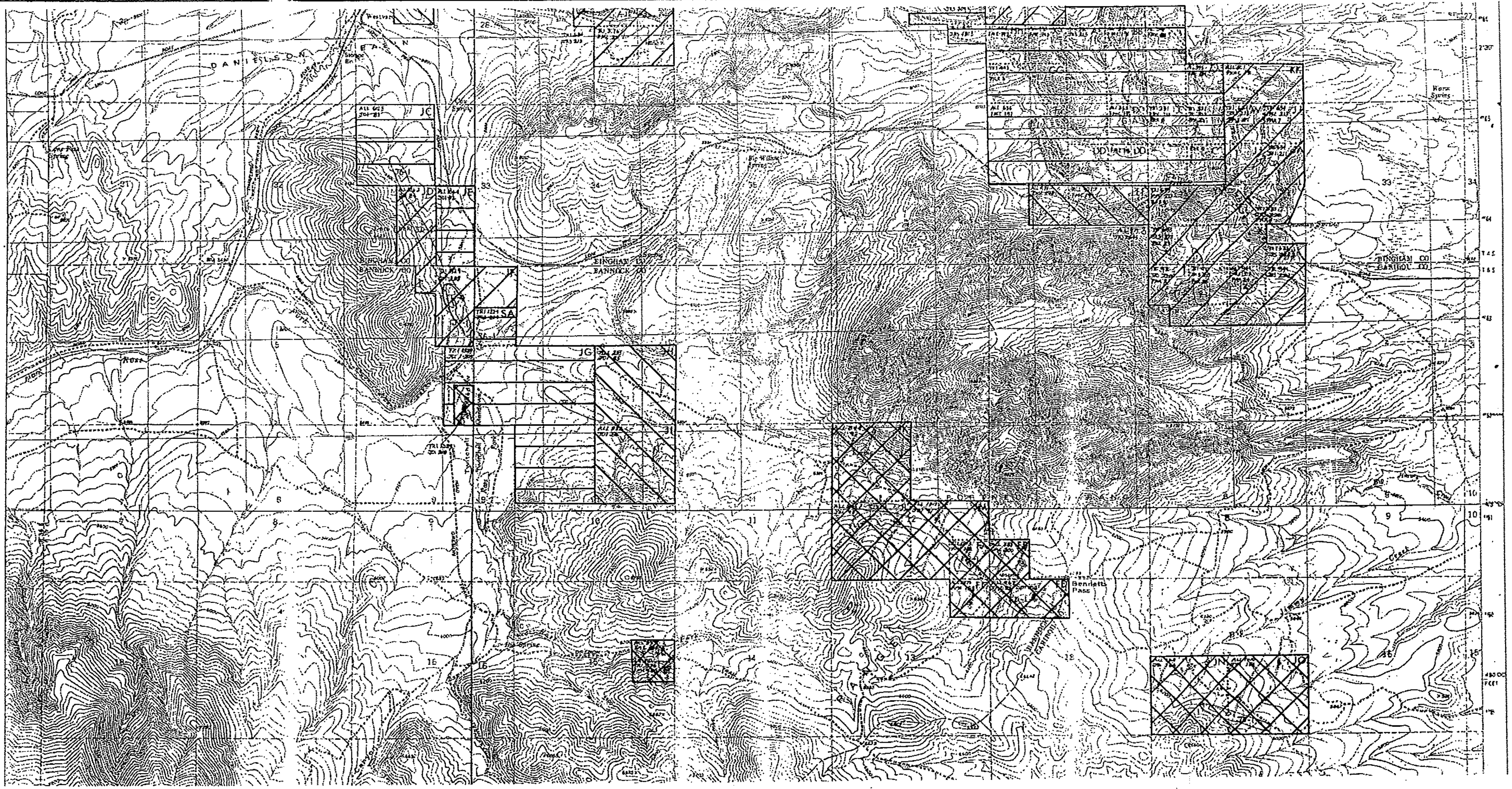
CATEGORY I LEASE

CATEGORY II LEASE

CATEGORY III LEASE

CATEGORY IV LEASE

BROWN AND CALDWELL	LINE IS 2 INCHES AT FULL SIZE (IF NOT 2"-SCALE ACCORDINGLY) FILE 0000-000	PRELIMINARY NOT FOR	REVISIONS: ZONE / REV. / DESCRIPTION / BY / DATE / APP.	GAYMINE LEASES BY CATEGORY APRIL 2000	DATE 04/11/00 CADFILE F1874119 OPERATOR TBL CLIENT FILE NUMBER DRAWING NUMBER 4-1



CATEGORY I LEASE

CATEGORY II LEASE

CATEGORY III LEASE

CATEGORY IV LEASE

BROWN AND CALDWELL

LINE IS 2 INCHES AT FULL SIZE (IF NOT 2"–SCALE ACCORDINGLY)

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OPERATOR TBL

CLIENT FILE NUMBER

DRAWING NUMBER **4-2**

SHEET NUMBER

Section 5.0
Summary and Recommendations

This report presented a preliminary evaluation of reclamation alternatives for partial backfill of four mine pits at the Gay Mine. In addition, pertinent issues regarding final reclamation at the site were discussed in light of concerns regarding selenium. Finally, issues regarding lease holdings were presented.

A meeting with BLM, BIA, and the Tribe is recommended to determine their expectations regarding reclamation of the pit lakes and the overall final phase of reclamation at the Gay Mine. It is imperative that the stakeholders work closely together throughout this process so that final reclamation of the mine is achieved.

Section 6.0 References

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