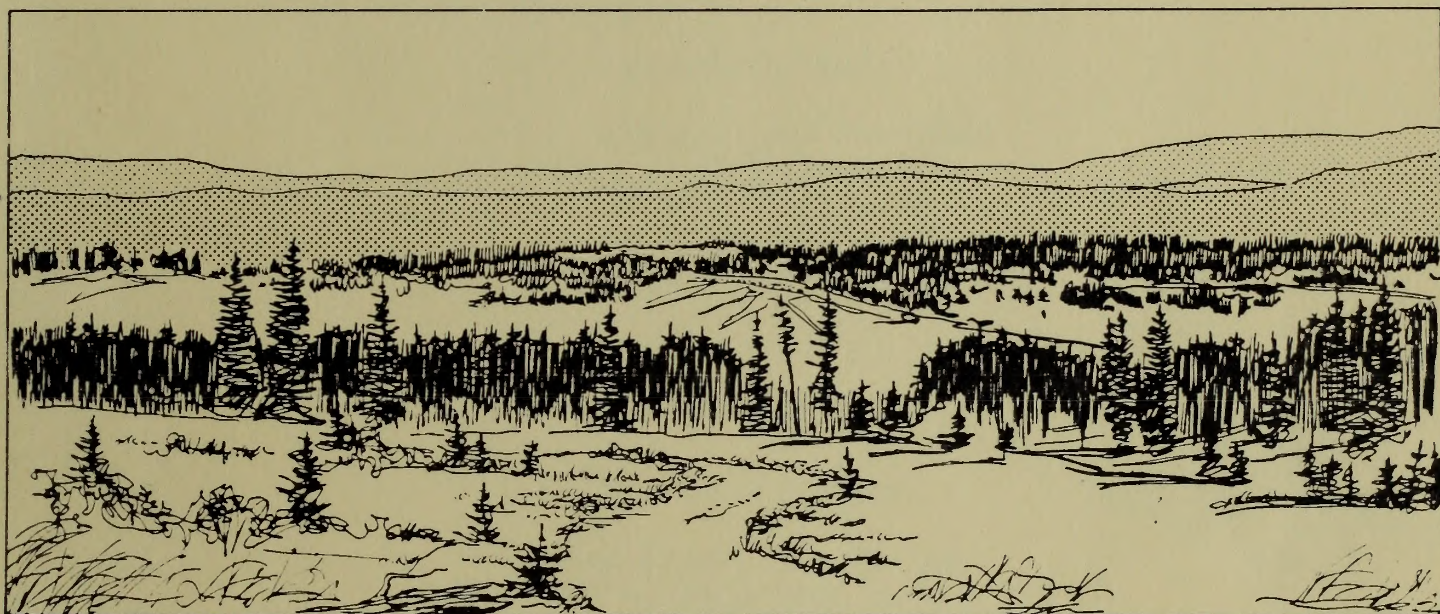
Environmental Assessment
Buffalo Gulch Mine
Idaho County, Idaho

June, 1990



Prepared For:

U.S. Department of the Interior
Bureau of Land Management
Coeur d'Alene District Office
Coeur d'Alene, Idaho

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of Bema Corporation

ENVIRONMENTAL ASSESSMENT

(EA NUMBER ID 060-90-05)

BUFFALO GULCH MINE PROJECT
IDAHO COUNTY, IDAHO

Responsible Agency:

U.S. Bureau of Land Management
Coeur d'Alene District Office
1808 North Third Street
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June 1990

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ENVIRONMENTAL ASSESSMENT

(EA Number ID 060-90-05)

BUFFALO GULCH MINE PROJECT
IDAHO GOLD CORPORATION
ELK CITY, IDAHO

1.0 INTRODUCTION

The Idaho Gold Corporation (IGC) has submitted a Plan of Operations under the 43 CFR 3809 Regulations for approval of an open-pit gold mining and heap leaching operation on unpatented mining claims in the Buffalo Gulch Creek and Maurice Creek drainages, approximately 3 miles northwest of Elk City, Idaho (Figures 1.1-1 and 1.1-2). The Plan of Operations will involve approximately 200 acres of land administered by the Bureau of Land Management (BLM), and includes the operation of an open-pit mine, a heap leach pad, process solution containment ponds, two waste rock dumps, a processing plant, and ancillary facilities. In addition, IGC has proposed a wetlands enchancement project on lower Buffalo Gulch Creek (4.7 acres) for wetlands mitigation as required by the Clean Water Act, Section 404(b). The decommissioning of Idaho Gold Corporation's small scale test heap leach facility, which has been operated at the proposed mine site since 1987 is also included in the Plan of Operations. The test facility will be consumed by the proposed mining project. The proposed mining and gold recovery operations are anticipated to last about six years.

This Environmental Assessment (EA) has been prepared by Hydrometrics, Inc., 2727 Airport Road, Helena, Montana 59601, an environmental consulting firm, under the provisions of a third-party agreement between the BLM and IGC, as described in a Memorandum of Understanding (MOU) dated June 24, 1988 (Attachment 1). This MOU specifies the responsibilities for preparing the EA. Under the terms of the MOU, the BLM has the responsibility for issuance of the EA, including review of all environmental data and and other information, and ensuring compliance with the National Environmental Policy Act (NEPA) requirements.

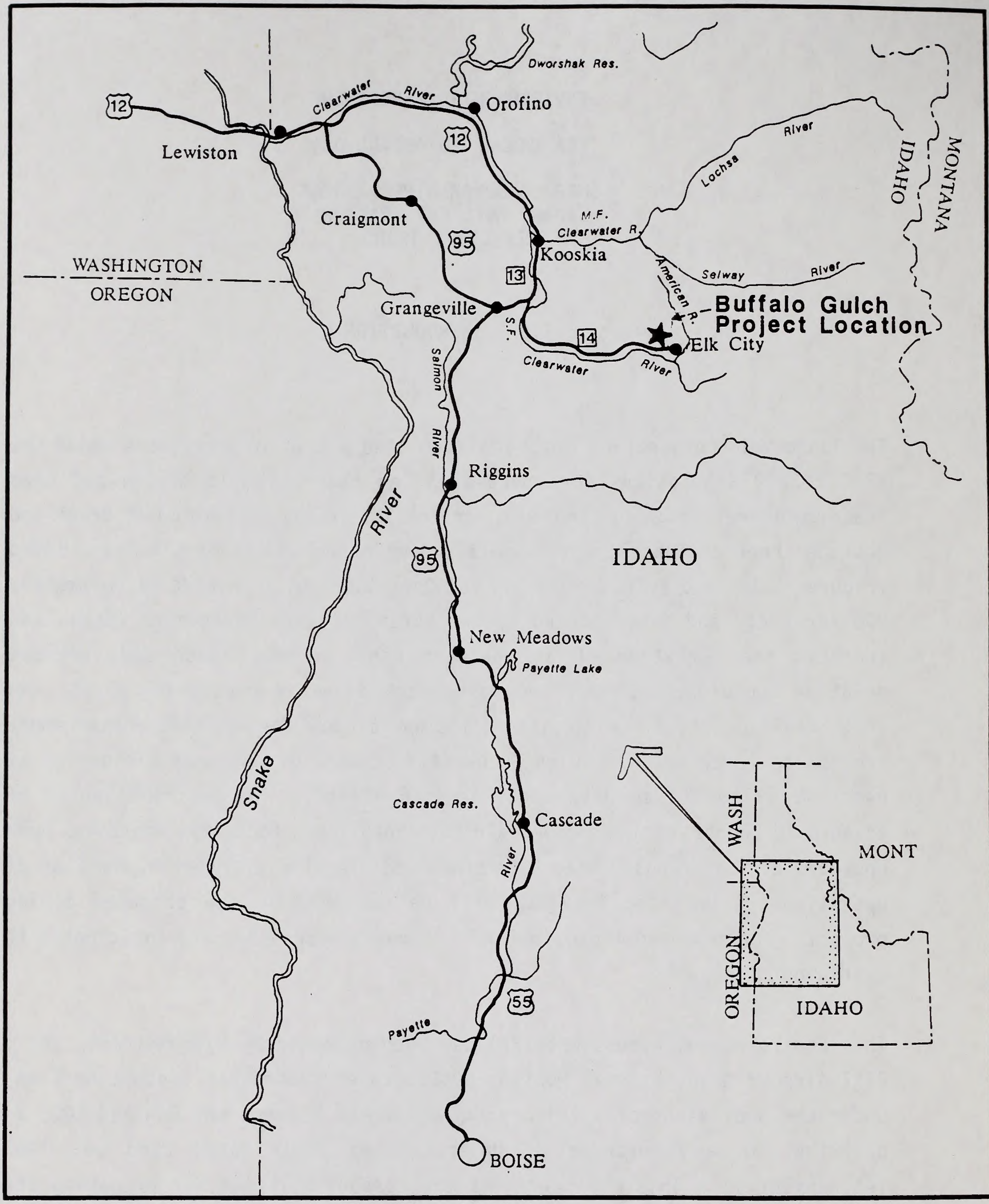


Figure 1.1-1.
Buffalo Gulch Mining Project Location

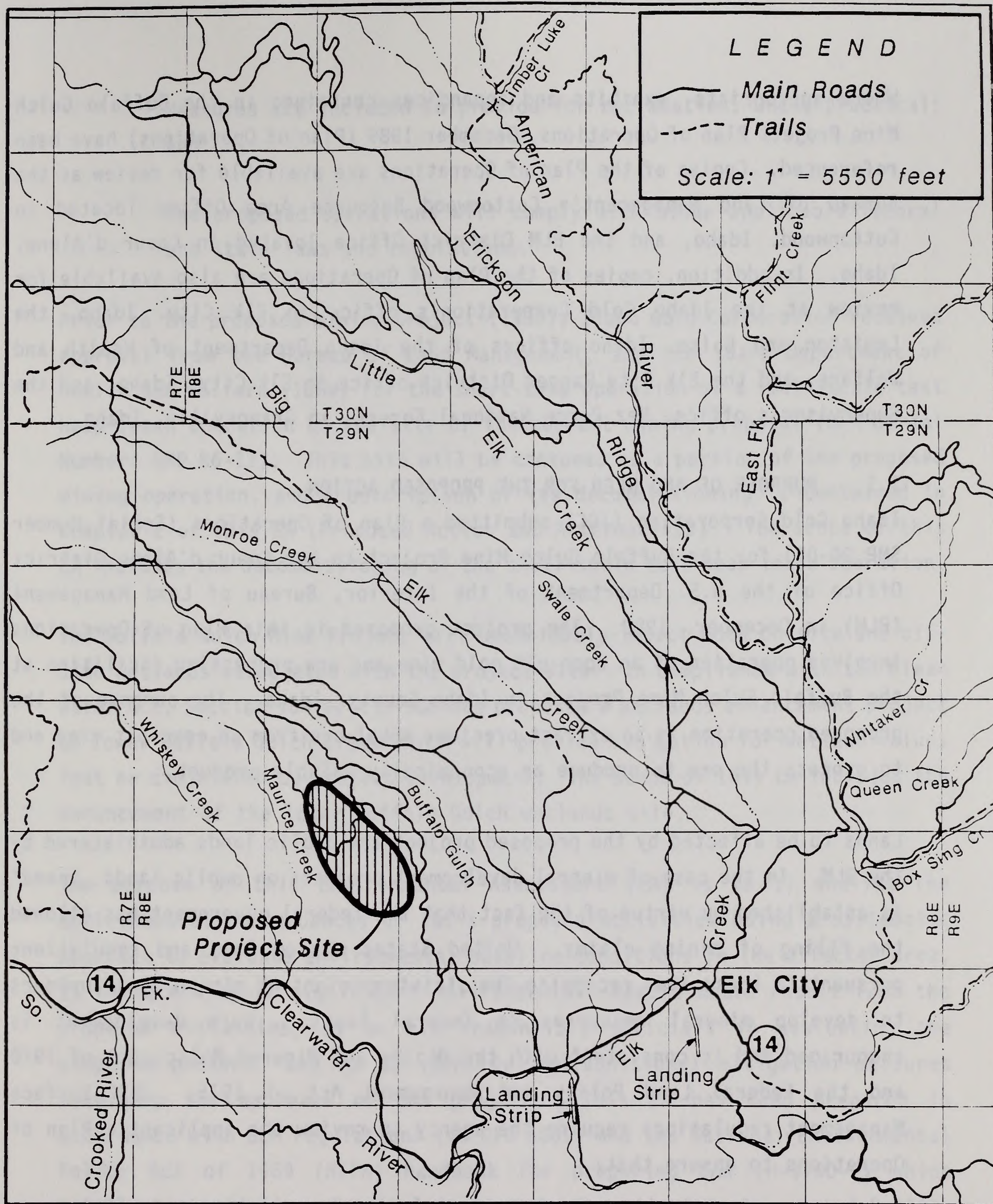


Figure 1.1-2: Project Vicinity Map

Where appropriate, exhibits and appendices contained in the Buffalo Gulch Mine Project Plan of Operations, December 1989 (Plan of Operations) have been referenced. Copies of the Plan of Operations are available for review at the Bureau of Land Management's Cottonwood Resource Area Office located in Cottonwood, Idaho, and the BLM District Office located in Coeur d'Alene, Idaho. In addition, copies of the Plan of Operations are also available for review at the Idaho Gold Corporation's office in Elk City, Idaho, the Lewiston and Boise, Idaho offices of the Idaho Department of Health and Welfare, and the Elk City Ranger District office in Elk City, Idaho, and the Supervisor's office, Nez Perce National Forest, in Grangeville, Idaho.

1.1 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

Idaho Gold Corporation (IGC) submitted a Plan of Operations (Serial Number SMP 90-01) for the Buffalo Gulch Mine Project to the Coeur d'Alene District Office of the U.S. Department of the Interior, Bureau of Land Management (BLM) in December, 1989. The project proposed in this Plan of Operations involves operation of an open-pit gold mine and ore processing facilities at the Buffalo Gulch Mine Project in Idaho County, Idaho. The purpose of the proposed operation is to extract precious metal ore from an open-pit mine and to process the ore to produce an economically salable product.

Lands to be affected by the proposed project are public lands administered by the BLM. In the case of mineral development projects on public lands, "need" is established by virtue of the fact that the federal government has allowed the filing of mining claims. United States mining laws and regulations pursuant to these laws recognize the statutory right of mining claim holders to develop mineral resources on federal lands. Such development is encouraged and is consistent with the Mining and Mineral Policy Act of 1970 and the Federal Land Policy and Management Act of 1976. BLM Surface Management regulations require the agency to review the applicant's Plan of Operations to ensure that:

- Adequate provisions are included to minimize, where feasible, adverse environmental impacts on public lands surface resources;

- Measures are included to provide for reclamation, where practical; and

- The proposed operations will comply with other applicable federal and state laws and regulations.

Prior to the proposed mining project (1986), Idaho Gold Corporation received approval from the Bureau of Land Management, and the Idaho Department of Health and Welfare (IDHW) for the short-term operation of a small-scale test heap leach operation on the site of the current mining proposal (BLM Serial Number: SMP 86-13). This site will be consumed as a portion of the proposed mining operation, and a description of its decommissioning is contained in Chapter 2 of this EA (Proposed Action and Alternatives). The scope of this EA includes the decommissioning of the small-scale test heap leach operation.

The Buffalo Gulch Mine Project will unavoidably impact both on-site and off-site wetlands associated with the project site. In compliance with the Clean Water Act, Section 404(b)(1), IGC has proposed a wetlands enhancement project on lower Buffalo Gulch Creek which will provide mitigation for wetland values lost or diminished by project development. The scope of this EA includes the enhancement of the lower Buffalo Gulch wetlands site.

The purpose of this Environmental Assessment (EA) is to 1) analyze the environmental consequences of IGC's proposed activities using a systematic approach to evaluate environmental baseline conditions in the affected area, 2) to determine if significant environmental impacts would result from the proposed activities, 3) to aid responsible officials in evaluating the proposed project, and 4) to identify any additional mitigation measures necessary for approval of the project. This EA has been prepared in accordance with BLM regulations (43 CFR 3809) and the National Environmental Policy Act of 1969 (NEPA) handbook for preparing EAs (H-1790-1) which establishes guidelines for implementing the Council of Environmental Quality Regulations (40 CFR 1500-1508) related to NEPA.

The BLM Area Manager is the responsible official (Cottonwood Resource Area Office, Cottonwood, Idaho). He may decide to approve the proposed project, or to develop and approve a new alternative. He may also decide, after a review of the EA, that an Environmental Impact Statement (EIS) must be prepared. However, based on the 43 CFR 3809 Regulations, the Area Manager may not categorically disapprove a reasonable mining operation, but may place operating conditions on the project to minimize environmental impacts.

This EA is organized to facilitate review and to satisfy NEPA document requirements.

1.2 COMPLIANCE WITH EXISTING LAND USE PLANS

The proposed project is consistent with the provisions of the Chief Joseph Management Framework Plan (MFP) prepared by the Bureau of Land Management for lands including the project area.

1.3 STATUTES AND REGULATIONS

This Environmental Assessment complies with the National Environmental Policy Act (NEPA) and has been prepared in compliance with BLM Handbook H-1790-1, National Environmental Policy Act Handbook.

In addition to receiving BLM approval for the Plan of Operations for the mining project, the Idaho Gold Corporation must comply with other federal and state regulations, and secure permits and approvals identified in Table 1.3-1. The following regulatory agencies have principal approval and review authority for the Buffalo Gulch Project:

1) The Bureau of Land Management (BLM);

2) The Idaho Department of Health and Welfare (IDHW) - Division of Environment, Water Quality and Air Quality Bureaus;

3) The Idaho Department of Lands (IDL);

4) The Idaho Department of Water Resources (IDWR);

5) The U.S. Corps of Engineers (COE).

TABLE 1.3-1. SUMMARY OF PERMITS AND APPROVALS REQUIRED FOR THE BUFFALO GULCH MINE

Agency	Permit/Approval	Project Facet
Federal		
Bureau of Land Management (BLM)	Plan of Operations (43 CFR-part 3809)	All project activities on unpatented BLM land or involving right-of-way on BLM land.
	National Environmental Policy Act (NEPA) - compliance	Documentation of baseline conditions and project-related impacts.
U.S. Corps of Engineers	Section 404(b)(1) Permit (40 CFR-part 230)	Facilities located in designated wetlands.
State		
Idaho Department of Health and Welfare (IDHW)	Air Quality - Permit to Construct and Operate (Title 1, Chapter 1, Rules and Regulations of IDHW)	Rock crusher and other facilities producing air contaminants.
	Ore Processing by Cyanidation (Title 1, Chapter 13, Rules and Regulations of IDHW)	Leaching facilities and land application area.
	Idaho Water Quality Standards - Compliance (Title 1, Chapter 2, Rules and Regulations of IDHW)	All project activities.
	Idaho Ground Water Protection Standards - Compliance (Title 1, Chapter 10, Rules and Regulations of IDHW)	All project activities.
Idaho Department of Lands (IDL)	Surface Mining Reclamation Plan Approval (Title 47, Chapter 15, Idaho Surface Mining Act)	Project reclamation plan and bonding.
Idaho Department of Water Resources (IDWR)	Dam Safety Permit (Chapter 17, Section 42-1714 to 42-1721)	Overflow pond and collection ponds.
	Water Rights Permit	Appropriation of water.

Each of these agencies has jurisdiction over aspects of the mining project, and require submittal of detailed permit applications, engineering design criteria, plans and specifications, and in some cases, a performance bond.

1.4 MAJOR ISSUES AND CONCERNS

The National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) guidelines mandate that the environmental assessment process include a forum for public notice and comment. Based upon comments received, the major public issues and concerns must be identified, and these concerns must be addressed in the EA. This subsection describes the efforts to solicit public comment, and identifies the major public issues and concerns expressed during the public comment period.

1.4.1 Interagency Scoping and Public Involvement

Several interagency scoping meetings for the Buffalo Gulch Mine Project have been held on-site, and at BLM offices since 1987 concerning the mining project and project design proposals, as well as regulatory and environmental compliance requirements. In addition to BLM personnel from the Cottonwood Resource Area and the Coeur d'Alene District Office, representatives from the Idaho Department of Lands (IDL), the Idaho Department of Health and Welfare (IDHW), the Idaho Department of Water Resources (IDWR), the U.S. Army Corps of Engineers (COE), the U.S. Environmental Protection Agency (EPA), the Nez Perce National Forest (USFS), and the Nez Perce Tribe have participated in these meetings. In addition, public meetings were held in Elk City, Idaho on February 3, 1987 and March 22, 1988 which provided early information to the public concerning the proposed Buffalo Gulch Mine Project.

In addition to the Buffalo Gulch Mine Project, Idaho Gold Corporation has submitted a Plan of Operations for the Ericson Reef Mine Project (approximately four miles north of the Buffalo Gulch Mine Project) to the Nez Perce National Forest (USFS) for review and approval. Both projects are scheduled for development in 1990. The proposed Ericson Reef Mine Project is described in section 4.1 of this EA. To facilitate interagency cooperation and review of both mine proposals, the BLM and the USFS jointly developed interagency task forces for the review of major regulatory and environmental issues identified through previous interagency scoping efforts and shared in common by the proposed projects. A listing of the task forces and membership is in Attachment 2 to this EA. Mitigation measures and/or alternatives developed and recommended by each task force have either been incorporated in the Plan of Operations, or have been included in Chapter 4 (Environmental Consequences and Mitigation Measures) of this EA.

In September 1989, an 8 page summary document concerning updated project plans was prepared by the Idaho Gold Corporation and distributed to state and federal agencies, as well as made available to interested individuals locally. The document summarized the proposed mining project and associated regulatory process, including the Environmental Assessment (EA) process, and identified persons and agencies to contact for additional information.

A public informational meeting was held in Elk City, Idaho, on October 11, 1989 at which Idaho Gold personnel described the updated proposed project and sought public participation in the identification of issues and concerns. Public notice of the meeting was published in the Lewiston Tribune on October 5, 1989 and the Idaho County Free Press on October 11, 1989. The meeting provided the public with information concerning both the Buffalo Gulch mine project, and the Ericson Reef mine project. Additionally, a public meeting was held by the Idaho Department of Health and Welfare (IDHW), Division of Environmental Quality, in Elk City, Idaho, on March 13, 1990 in compliance with state regulations concerning the application by Idaho Gold Corporation for an Ore Processing by Cyanidation Permit for both the proposed Buffalo Gulch and Ericson Reef Mining Projects. These public meetings provided an opportunity for the public to comment and ask questions concerning potential impacts associated with each project, as well as cumulative impacts.
Public and agency concerns expressed at these meetings focused primarily on the following items:

- Concerns that adequate measures be required for the protection of groundwater and surface water quality on the mine site, and adjacent wetlands, streams, and rivers.

- Concerns that adequate measures be required to assure the safe transportation of cyanide and other chemicals and petroleum products used by the mining operation, especially along rivers that provide important anadromous fisheries.

- Concerns that adequate measures be required to control the potential increase in sediment associated with the mining project so as to protect adjacent streams and rivers that provide habitat for anadromous fisheries.

- Concerns for the existing housing shortage in Elk City, and a shortage of available classrooms for additional students associated with mine worker families.

- Concern for the effect of the mine projects on the local economy, including taxation and a potential "boom and bust" local economy associated with the opening and closure of the mines.

- Concern that successfully reclamation be required during and following project completion.

Concerns expressed at these meetings are summarized in Table 1.4-1, and along with task force concerns, have helped to form the basis for the evaluation of potential impacts contained in Section 4.0 of this EA.

TABLE 1.4-1. BUFFALO GULCH MINE PROJECT - ISSUES AND CONCERNS IDENTIFIED AT PUBLIC MEETINGS IN ELK CITY, IDAHO, OCTOBER 11, 1989 AND MARCH 13, 1990.

- Will the mining project operate 24-hours-a-day?
- Will the project cause a noise problem?
- What will the project site look like after reclamation?
- Will the mine pit fill with water after mining, and what will happen if it does?
- Can excess process waters be safely land applied on snow covered ground?
- What will be the social impacts for housing and the Elk City School?
- Will the project result in an increase in property taxes for local residents?
- What tax or other revenue from the project will be available for use locally?
- Does Idaho Gold Corporation have adequate experience for safely conducting the proposed type of mining project?
- Is Idaho Gold Corporation financially sound and what will happen to the local economy if project is started and then prematurely abandoned?
- How many acres will the project disturb?
- Has the feasibility of the project been adequately determined prior to development?
- Will there be a boom/bust economic cycle for Elk City?
- Will sufficient topsoil be recovered to adequately reclaim the site?
- How will the use of cement in agglomeration affect future soil chemistry?
- How long will it take to restore the site to a productive timber site?
- What type of vegetation will be established during reclamation?
- Are there additional future mining activities at or near the mine site?
- Will water quality be monitored after mining, and for how long?
- What will be the long-term chemical makeup of water at the site?
- How much gold has been recovered during the test operations?
- What is the operational break-even price for gold?

TABLE 1.4-1 (Continued)

- What will be the visual effect of the project area when viewed from the Elk City area?
- What will be the project's effect on existing springs used for drinking water?
- Will there be future public meetings?
- What are the NEPA involvement opportunities in the project review?
- What is the difference between an Environmental Assessment and an Environmental Impact Statement?
- Will the collection ponds be fenced?
- Does the carbon column system (for removal of metal laden solutions) affect water quality?
- Is it feasible to leach year-round considering local winter weather?
- Will the solution collection facilities be designed to safely contain additional precipitation from storm events?
- Will Idaho Gold Corporation continue to have a presence in the community after the project is finished?
- Where will excess process waters be land applied?
- Will the carbon columns trap heavy metals?
- Will sediment be a problem from erosive soils?
- How will the open-pit be reclaimed. Will it be filled?
- Will the open-pit be reclaimed to a beneficial use?
- What type of reclamation and revegetation measures will be used for the waste dumps and ore heap?
- How will the concentrations of heavy metals be controlled?
- How much cyanide will be transported to the project site, by what means, and what safeguards will be used?
- Will the solution ponds be netted to prevent use by birds?
- How will any leaks in the facility synthetic liners be detected and corrected?

2.0 PROPOSED ACTION AND ALTERNATIVES

NO ACTION

[illegible]

[illegible]

[illegible]

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO ACTION

This alternative would leave the area in its existing condition. Impacts would be the result of natural processes and the continuation of existing conditions in the area. Selection of the no action alternative would typically mean that the BLM would not approve the proposed Plan of Operations for the Buffalo Gulch Mine Project, and would require closure and reclamation of the existing small-scale test heap leach facility. The U.S. Mining Law of 1872, however, provides the Idaho Gold Corporation the right to pursue a reasonable mining project on its unpatented mining claims as long as the project is operated in an environmentally sound manner. In addition, the BLM can reject a Plan of Operations submitted under the federal 43 CFR 3809 regulations only when a federally designated threatened or endangered species, or its habitat, would be adversely affected by the proposed operations. Baseline environmental studies conducted for the Buffalo Gulch Mine Project, and required consultation with the U.S. Fish and Wildlife Service have determined that no federally designated threatened or endangered wildlife, fisheries, or plant species is likely to be adversely affected by the proposed mining project (see Section 4.6 of this EA). Based on regulatory and environmental conditions, the no action alternative is not a valid alternative.

2.2 PROPOSED ACTION

The proposed Buffalo Gulch Mine Project will involve open-pit mining of approximately 5.0 million tons of gold-bearing ore and 7.5 million tons of overburden and waste rock from one pit. The ore will be heap leached using conventional cyanide heap leach and gold recovery technology. The planned heap leach facilities will include: 1) a synthetic PVC membrane lined, phased-construction leach pad; 2) drain system above the pad liner; 3) double synthetically lined collection ditches and ponds; 4) collection pipeline to route pad solutions to the collection ponds; 5) pipelines and containment ditches to route excess runoff to the surplus/retention pond; 6) underlying leak detection systems for the leach pad, collection ditches and ponds, 7) sediment control structures; 8) valley underdrain systems beneath the leach pad and mine waste dumps to control natural water beneath the facilities, and 9) a fresh water pipeline from the American River to a make-up water pond on-site to provide initial and make-up water for the leaching operations. In addition, a wetland mitigation project will be conducted on lower Buffalo Gulch Creek in compliance with the Clean Water Act, Section 404(b)(1).

Development of the proposed project will consume the existing small-scale test heap leach facility (approximately 4 acres). Ore leached during the previous testing will be removed from the site and placed on the project's first year leach pad. Sediments remaining in the collection ponds (small tanks) will be tested using the EP Toxicity test to determine if disposal of this material can be safely accomplished by placing it within the first year leach pad. The synthetic PVC liner from the small leach pad will be removed and placed on the similarly lined area of the first year leach pad. All other remaining facilities, including the chain-link fence, will be salvaged for potential use in the development of the project.

Following mining from the open pit, the ore will be hauled to the ore preparation facility where it will be agglomerated (see Section 2.2.5). Crushing of the ore will not be necessary prior to agglomeration. Overburden removed from the pit area, as well as waste rock encountered during mining of the orebody will be hauled to two designated disposal areas, or used in construction of the leach pad and collection ponds. Following agglomeration, the ore will be transported to leach pad cells by conveyor system, heap leached, and the metal-bearing solutions processed on-site to remove gold. Topsoil will be stripped from all areas of disturbance, and stockpiled for use in interim and final reclamation.

The general arrangement of the Buffalo Gulch Mine Project facilities is shown on Figure 2.2-1. A detailed facility layout is shown on WELSH Drawing 11602/12, Revision B, Addendum B, Appendix L of the Plan of Operations. Mining and processing of the ore, overburden disposal areas, and the land application area will require surface disturbance of approximately 200 acres. Areas of disturbance are identified in Table 2.2-1. It is Idaho Gold Corporation's intent to minimize the amount of surface disturbance throughout

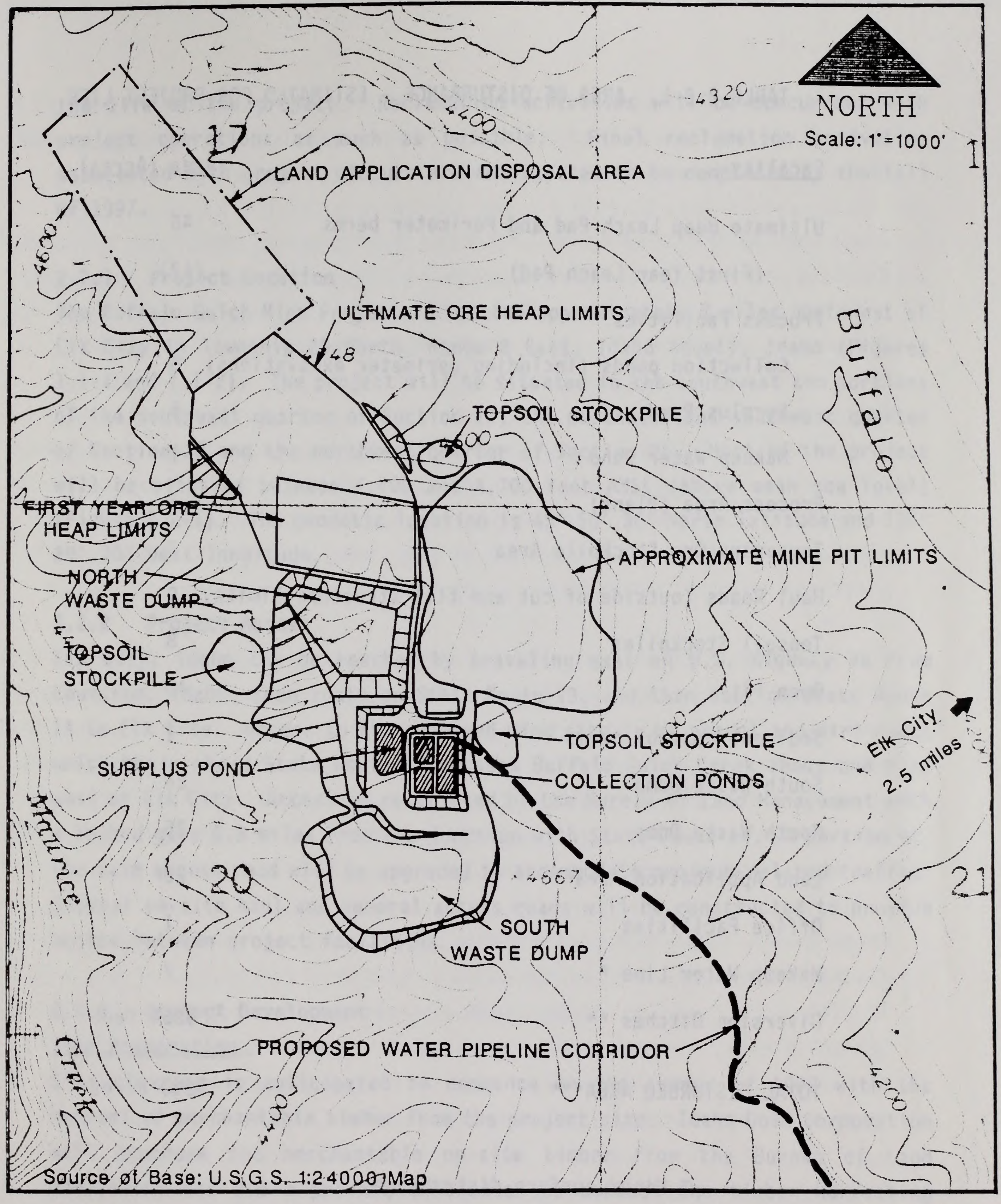


Figure 2.2-1: General Project Layout

TABLE 2.2-1. AREA OF DISTURBANCE - ESTIMATED FOR PROJECT LIFE

Facility	Area (Acres)
Ultimate Heap Leach Pad and Perimeter berms	46
(First Year Leach Pad)	(12)
Process Facilities	
Collection ponds (including perimeter excavations)	5
Surplus Pond	5
Makeup Water Pond	1
Process Area (Plant)	2
Temporary Ore Stockpile Area	2
Haul Roads (outside of cut and fill structure limits)	9
Topsoil Stockpiles	8
Open Pit	48
Sediment control berms	1
South Waste Dump	24
North Waste Dump	26
Land Application Area *	20
Office Facilities	1
Makeup Water Line *	2
Diversion Ditches **	9854 feet
TOTAL DISTURBED AREA***	200 acres

* Minor surface disturbance

** Not included in area of disturbance total

*** If approved by the Army Corps. of Engineers, the wetlands mitigation site on Lower Buffalo Gulch Creek will add approximately 4.7 acres to this total.

the life of the project. Reclamation activities will be concurrent with project operations as much as possible. Final reclamation activities associated with project closure are anticipated to be completed by the fall of 1997.

2.2.1 Project Location

The Buffalo Gulch Mine Project is located approximately 3 miles northwest of Elk City in Township 29 North, Range 8 East, Idaho County, Idaho (Figures 1.1-1 and 1.1-2). The project will be situated in the southwest and portions of the southeast quarter of Section 17, the northeast and southwest quarter of Section 20 and the northwest quarter of Section 21. Most of the project will be situated between 4,400 and 4,700 feet AMSL (above mean sea level) (Figure 2.2-1). The geodetic location is 45° 50′ 30" North latitude and 115° 29′ 30" West longitude.

2.2.2 Project Access

Elk City, Idaho can be reached by traveling east on U.S. Highway 95 from Lewiston, Idaho, then south on State Route 13, and then east on State Route 14 to Elk City. Access to the proposed mine site is by gravel and dirt roads which begin where State Route 14 crosses Buffalo Gulch Creek about one mile west of Elk City. Access is restricted by the Bureau of Land Management with a locked gate 0.8 miles from the junction with State Route 14. A portion of the main access road will be upgraded to accommodate project-related traffic. Several on-site haul and general access roads will be constructed to provide access between project facilities.

2.2.3 Project Development

<u>Site Preparation</u>

Site clearing is anticipated to commence in the summer of 1990 with the removal of merchantable timber from the project site. Idaho Gold Corporation will purchase the merchantable on-site timber from the Bureau of Land Management and use a private contractor to conduct the timber harvesting activities. The timber harvesting will be conducted prior to site preparation work. Site preparation will include clearing, grubbing, stripping, borrow development, required excavations, and foundation preparation for areas proposed for facility development. In general, these areas include the heap leach pad, solution collection facilities, surplus pond, sediment control berms, interior access and haul road corridors, and waste dumps and borrow areas.

Slash, brush, tree vegetation, and other organic debris associated with site clearing and preparation work, will be stockpiled and used for select sediment control (Appendix K, Plan of Operations) and for site rehabilitation efforts to help maintain soil productivity and wildlife habitat.

Facility Construction

Appendix E of Appendix L of the Plan of Operations contains a detailed discussion of design-related criteria and specifications concerning the development of major project facilities, including site preparation, fill placement, pad liner placement and testing, pipe and miscellaneous material placement, and quality assurance.

Facility construction is scheduled to commence following obtaining all necessary project approvals and permits from federal and state regulatory agencies. The initial construction period will include completion of process water ponds, surplus pond, first year leach pad and collection system, process facilities, and office as well as a portion of soil stockpiles, on-site access and haul roads, sediment control structures, diversion and drainage ditches, and valley underdrains.

Prior to the completion of the above construction activities, upgrading of the main access road will be completed. Appendix V of the Plan of Operations is the Buffalo Gulch Access Road Upgrading Design Considerations and Operating Plan. The main access road will be upgraded from State Route 14 to the mine site as an all-weather road of a typical single-lane width of 14 feet, with turnouts to permit controlled traffic flow in both directions.

Overburden removal and development of the retention berm within the north waste dump, as well as mining and placement of ore on the first year leach pad is anticipated to commence in late summer 1990. Heap leaching would begin about 45 days later.

2.2.4 Mining

The proposed Buffalo Gulch Mine Project will involve open-pit mining of ore, overburden and waste rock utilizing conventional open-pit mining methods. Approximately 5 million tons of ore and 7.5 million tons of overburden and waste rock will be mined from one pit with an annual production rate of approximately 900,000 tons of ore during the first five years of the operation. The amount of ore available for mining in the sixth year of the operation will be determined by on-going exploration drilling and ore body delineation. The open pit will extend approximately 1,900 feet in a north-south direction and 1,600 feet in an east-west direction, with a maximum depth of about 200 feet and 30 to 35 degree pit slopes. Mining will entail some drilling and blasting of the ore overburden and waste rock, loading the ore onto trucks with front-end loaders, hauling the ore to the ore preparation facility (agglomerator), and loading and hauling the overburden to the designated disposal areas adjacent to the pit.

2.2.5 Ore Preparation Facility

Results of laboratory metallurgical tests indicate agglomeration will be required for successful leaching of the Buffalo Gulch ore. Agglomeration is a treatment process that mixes cement as a binder, and water with the ore in various amounts to form stable particles. This increases the percolation rate of the leach solution and accelerates gold recovery. Cyanide solution may be used in the agglomeration circuit instead of water. This process would mix the cyanide solution evenly throughout the ore, and start the gold dissolution process. The agglomerator will be moved approximately two times yearly to reduce the length of the ore conveyor system. The agglomerator site will be underlain by the lined leach pad.

2.2.6 Heap Leach Facility

The heap leach facility will be located on a large ridge separating the Maurice Creek and Buffalo Gulch drainages as shown on Figure 2.2-1, General Project Layout and on WELSH Drawing 11602/02 of Appendix L of the Plan of Operations.

The general processing area consists of a leach pad, three process water ponds, a fresh water makeup pond, a surplus/retention pond, and a metals-extraction (process) area. The metals-extraction process area contains reagent storage facilities and a carbon adsorption/desorption plant and refinery.

The heap leach process involves placing the ore by conveyor on a synthetically lined (PVC) leach pad, applying a dilute sodium cyanide solution to the ore through low-volume emitters, and collecting the metal-bearing leachate solution which has percolated downward through the ore heap. The gold bearing solution is captured and routed through pipes in a double-PVC lined collection ditch to a double-PVC lined collection pond (pregnant pond). The solution from the pregnant pond is routed to the gold recovery facility where the gold is recovered from the cyanide solution using a carbon adsorption process. The barren solution from the recovery process is then routed to the barren pond, additional cyanide added if necessary, and reapplied to the ore heap.

Ore will be placed on the leach pad in 20 foot lifts. An average maximum height of 90 feet is anticipated for the ultimate heap. The heap leach facility is designed as a zero-discharge system. Solution management practices may include seasonal or periodic land application to safely handle potential excess water from the process system.

Following completion of the leaching operations, the heaps of spent ore will be neutralized in compliance with the requirements of the Ore Processing by Cyanidation Permit regulations administered by the Idaho Division of Environmental Quality. The Ore Processing by Cyanidation Permit requires that a bond be held by the IDEQ in an amount sufficient to assure neutralization of the spent ore heaps at the completion of the leaching operations, or in the event that the mining project ceases operations prior to the anticipated project closure.

Several methods of heap neutralization are available for use by IGC, including natural neutralization with recirculated fresh water, peroxidation, chlorination, oxidation with sulfur dioxide, complexation with ferrosulfate, and biological treatment (see Section 2.3.10 of this EA). Based upon neutralization tests performed in conjunction with the Buffalo Gulch small scale leach test project, and on other heap leach ores, the most successful, cost effective, and environmentally safe method to neutralize the spent ore heaps at the Buffalo Gulch Mine Project is with the application (recirculation) of neutralized process solution and augmentation of the solution with freshwater.

Following the completion of leaching activities, barren process waters will be chemically neutralized by chlorination and the neutralized waters will be applied and circulated through the spent ore heaps. In addition, freshwater will be added to the circulating waters. This process takes advantage of the rapid destruction of cyanide that occurs below a pH of about 9.5, and includes volatilization, photodecomposition, oxidation, adsorption, and biodegradation. Upon satisfactory demonstration that the discharge from the spent ore heaps is neutralized (and remaining so for a period of time to be determined by the regulatory agencies), the waters will be land applied to the designated land application disposal area. Following disposal of the neutralized heap drainage solutions, the spent ore heaps will be neutralized and the post-mining drainage routed to the mine pit.

Continued ore testing by IGC and information gained concerning the characteristics of the ore within the heaps during the leaching operations will be used to determine the most effective method of final heap treatment required for successful project closure. Consultation with appropriate state and federal regulatory agencies at the time of project completion will determine those specific heap closure measures necessary to ensure compliance with all applicable environmental laws. Control and monitoring of discharges and potential discharges after closure will occur to ensure neutralization of the spent ore and solutions.

Temporary seasonal closure (complete shutdown) of the leaching operation for extreme weather or other conditions extending beyond 180 days will include protective on-site measures including neutralization of ore heaps and process waters.

2.2.7 Containment Ditch

The metal bearing process water from the ore heap will be routed to the collection ponds by a 12 inch PVC pipe within a double PVC lined collection ditch. The open flow capacity of the containment ditch is designed to safely pass the additional amounts of runoff water associated with the 100-year, 24-hour storm event (3.6 inches of precipitation), as well as 100 percent snowmelt in 48 hours from a maximum snowpack (in excess of the average 40 inch snowpack) under 10-year maximum precipitation conditions (50 inches of snowpack at 34 percent water). Design flow calculations for the containment ditch are in Attachment 7 of this EA. The containment ditch will be underlain by a leak detection system.

2.2.8 Process Water Collection Ponds

Process water from the ore heap will be routed to the collection ponds, which include a 3 million gallon pregnant pond (for metal bearing solution), a 1.5 million gallon barren pond (for processed solution destined for reapplication to the ore heap), and a 1.5 million gallon holding pond (for contingency storage and land application of neutralized excess process waters). Each of the collection ponds will be double PVC lined and underlain by a leak detection system. The pregnant pond or combination holding and barren ponds are designed to safely contain and store process water amounts associated with a 48 hour leach pad draindown in the event of a loss of power for the pumping system (1,000 gpm maximum - 2.88 million gallons), and additional contribution from the 100-year, 24-hour storm event on the ponds' surface (3.01 million gallons). The ponds are designed to pass additional excess waters resulting from the 100-year, 24-hour storm event and average snowpack snowmelt from other components of the process system, as well as a 5-day total pad draindown to the surplus/retention pond for containment. Containment design calculations for the collection ponds are in Attachment 7 of this EA.

Following completion of heap leaching activities, remaining process water within the collection pond system will be chemically neutralized (chlorination) and recirculated to the spend ore heaps for use in heap neutralization and eventual land application disposal as discussed in Section 2.2.6.

2.2.9 Surplus/Retention Pond

A single PVC lined surplus pond will be built in year one of the project operations with a capacity to safely contain 7.65 million gallons of water associated with the worst case event of 100 percent pad draindown (5 days - 1000 gpm maximum). The first year leach pad surface is about 29 percent less than the ultimate pad surface so that full containment of maximum runoff events plus pad draindown is provided by the surplus pond in combination with the collection ponds in the first year of operations. By the second year of the project operations (to accommodate an increasing leach pad surface), a backup retention berm will be added to the pond crest level to provide an additional 17 feet of soil lined freeboard, bringing the total temporary storage capacity of the pond to 23.5 million gallons. Overflow pipes from the collection ponds (at the 2 foot freeboard level) will pass water to the surplus/retention pond in excess of the storage capacity (6 million gallons) of the collection ponds. In the unlikely event that the storage capacity of the collection ponds and surplus/retention pond system were to be neared (29.5 million gallons), excess water would be pumped from the pond system to the mine pit for temporary emergency containment. As a backup to this contingency measure, an emergency drainage ditch will be constructed in the second year of operations to route excess runoff storage from the surplus/ retention pond to the mine pit for containment.

2.2.10 Land Application Disposal (LAD)

Land Application Disposal (LAD) will be utilized to dispose of periodic operational excess water from the project activities and for the disposal of neutralized process water following project closure. Excess water will result primarily from rainfall and snowmelt on the heap leach pad, open pit mine, and process pond area. Excess process solution from the ore processing circuit will be treated to remove precious metals and to destroy (neutralize) cyanide before land application disposal.

A suitable LAD area has been identified in the northwest portion of the project area (Figure 2.2-1). Disposal of excess water from the process water system will be accomplished by periodically removing water from the pit/and or barren pond/holding pond/surplus pond and applying the water through an overhead or drip sprinkler system to the LAD area. Land application of neutralized excess process water will occur in full compliance with State of Idaho Water Quality Standards, and the Idaho Department of Health and Welfare's Guidelines for Land Application of Municipal and Industrial Waste Water.

Based upon the project water balance, it is anticipated that no land application disposal will be required during the first year of operation. During this period, the project has an adequate water retention capacity. In the remaining years of operation, it is estimated the 3 acre-feet during years 2 and 3 and 18 acre-feet during years 4 and 5 of water will need to be handled by the disposal system.

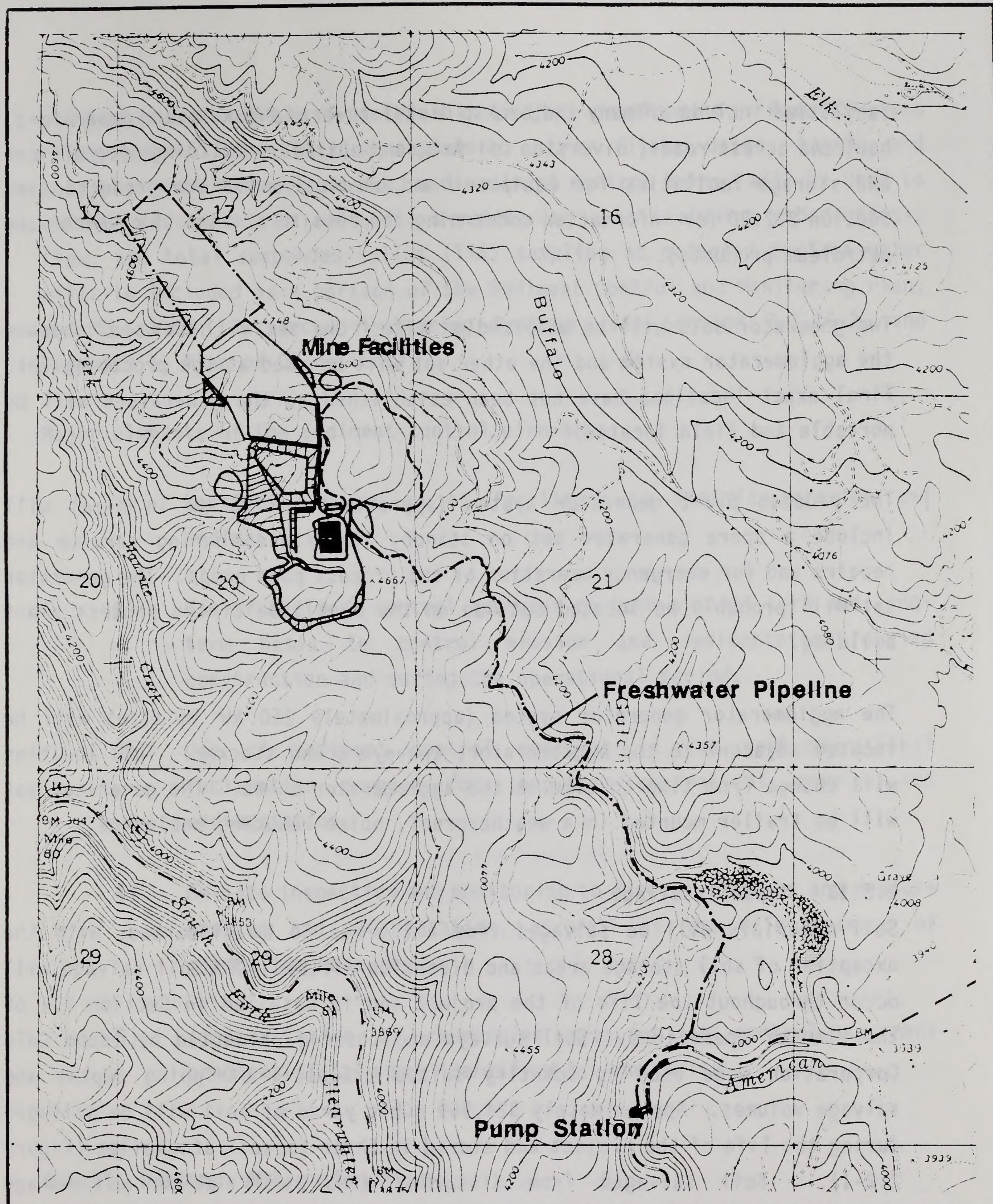
2.2.11 Freshwater/Makeup Water Pipeline

The primary startup water supply for the project will be surface water from the American River, which is a tributary to the South Fork of the Clearwater River. Idaho Gold Corporation has applied for a surface water right that will be used for this supply.

At the water right site on the American River, a surface water pump and intake pipe will be installed. A four-inch steel water pipeline from the intake site will be installed under State Route 14 and, with the exception of a small portion of the line overland from State Route 14 to the Buffalo Gulch Creek road, will be routed adjacent the main access road (Buffalo Gulch Creek Road) to the mine site (Figure 2.2-2, and Exhibit 3, Plan of Operations). The pipeline will be located on the surface of the existing topography for its entire route, with the exception of the crossing under State Route 14. The water pump and pipeline will be capable of transporting a maximum of 200 gpm, but will average about 50 gpm. Water will be stored on-site in a 40,000 gallon lined fresh water pond. Following initial startup water demands, this water will be used to add makeup water to the process plant system, and to load water trucks for dust control road application, as well as fire fighting contingencies.

2.2.12 Ancillary and Support Facilities

In addition to the above described facilities, the Buffalo Gulch Mine Project will also involve ancillary and support facilities. These additional



Scale: 1" = 2000 feet

NORTH

Figure 2.2-2: Freshwater/Makeup Water Pipeline Route facilities include primary and backup diesel-powered 270 kW power generators, haul and access roads, diversion ditches, and auxiliary buildings for offices and storage facilities for equipment and chemical/petroleum products (see Section 2.2.20 for information concerning the on-site storage of chemical and petroleum products).

Two generator sets will be utilized on site. One set will be used to power the agglomerator system and the other set will be used at the process plant. Final exact locations have not been established as the generators will be portable and field located.

The process plant generator system (approximately 225 kW in size) will include a spare generator set on standby to be used during service and repairs and for emergency operation of the process pond pumps. The generator set will probably be located outside on the west side of the process plant building.

The agglomerator generator system (approximately 250 kW in size) will be located adjacent to the agglomerator, conveyors and stacker. This location will change from time to time as the agglomerator moves. The generator set will be trailer mounted in a weatherproof, noise reducing enclosure.

2.2.13 Topsoil Salvage

Soil materials will be salvaged from all areas to be disturbed, with the exception of soil storage areas and diversion ditches. Topsoil salvage will occur throughout the life of the project and is detailed in Section 7.4 of the Plan of Operations. Soil surveys and testing conducted by Idaho Gold Corporation were used to identify suitable topsoil stripping depths and salvage volumes. Approximately 324,969 cubic yards of soil will be salvaged during the life of the project and stored in three topsoil stockpiles (Figure 2.2-1). Soil salvaged from disturbed areas will allow an average redistribution depth of approximately 19.8 inches.

2.2.14 Sediment Control Plan

A Sediment Control and Monitoring Plan (Appendix K, Plan of Operations) has been included as a portion of the Plan of Operations for the control of erosion and sediment associated with project development. Resoiling and revegetation, fiber matting, mulching, straw filter bales, single and multiple brush filter windrows, and sediment control berms, will be used to control sediment. In addition, a monitoring plan including embeddedness, flow, and total suspended solids (TSS) sampling at selected surface water sites is included as a portion of the Sediment Control and Monitoring Plan, and the Water Resources Monitoring Program (see Section 2.2.16-2, and Appendix I, Plan of Operations).

Major elements of the sediment control plan are:

1) Location and design of facilities to minimize erosion and sedimentation.

2) Use of sediment control measures on both a short-term and long-term basis to control erosion and sedimentation during construction and during the operational period.

3) Use of sediment control measures in the post-operational reclamation program for long-term control of erosion and sedimentation.

4) On-site inspection and monitoring to directly observe and measure erosion and sedimentation, as well as the effectiveness of mitigation measures.

5) Implementation of corrective measures to control sediment problems if they are identified by monitoring.

2.2.15 Wetlands Mitigation Plan

Section 404(b)(1) of the Clean Water Act, administered by the U.S. Army Corps of Engineers, requires that IGC develop and implement a wetland mitigation plan designed to replace on-site and off-site wetland values if the loss or diminishment of these values is unavoidable as a result of project development. The loss or diminishment of wetland values as a result of the project development is unavoidable, and the Idaho Gold Corporation has submitted a Joint Application for Permit for the Buffalo Gulch Project to the U.S. Army Corps of Engineers that details a proposed wetlands mitigation plan. This wetlands mitigation plan is included as Appendix T of the Plan of Operations, and is summarized below.

1) <u>Mine Site</u>. The open pit and regraded process and surplus ponds at the Buffalo Gulch Mine Project following project closure and reclamation will create depressions that may seasonally or permanently contain water providing an opportunity for on-site wetlands reestablishment.

2) <u>Open Pit</u>. After completion of mining the pit will contain water and may occasionally overflow. Maximum potential depth of the pit impoundment will be approximately 70-75 feet. Based upon post-mining pit inflow analyses, a pond in the pit with an approximate area of about 17.5 acres will form by year four following mine closure. Utility of the pit as a wetland is primarily related to its recharge potential. Some down gradient springs will be recharged by water from the pit, providing increased and longer term flows. Bench areas on the perimeter of the pit impoundment will be resoiled (if access is possible) and will be seeded to provide herbaceous vegetation.

3) <u>Process and Surplus Ponds</u>. Following reclamation, the depressions in the area of the process and surplus ponds will contain water at least during a portion of the year. Ultimate drainage from the reclaimed process pond area will be routed to the pit. These reclaimed pond areas will be resoiled, seeded and planted and will provide an opportunity for approximately 6 to 8 acres of wetland plant communities to develop.

4) <u>Lower Buffalo Gulch</u>. Lower Buffalo Gulch has been selected cooperatively by the Bureau of Land Managment (BLM), U.S. Corps of Engineers (COE), U.S. Environmental Protection Agency (EPA), and Idaho Gold Corporation (IGC) as a potentially preferred area

for off-site wetlands mitigation (Figure 2.2-3). The lower Buffalo Gulch site was selected for the following reasons:

- The proposed mine site involves spring and seep contribution to Maurice Creek and Buffalo Gulch Creek and the mitigation of wetlands in Buffalo Gulch is as close as possible to the mine site;

- Idaho Gold Corporation controls unpatented mining claims on the mitigation site;

- Excess soil materials (rock and gravel) removed from the proposed pond excavation can be used for construction at the project site or on the access road to the site;

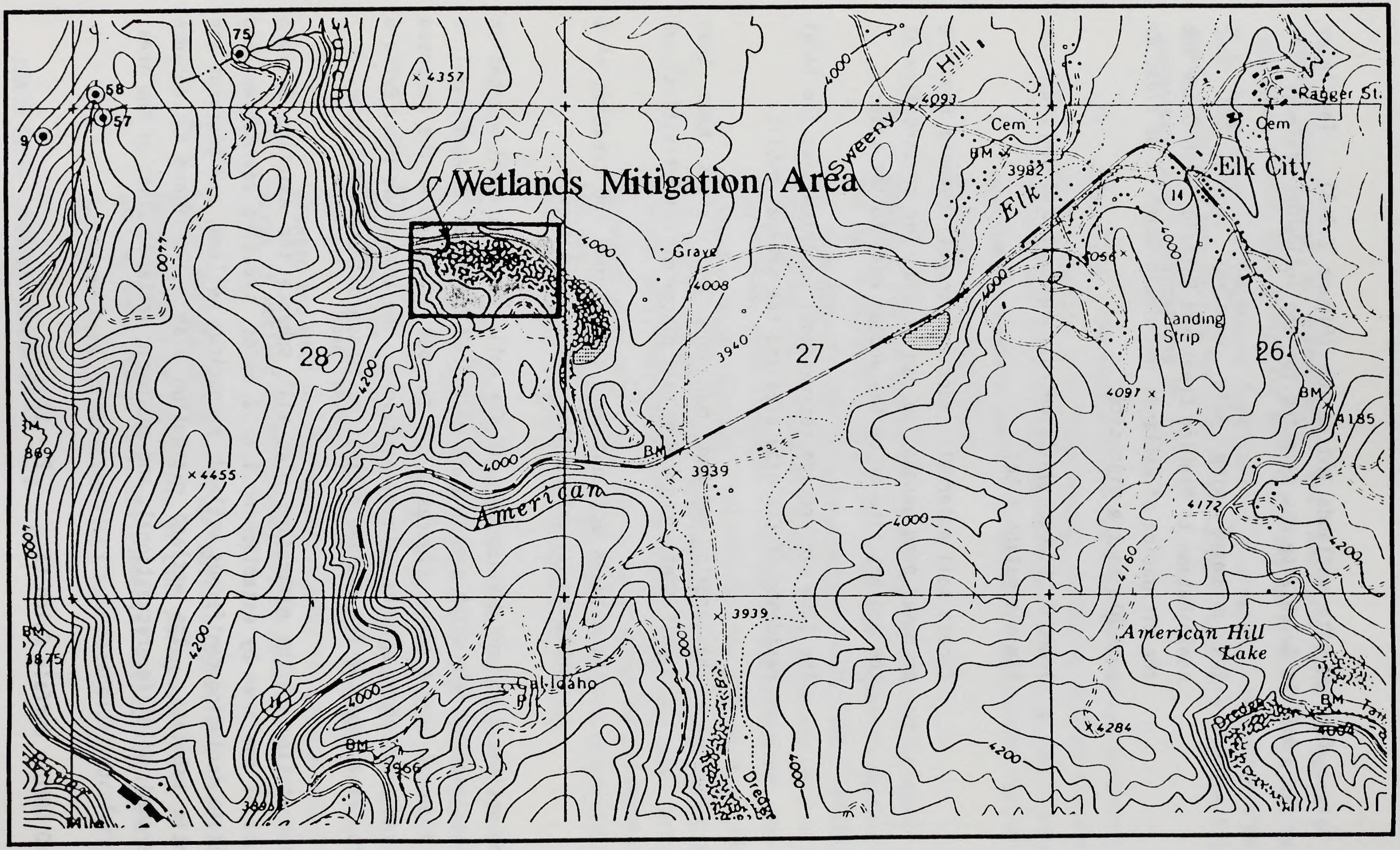
- The site can provide recreational opportunities for local residents of Elk City area and the general public.

- The area's wetland functions and values have been significantly reduced by past placer mining activities; and

- The site is adjacent to a public road and creation of a wetland will enhance the area's appearance.

Three options have been developed by IGC for wetlands enhancement/mitigation in the lower Buffalo Gulch area and are described in detail in Appendix T of the Plan of Operations. Figures 2.2-3 through 2.2-10 show the proposed wetland development options and cross-sections. The area along lower Buffalo Gulch Creek proposed for wetland mitigation is approximately 4.7 acres.

Implementation of the mitigation plan will enhance the existing wetland values of the area by establishing 1 or 2 ponds, creating several wetland habitats including coniferous wetland, herbacious wetland, and emergent and aquatic habitats. The wetland mitigation plan is designed to enhance watershed, wildlife, recreational, and aesthetic wetland values of the area.



Scale: 1" = 1500 feet

NORTH

Figure 2.2-3: Wetlands Mitigation Location Map

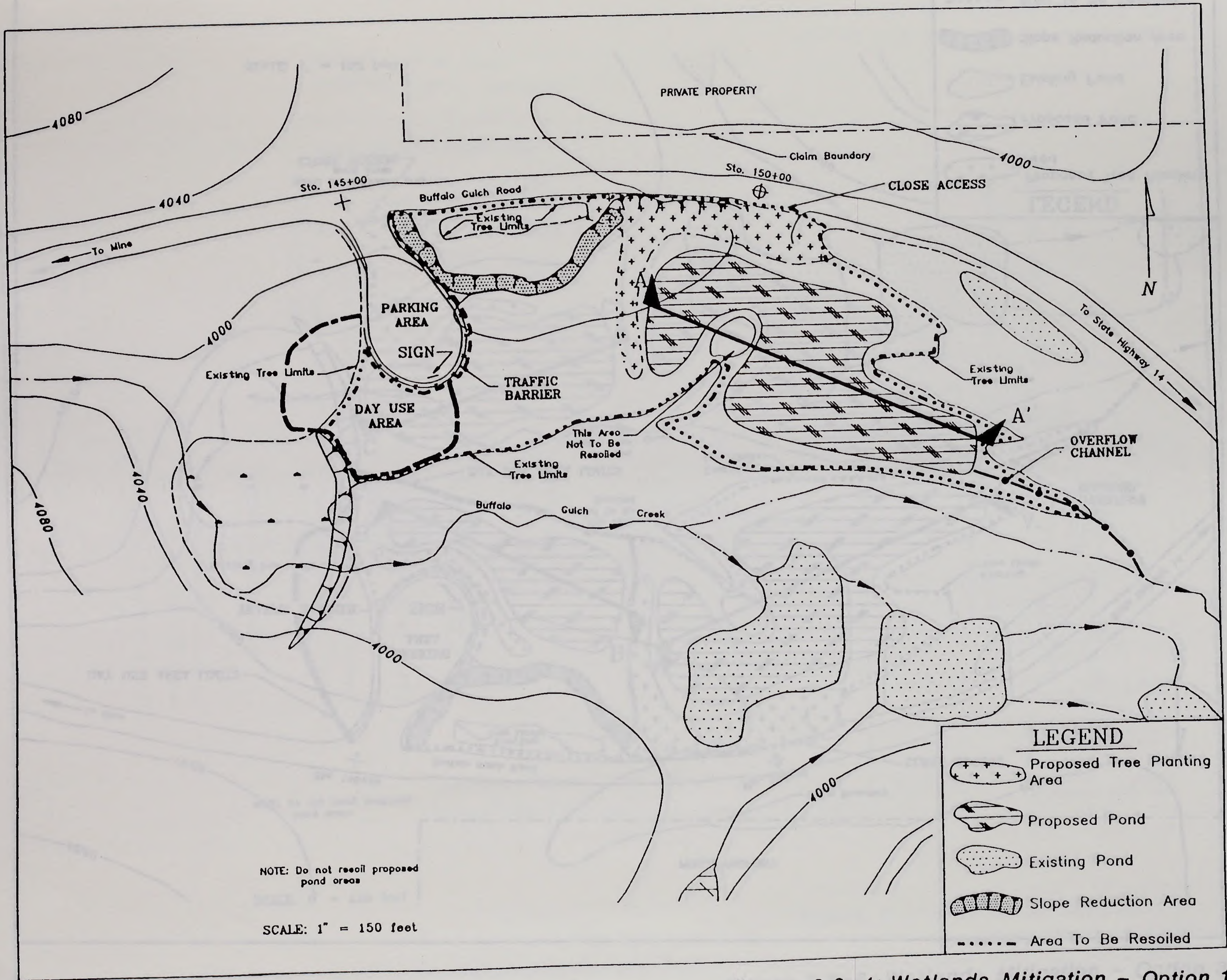
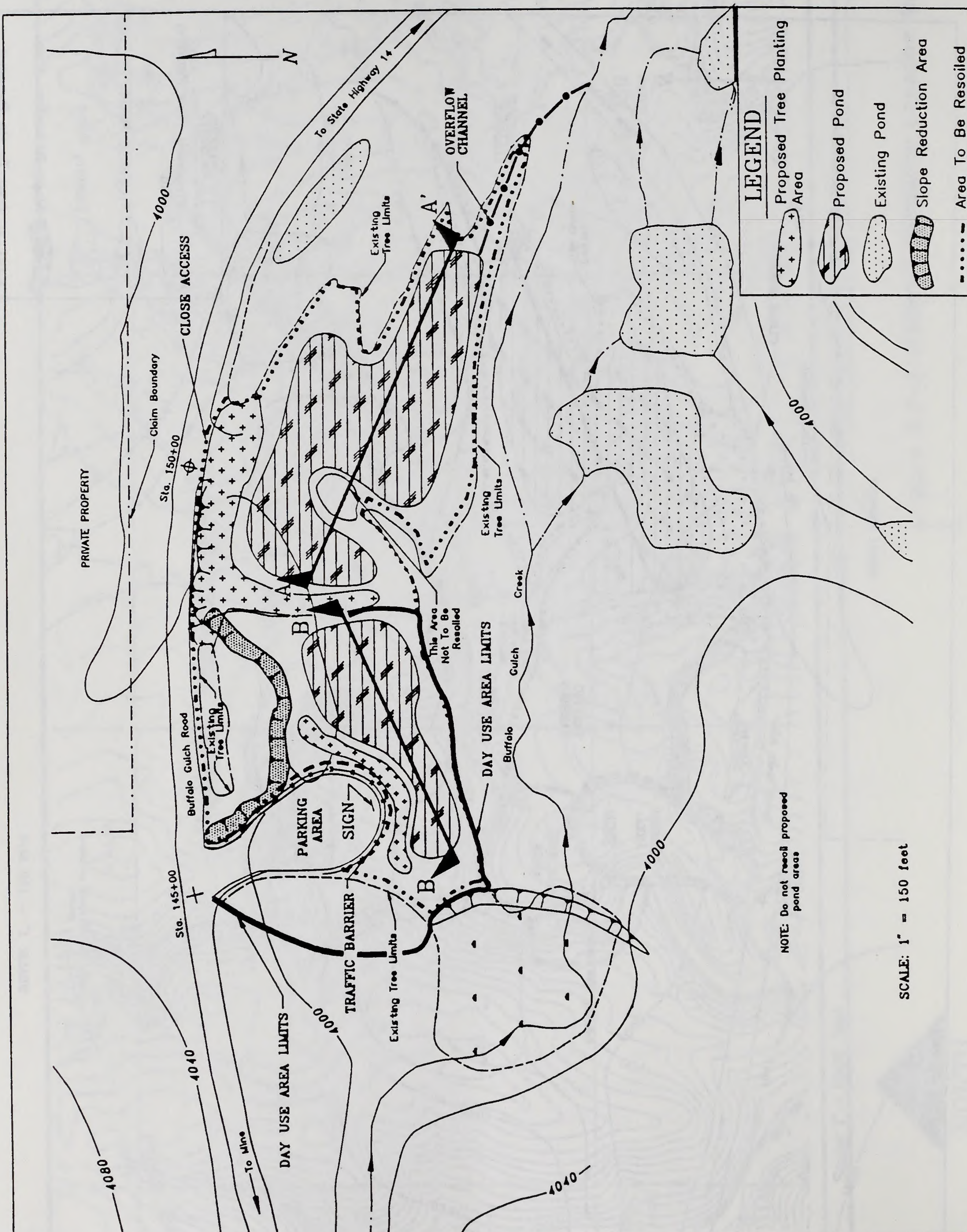


Figure 2.2-4: Wetlands Mitigation – Option 1



PRIVATE PROPERTY
Claim Boundary
Sta. 150+00
CLOSE ACCESS
N
To State Highway 14
OVERFLOW CHANNEL
A'
Existing Tree Limits
4000
Buffalo Gulch Road
Existing Tree Limits
A
B'
This Area Not To Be Resoiled
Existing Tree Limits
DAY USE AREA LIMITS
Buffalo Gulch Creek
PARKING AREA
SIGN
B
TRAFFIC BARRIER
Existing Tree Limits
Sta. 145+00
DAY USE AREA LIMITS
4000
4040
4080
To Mine
4000
4040
NOTE: Do not resoil proposed pond areas
SCALE: 1" = 150 feet
LEGEND
Proposed Tree Planting Area
Proposed Pond
Existing Pond
Slope Reduction Area
Area To Be Resoiled

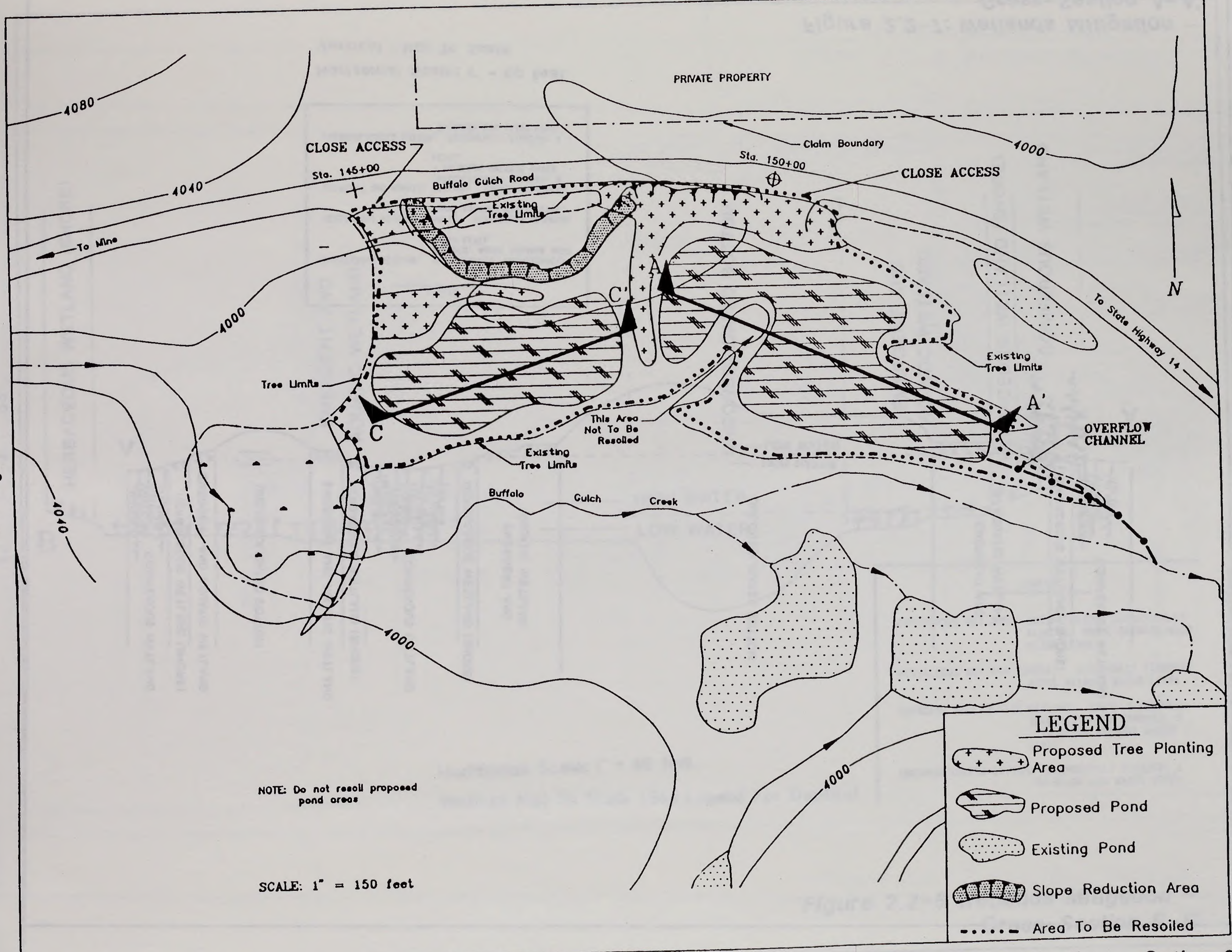
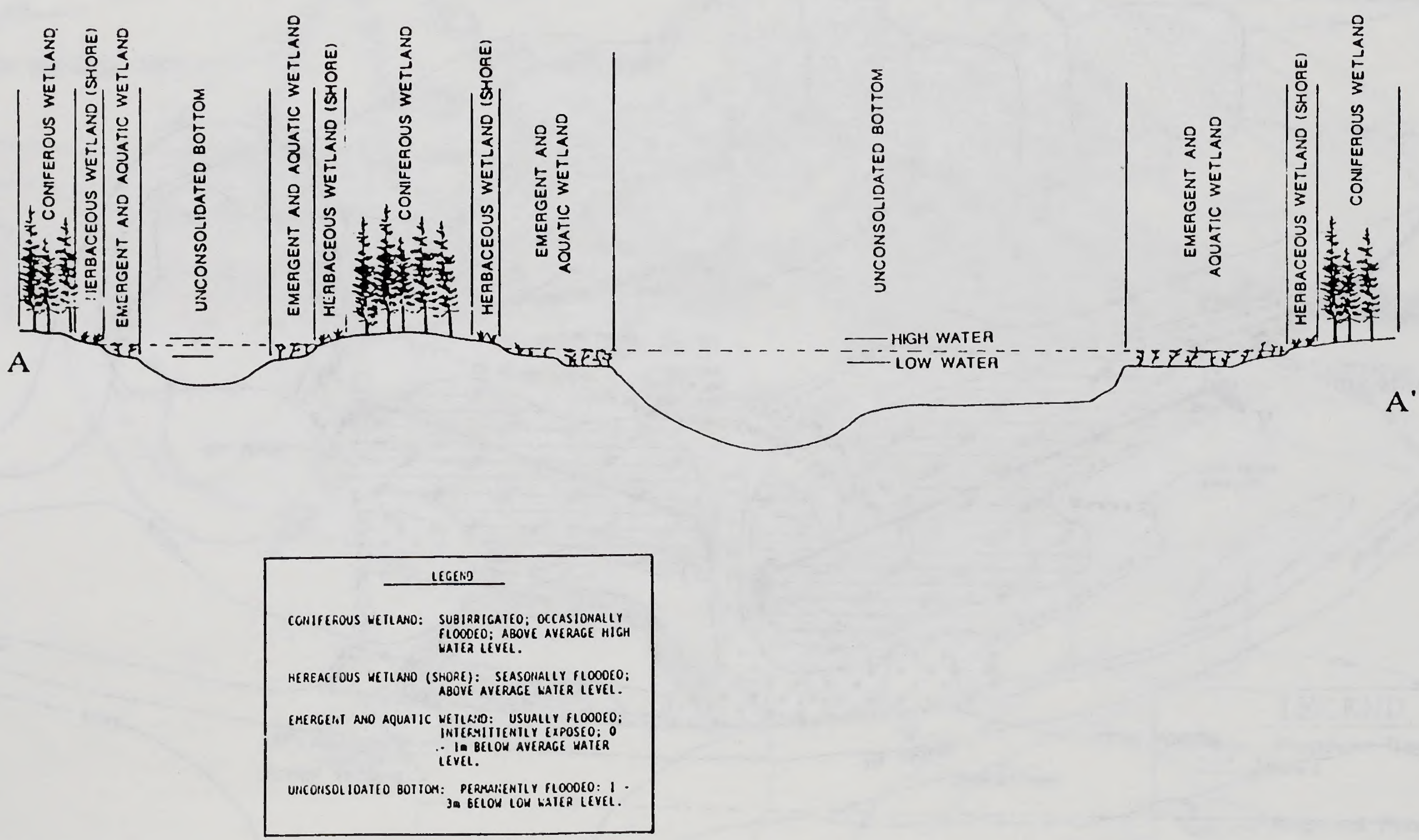


Figure 2.2-6: Wetlands Mitigation - Option 3



Horizontal Scale: 1" - 60 feet

Vertical : Not To Scale

Figure 2.2-7: Wetlands Mitigation – Cross-Section A-A'

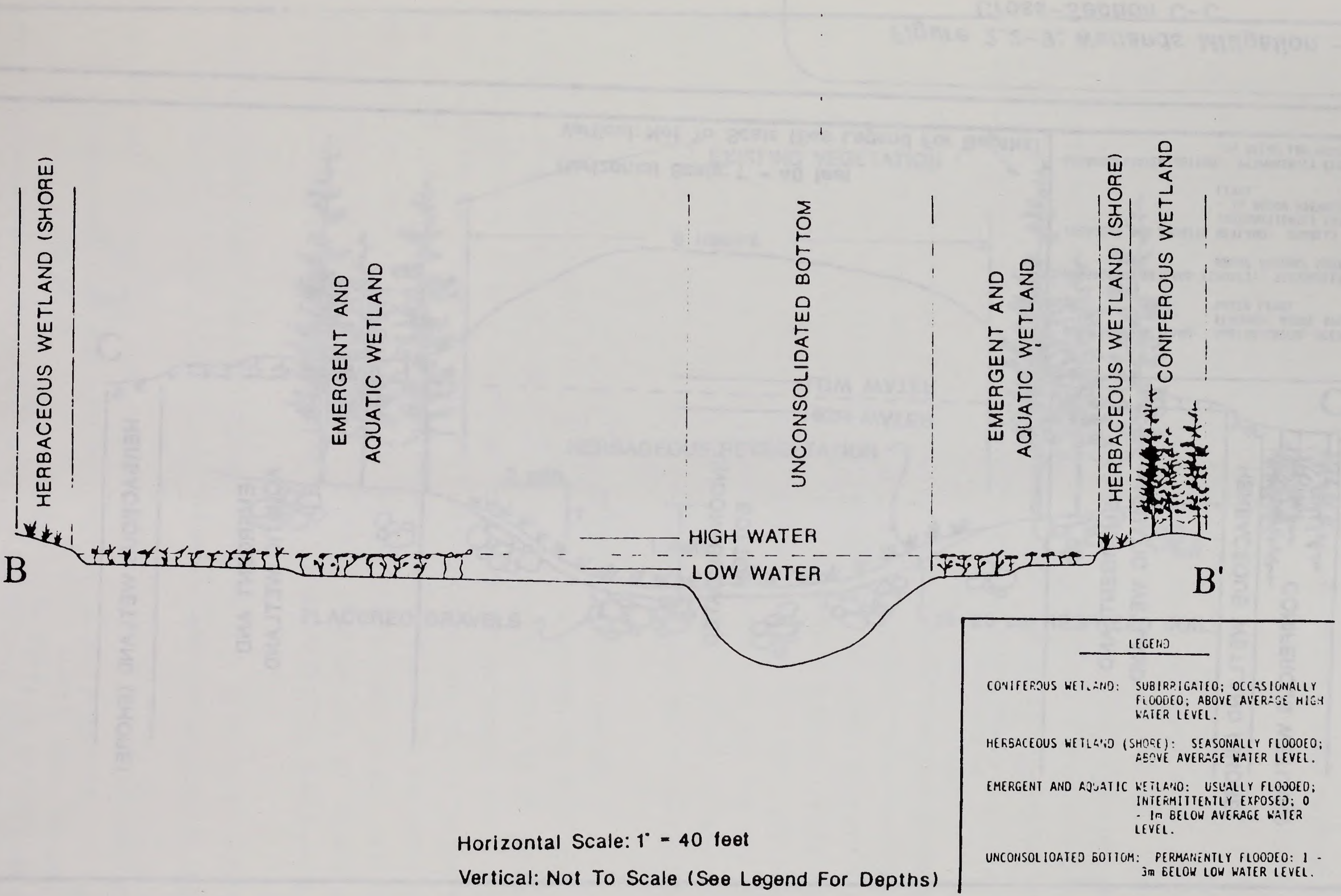


Figure 2.2-8 Wetlands Mitigation – Cross-Section B-B'

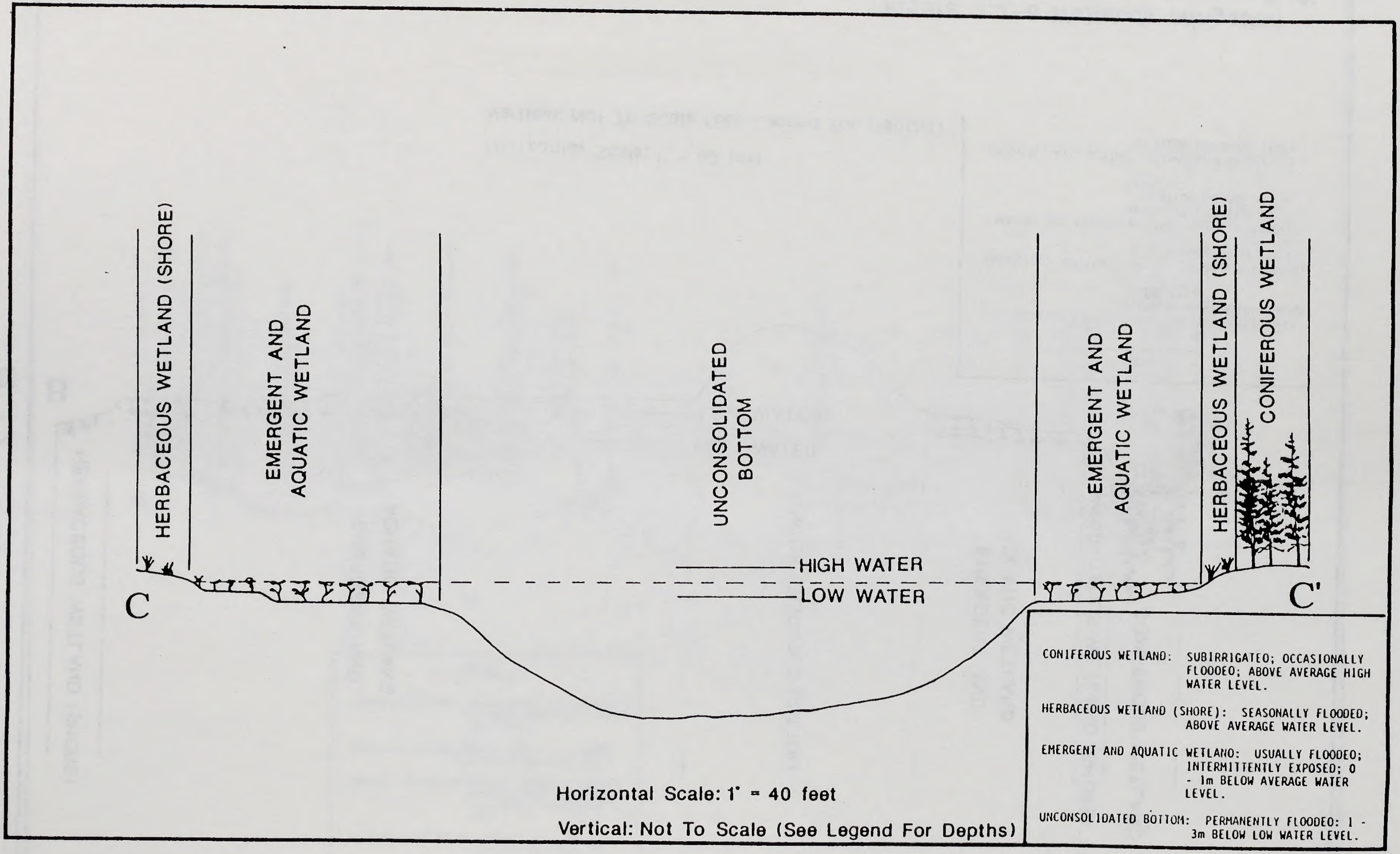


Figure 2.2-9: Wetlands Mitigation – Cross-Section C-C'

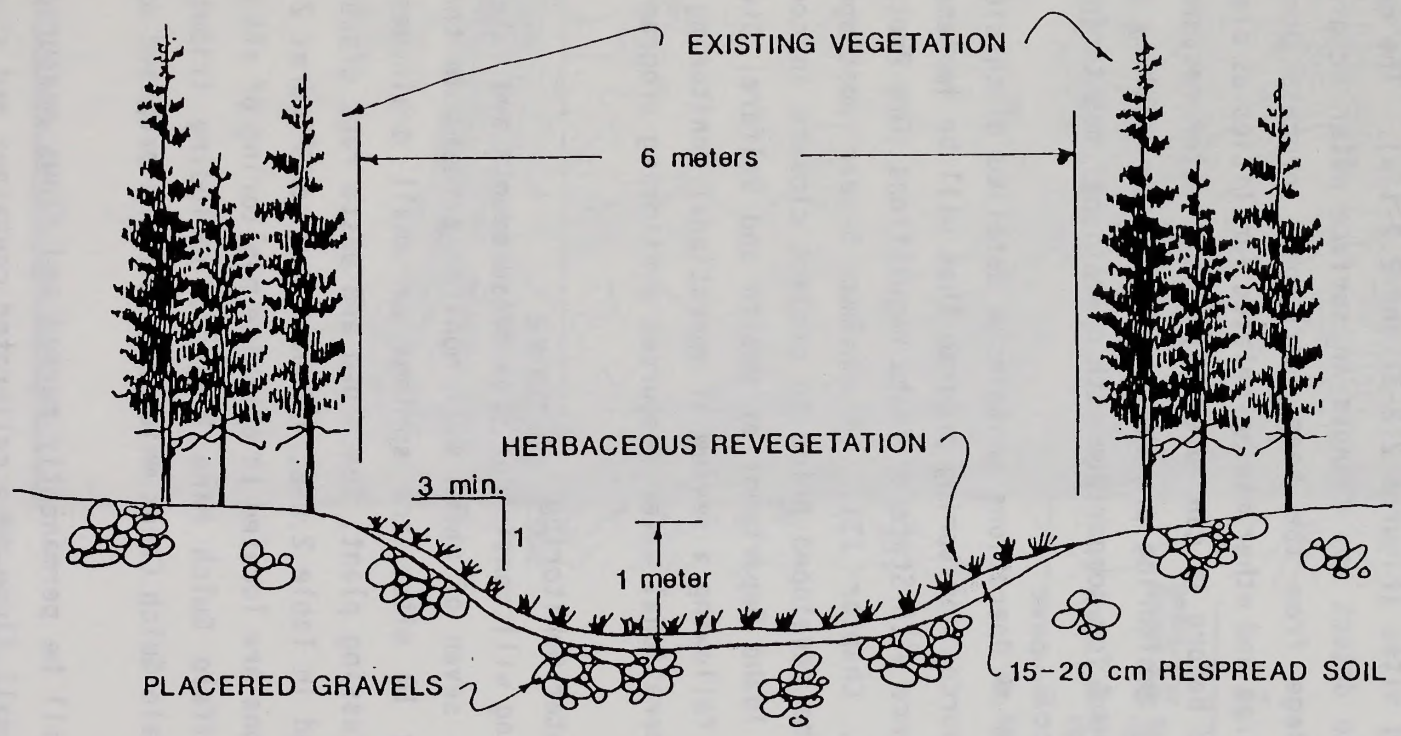


Figure 2.2-10: Overflow Channel Cross-Section

2.2.16 Environmental Monitoring

1) Surface Water and Groundwater Monitoring

The operational water resources monitoring program for the Buffalo Gulch Mine Project will consist of a comprehensive network of surface water and groundwater monitoring sites (Figures 2.2-11 and 2.2-11a). The monitoring program is designed to detect any changes in surface water or groundwater quality and any leakage from the heap leach pad, process ponds, land application disposal area and other mining-related facilities as close to the source as possible and before it can adversely affect water resources. The baseline water quality monitoring program provided water quality data that can serve as a background for comparison with operational monitoring data.

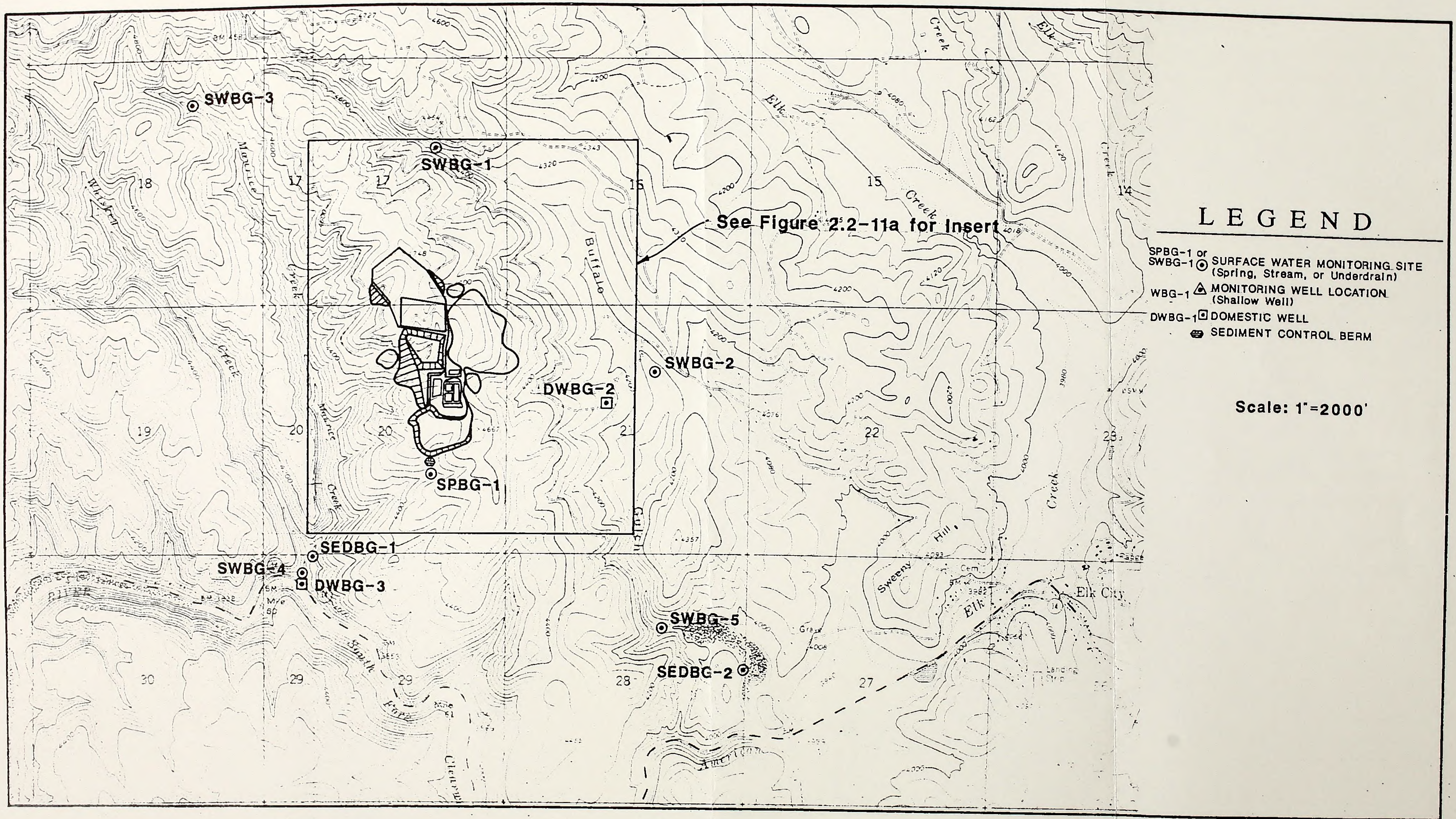
Appendix I of the Plan of Operations contains a detailed discussion of the operational water resources monitoring program that will be implemented for the project in compliance with State of Idaho regulations (Ore Processing by Cyanidation, Title 1, Chapter 13). A minimum 5-year post-operational monitoring plan will be developed prior to project closure in cooperation with the BLM and the Idaho Department of Health and Welfare, Division of Environmental Quality following a review of operational monitoring results. A discussion of the operational water resources monitoring program follows.

a. Surface Water Monitoring

Surface water monitoring will consist of flow measurements and water quality analyses at 17 sites, seven of which will monitor streams in the project area. The remaining 10 sites are springs or small drainages present peripheral to the processing plant, leach pad and waste rock disposal area. The sites are described in Table 2.2-2, and are shown on Figures 2.2-11 and 2.2-11a. The 17 stations are located to optimize monitoring of all drainages peripheral to the Buffalo Gulch Mine Project, including tributaries to Maurice Creek and Buffalo Gulch Creek which are near the proposed operation.

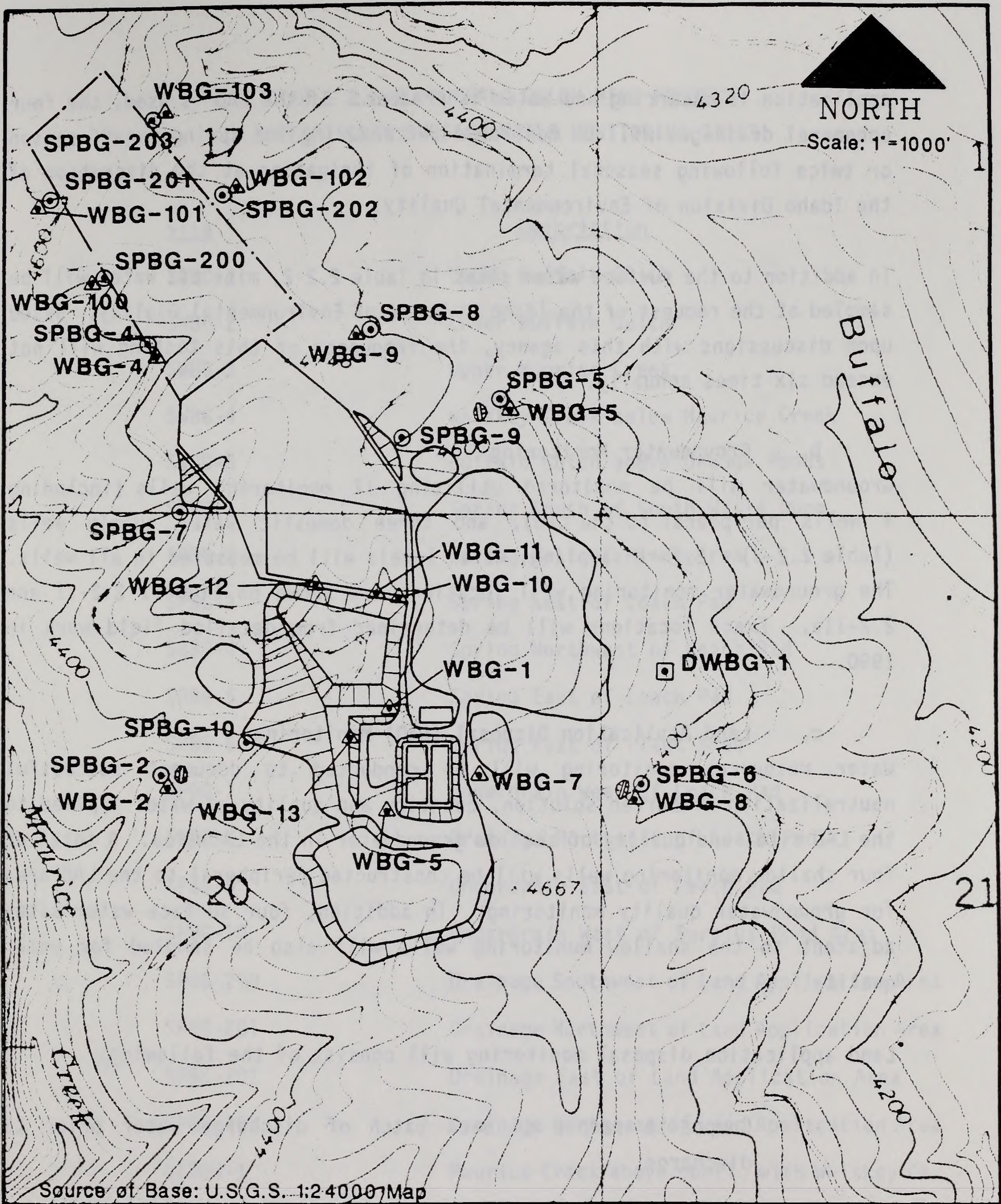
Surface water sites will be permanently marked and flows measured using a weir, current meter, small flume or a calibrated container and stopwatch.

The headwaters of four small ephemeral drainages peripheral to the LAD (land application disposal) area will be monitored for runoff and when the land



NORTH

Figure 2.2-11.
Buffalo Gulch Mine Project
Operational Surface and Groundwater Monitoring Site Locations.



LEGEND

SPBG-1 or SWBG-1	SURFACE WATER MONITORING SITE (Spring, Stream, or Underdrain)
WBG-1	MONITORING WELL LOCATION (Shallow Well)
DWBG-1	DOMESTIC WELL
	SEDIMENT CONTROL BERM

Figure 2.2-11a. Insert for Figure 2.2-11.

application is occurring and water is present. If the LAD is used, the four ephemeral drainages will be monitored twice during the spring runoff season or twice following seasonal termination of irrigation at the discretion of the Idaho Division of Environmental Quality.

In addition to the surface water sites in Table 2.2-2, mine pit water will be sampled at the request of the Idaho Division of Environmental Quality. Based upon discussions with this agency, the frequency of this testing will not exceed six times annually.

b. Groundwater Monitoring

Groundwater will be monitored utilizing 17 monitoring wells (including 4 wells peripheral to the LAD), and three domestic water supply wells (Table 2.2-3). Before sampling, water levels will be measured in all wells. The groundwater monitoring well locations are shown on Figures 2.2-11 and 2.2-11a. Exact locations will be determined from detailed field work in 1990.

c. Land Application Disposal (LAD) Monitoring

Water resources monitoring will be conducted to document successful neutralization of barren solution, quantity and quality of water applied to the LAD site, and quality of shallow groundwater in the LAD area. A total of four shallow monitoring wells will be constructed peripheral to the LAD area for groundwater quality monitoring. In addition, four surface water sites adjacent to the shallow monitoring wells will also be sampled for water quality.

Land application disposal monitoring will consist of the following:

- Composite sample of each batch of discharge water prior to discharge.

- HACH kit cyanide analysis of water from the main line daily during discharge.

TABLE 2.2-2. BUFFALO GULCH MINE PROJECT
OPERATIONAL SURFACE WATER MONITORING SITES

Site	Description
SWBG-1	Upper Buffalo Gulch
SWBG-2	Lower Buffalo Gulch
SWBG-3	Upper Maurice Creek
SWBG-4	Whiskey Creek below Maurice Creek
SWBG-5	Buffalo Gulch above Dredge Ponds
SPBG-1	Spring South of South Waste Dump
SPBG-2	Spring West of Plant Area
SPBG-3	Spring West of Leach Pad
SPBG-4	Spring Northwest of Leach Pad
SPBG-5	Spring East of Leach Pad
SPBG-6	Spring East of Plant Area
SPBG-7	Underdrain West of Leach Pad
SPBG-8	Drainage Northeast of Leach Pad
SPBG-9	Underdrain East of Leach Pad
SPBG-10	Underdrain West of Surplus Pond Area
SPBG-200	Drainage Southwest of Land Application Area
SPBG-201	Drainage Northwest of Land Application Area
SPBG-202	Drainage East of Land Application Area
SPBG-203	Drainage Northeast of Land Application Area
SEDBG-1	Maurice Creek above confl. with Whiskey Ck.
SEDBG-2	Buffalo Gulch below Wetland Mitigation Area

See Figures 2.2-11 and 2.2-11a for locations of monitoring sites.

TABLE 2.2-3. BUFFALO GULCH MINE PROJECT OPERATIONAL GROUNDWATER MONITORING SITES

Site	Description
WBG-1	Monitoring Well North of Surplus Pond
WBG-2	Monitoring Well West of Plant Area
WBG-3	Monitoring Well West of Leach Pad
WBG-4	Monitoring Well Northwest of Leach Pad
WBG-5	Monitoring Well East of Leach Pad
WBG-6	Monitoring Well South of Surplus Pond
WBG-7	Monitoring Well East of Ponds
WBG-8	Monitoring Well East of Ponds
WBG-9	Monitoring Well Northwest of Leach Pad
WBG-10	Leach Pad Underdrain
WBG-11	Leach Pad Underdrain
WBG-12	Leach Pad Underdrain
WBG-13	East of Surplus Pond
DWBG-1	Domestic Water Supply
DWBG-2	Domestic Water Supply
DWBG-3	Domestic Water Supply
WBG-100	Southwest of Land Application Site
WBG-101	Northwest of Land Application Site
WBG-102	East of Land Application Site
WBG-103	Northeast of Land Application Site

See Figures 2.2-11 and 2.2-11a for locations of groundwater monitoring sites.

- Composite sample of discharge water from the main line sampling port weekly during discharge.

- Measure application rate by pan collection once daily during discharge.

- Visual reconnaissance of the disposal area will be made daily. If overland flow of sufficient intensity to reach the land disposal boundary area occurs, the discharge rate will be reduced.

- Frequent sampling of LAD monitoring wells and surface monitoring sites during irrigation period and twice during the spring runoff period or twice following seasonal termination of irrigation at the discretion of the Idaho Division of Environmental Quality (DEQ).

- A complete operating record of all treatment and discharge activities will be maintained. A daily log will indicate the amount of chemicals added, the source of water in each detoxification batch, the length of time discharge occurred, the area sprinkled and application rate. A record of all HACH and ion electrode test results of all samples collected also will be maintained.

d. Monitoring Schedule and Parameters

Parameters to be monitored (Table 2.2-4) include an Extended Analysis Group, which is a comprehensive list of water quality parameters that potentially could be affected by the project, and an Indicator Analysis Group which are parameters most indicative of the process solutions to be present at the Buffalo Gulch Mine Project (a subset of the Extended Analysis Group). If results of analysis of the Indicator Analysis parameters suggest a change in water quality has occurred, then the Extended Analysis Group parameters will be utilized to more completely assess water quality.

The weekly schedule (using the Indicator Analysis Group parameters) for surface and groundwater monitoring is shown on Table 2.2-5, and the monthly schedule (using the Extended Analysis Group parameters) is in Table 2.2-6.

TABLE 2.2-4. BUFFALO GULCH MINE PROJECT OPERATIONAL WATER QUALITY MONITORING ANALYTICAL PARAMETERS

EXTENDED ANALYSIS GROUP

Metals *

Arsenic	Lead	Selenium
Barium	Manganese	Silver
Cadmium	Mercury	Zinc
Copper	Nickel	
Chromium		
Iron		

Physical Parameters, Common Ions and Cyanide

Bicarbonate/carbonate	Total Dissolved Solids
Total Alkalinity	Total Suspended Solids
Calcium	Temperature
Magnesium	Turbidity
Sodium	Specific Conductivity
Total Hardness	Water Level (wells)
Chloride	Flow (streams and springs)
Sulfate	Total Cyanide **
pH	

INDICATOR ANALYSIS GROUP

Temperature (°C)	pH
Turbidity (NTU)	Specific Conductance
Flow (streams and springs)	Water Level (wells)
	WAD Cyanide

* All metals will be measured as Total Metals.

** If total cyanide is present in a concentration exceeding 0.005 mg/L, a test will be conducted for both WAD cyanide and free cyanide. The total cyanide measurement is accurate and will show any WAD or free cyanide in concentrations exceeding 0.005 mg/L. The analytical procedure for free cyanide will be determined in coordination with the DEQ.

TABLE 2.2-5. BUFFALO GULCH MINE PROJECT WEEKLY OPERATIONAL WATER RESOURCES MONITORING SCHEDULE

Surface Water	Groundwater	Location
SPBG-1		Spring south of south waste dump
	WBG-1	Well north of surplus pond
	WBG-6	Well south of surplus pond
	WBG-7	Well east of ponds
SPBG-7		Underdrain west of leach pad
SPBG-9		Underdrain east of leach pad
SPBG-10		Underdrain west of surplus pond area
	WBG-10	Leach pad under drain
	WBG-11	Leach pad under drain
	WBG-12	Leach pad under drain
	WBG-13	West of surplus pond
	DWBG-1	Domestic Water Supply
	DWBG-2	Domestic Water Supply
	DWBG-3	Domestic Water Supply
SPBG-200*	WBG-100	Southwest of land application site
SPBG-201*	WBG-101	Northwest of land application site
SPBG-202*	WBG-102	East of land application site
SPBG-203*	WBG-103	Northeast of land application site

* Land application sites only during irrigation period and twice during the spring runoff period or twice following seasonal termination of irrigation at the discretion of the Idaho Division of Environmental Quality.

See Figures 2.2-11 and 2.2-11a for locations of groundwater monitoring sites.

TABLE 2.2-6. BUFFALO GULCH MINE PROJECT MONTHLY OPERATIONAL WATER RESOURCES MONITORING SCHEDULE

Surface Water	Groundwater	Location
SWBG-1		Upper Buffalo Gulch
SWBG-2		Lower Buffalo Gulch
SWBG-3		Upper Maurice Creek
SWBG-4		Whiskey Cr. below confl. w/ Maurice Cr.
SWBG-5		Buffalo Gulch above Dredge Ponds
SEDBG-1		Maurice Ck. above confl. w/Whiskey Ck.
SEDBG-2		Buffalo Gulch below Wetland Mitigation Area
SPBG-1		Spring south of south waste dump
	WBG-1	Well north of surplus pond
SPBG-2	WBG-2	Spring west of plant area
SPBG-3	WBG-3	Spring west of leach pad
SPBG-4	WBG-4	Spring northwest of leach pad
SPBG-5	WBG-5	Spring east of leach pad
	WBG-6	Well south of surplus pond
	WBG-7	Well east of ponds
SPBG-6	WBG-8	Spring east of plant area
SPBG-7		Underdrain west of pad
SPBG-8	WBG-9	Drainage northeast of leach pad
SPBG-9		Underdrain east of leach pad
SPBG-10		Underdrain west of surplus pond area
	WBG-10	Leach pad underdrain
	WBG-11	Leach pad underdrain
	WBG-12	Leach pad underdrain
	WBG-13	West of surplus pond
	DWBG-1	Domestic water supply
	DWBG-2	Domestic water supply
	DWBG-3	Domestic water supply
SPBG-200*	WBG-100	Southwest of land application site
SPBG-201*	WBG-101	Northwest of land application site
SPBG-202*	WBG-102	East of land application site
SPBG-203*	WBG-103	Northeast of land application site

* Land application sites only during irrigation period and twice during the spring runoff period or twice following seasonal termination of irrigation at the discretion of the Idaho Division of Environmental Quality.

The only exceptions to this monitoring schedule are sites SEDBG-1 and SEDBG-2 which will be monitored for flow, total suspended solids and turbidity only. Operational monitoring of streams and springs will begin in conjunction with the mine project construction. Monitoring wells will be drilled in early summer of 1990 (as soon as there is access to the sites). After well drilling, construction and completion, the groundwater monitoring program will begin prior to completion and operation of the heap leach facilities. A post-operational surface and groundwater monitoring plan will be developed in cooperation with the Idaho Department of Health and Welfare, Division of Environmental Quality, and the BLM prior to project closure. Operational water resources monitoring data will be jointly reviewed, and key monitoring sites and analytical parameters of major concern determined for post-operational monitoring. Water resources monitoring during the operational period will provide a good basis for selection of post-operational monitoring sites and parameters. It is anticipated that post-operational monitoring by Idaho Gold Corporation will continue until successful project reclamation and bonding release by state and federal regulatory agencies. Post-operational monitoring will extend a minimum of 5 years after completion of reclamation at the Buffalo Gulch Site. The post-operational monitoring period may be extended at the discretion of the Idaho Division of Environmental Quality (DEQ) and the BLM to continue monitoring of active water quality trends resulting from mining operations.

Results of water quality monitoring will be reviewed on a periodic basis to determine if the parameters and frequency are appropriate. The review period may range from four months to annually as determined appropriate by IGC or by the DEQ annually. In cooperation with the Idaho Department of Health and Welfare, Division of Environmental Quality, and the BLM, a revised set of parameters, sampling sites and frequency will be developed, if appropriate, to ensure monitoring is effective and cost efficient.

The operational water resource monitoring program will include a quality assurance and quality control program. The quality assurance and quality control (QA/QC) program, organization, procedures, documentation, acceptance criteria and corrective actions for operational monitoring of water resources at the Buffalo Gulch Mine Project site are described in detail in a project

Operational Monitoring Procedures Manual (OMPM). The principles of the QA/QC program, sampling procedures, and data management and reporting are described in Appendix I of the Plan of Operations.

2) Sediment Monitoring

The project water quality monitoring plan includes measurement of total suspended solids, turbidity and flow of streams. This will provide substantial information on sediment in streams and on the effectiveness of project sediment control measures. Appendix K of the Plan of Operations describes the project sediment control program.

Although sediment will be monitored at all sites, the focus of sediment monitoring is on small headwater drainages peripheral to the project facilities and on the two major streams that drain the area. All monitoring sites are shown on Figures 2.2-11 and 2.2-11a. Sediment (TSS, turbidity and flow) in these streams will be monitored weekly during April, May, and June. For the remainder of the year, these stations will be monitored monthly for sediment.

3) Monitoring Data Management and Reporting

Environmental monitoring data management and reporting by IGC will consist of the following elements:

a. Field log books into which all monitoring, casing survey and weather data are recorded.

b. A record of all samples taken will be kept by IGC including date, time, sample containers, preservation, and date sent to the laboratory.

c. All samples and quality control samples will be coded so the laboratory cannot distinguish sample sources.

d. All laboratory data will be supplied to IGC and the Idaho DEQ directly from the laboratory.

e. Data will be entered into a computerized data base and compared with the site data record. If there are parameter values that are inconsistent with the data base for that site, a sample rerun will be requested from the laboratory. A review and validation process will be used to determine the validity of parameters in the data base.

f. The proposed daily and weekly reporting format for general information and observations concerning the routine mining and processing operations at the Buffalo Gulch Mine is presented in Figures 5.8-1 and 5.8-2 of Section 5.0 of the Plan of Operations. These reports will be submitted to the DEQ and the BLM.

2.2.17 Reclamation and Closure Plan

A detailed reclamation plan is in Section 7.0 of the Plan of Operations. The Reclamation Plan addresses post-operational topography, characteristics of waste rock and ore, soil handling, revegetation, erosion control, stability, water resources, wetlands reestablishment, facilities removal and solid waste disposal, monitoring and management, reclamation schedule, cessation of operations, and reclamation costs. Exhibit 4 shows post-mining topography.

The reclamation plan has been designed to satisfy State of Idaho and federal requirements governing mineral development in Idaho. The Plan is designed to prevent unnecessary and unreasonable damage to surface resources, and to provide for reclamation of disturbed lands. It is the intent of the reclamation plan to minimize areas affected, and to promptly restore affected areas to a condition that is compatible with the surrounding environment.

A further discussion of the reclamation plan is presented in the soil and vegetation sections of Chapter 4 of this EA.

2.2.18 Revegetation

A revegetation plan has been designed to stabilize disturbed areas through erosion and sedimentation control, reestablish a vegetative cover that is ecologically comparable to pre-mine conditions and restore watershed, wildlife, recreational, and aesthetic values to meet post-operation BLM land use objectives. The revegetation plan for the project site is detailed in

Section 7.5 of the Plan of Operations, and specifically addresses species selection, seed mixtures and rates, seedbed preparation, seeding and planting methods, cultural treatments, and interim revegetation.

For the project site reclamation, Idaho Gold Corporation proposes to use a revegetation mixture which includes grass, forb, shrub and tree species present in pre-mine habitat types. A diversity of species has deliberately been selected to account for expected broad ranges in post-operational conditions such as soil moisture holding capacity, topography and aspect. All mining-related disturbances will be revegetated, with the exception of pre-mining rock outcrops. All pit walls and benches will be broadcast seeded.

At the wetlands enhancement site on lower Buffalo Gulch Creek, revegetation is designed to stabilize disturbed areas through erosion and sedimentation control, reestablish a vegetative cover that is ecologically comparable to pre-disturbance conditions, and enhance watershed, wildlife, recreational, and aesthetic values. Idaho Gold Corporation has proposed to establish a wetland revegetation community at the wetlands enhancement site that utilizes species adapted to moist-site conditions and tolerant of potential recreational use. A detailed discussion of revegetation of the wetlands enchancement site is in Appendix T of the Plan of Operations.

Additional discussion of revegetation is in Section 4.7 of Chapter 4 of this EA.

2.2.19 Transportation of Chemicals and other Materials of Concern

Operation of the proposed heap leach facilities will require the use of chemicals and other materials of concern, including petroleum products. These chemicals and materials will need to be transported to the site from supply sources off-site. An Off-site Transportation and Spill Contingency Plan has been prepared by Idaho Gold Corporation as a portion of the Plan of Operations (Appendix M). The plan includes the recommendations of the Interagency Transportation Task Force and addresses the concern associated with the inherent potential for an off-site transportation-related spill of project chemical and petroleum products.

Table 2.2-7 describes the function, amount, source, route of delivery, and frequency of delivery for the various materials the Buffalo Gulch Mine Project will require. The specific transport contractors and sources for the various chemicals, fuels, and other products, and hence transportation routes, will be finalized prior to project operation.

All chemicals and petroleum products as defined in the transportation plan will be delivered to the Buffalo Gulch Mine Project site according to the following procedures:

1) Via designated delivery route except in emergency need situations. If alternate route use is needed, IGC will notify personnel identified below in writing at least one week prior to chemical shipment.

2) Prespecified notification requirements including destination, departure notification, placarding, and piloting (if required), arrival notification and manifesting will occur. The following individuals or agencies will be notifed at least one week in writing by IGC prior to shipment of chemical products:

Jim Wiebush	USFS Elk City District Ranger	Elk City, Idaho 842-2245
D.J. Richardson	ITD/POE Port of Entry	P.O. Box 837 Lewiston, Idaho 743-0601
Lanny Wilson *	BLM Area Manager	P.O. Box 453 Cottonwood, Idaho 962-3245
Terry Beeler	Idaho Co. Deputy Sheriff	Box 194, Elk City, Idaho 842-2484
Gregg Teasdale *	IDHW - DEQ	1118 "F" Street Lewiston, Idaho 799-3430
	Idaho State Police	2700 North South Highway Lewiston, Idaho 743-9546
	Idaho Transportation Dept.	P.O. Box 837 Lewiston, Idaho 746-1345

* Verbal communication only needed.

TABLE 2.2-7. (Continued)

Material	Form	Function	Annual Use Amount (Estimate)	Source of Shipment	Route of Delivery	Frequency of Delivery
Anti-Scalant	Liquid	Control of scale buildup in leaching circuit	20,000 gallons	Spokane or Boise	Same as for Portland Cement	Four truck shipments per year
Hydro-chloric Acid	Liquid	Carbon treatment	Less than 220 gals.	Spokane or Boise	Same as for Portland Cement	One truck shipment per year
Borax	Granular	Refining	Less than one ton	Spokane or Boise	Same as for Portland Cement	One truck shipment per year
Soda Ash	Powder	Refining	Less than one ton	Spokane or Boise	Same as for Portland Cement	One truck shipment per year
Diesel Fuel	Liquid	Fuel for generator and mining equipment	750,000 gallons	Spokane or Boise	Same as for Portland Cement	One to two tank truck shipments per week
Gasoline	Liquid	Vehicle fuel	30,000 gallons	Spokane or Boise	Same as for Portland Cement	One tank truck shipment every two weeks
Propane	Pressurized Liquid	Misc. heating	2,000 gallons	Spokane or Boise	Same as for Portland Cement	Two shipments per year
Anti-Freeze	Liquid	Used in mining equipment and vehicles	1,000 gallons	Spokane or Boise	Same as for Portland Cement	One truck shipment per year

TABLE 2.2-7. CHEMICAL AND PETROLEUM USE

Material	Form	Function	Annual Use Amount (Estimate)	Source of Shipment	Route of Delivery	Frequency of Delivery
Sodium Cyanide	Briquets in Flo-bin steel containers carrying 3,000 lbs.	Principal component of heap leaching process	Up to 300 tons	Spokane or Boise	Spokane to Lewiston (US-95); Lewiston to Elk City via Grangeville US-95 and State Routes 13 and 14). Carlin, Nevada to Elk City (I-80, US-95 and State Routes 13 and 14)	30 truck loads per year in convoys of three to six trucks
Portland Cement	Bulk powder	Agglomeration of ore to improve leaching	Up to 10,000 tons	Spokane or Boise	Spokane to Elk City (same route as cyanide) Boise to Elk City (I-84, US-95 and State Routes 13 and 14)	Six truckloads per week; 66,000 pounds per truck
Ammonium Nitrate (ANFO)	Prills (granular)	Blasting	50,000 pounds	Spokane or Boise	Same as for Portland Cement	Ten truck shipments per year
Calcium or Sodium Hypochlorite	Granular in drums	Used to neutralize cyanide	Up to 50 tons	Spokane or Boise	Same as for Portland Cement	Four truck shipments per year
Hydrogen Peroxide	Liquid in bulk drums	Used to neutralize cyanide	Possible alternative for calcium or sodium hypochlorite	Spokane or Boise	Same as for Portland Cement	One truck shipment per year
Caustic Soda	Granular	pH control of cyanide	One ton	Spokane or Boise	Same as for Portland Cement	One truck shipment per year

3) Materials guides will accompany all chemical shipments and will be made available to BLM and local safety officials.

4) In accordance with the Idaho Hazardous Materials Response Plan, all spills of hazardous materials shall be reported immediately to the State Communication Center (EMS) 1-800-632-8000 (24-hour toll free number), as required under Idaho Code, Section 1.2850, and the appropriate Idaho State Police District Office.

5) Spill response will be consistent with the Idaho Department of Health and Welfare's <u>Idaho Hazardous Material Incident Command Response and Support Plan</u>.

6) Emergency containment will be given priority at the site of the spill, where the spilled chemical does not involve imminent health hazard.

7) Standard delivery procedures to apply to all chemical suppliers will be identified prior to the beginning of project operations and will address:

   a. Transportation
   b. Manifesting
   c. On-site Storage and Inventory
   d. Spill Response
   e. Cleanup/Monitoring
   f. Reporting
   g. Prespecified notification

8) Placarding of all shipments in compliance with state and federal law will occur.

9) An escort (pilot) vehicle shall proceed and maintain communications with all cyanide and other chemical transport vehicles (excluding cement, petroleum, and ammonium nitrate). Only drivers who have completed training equivalent to Idaho Department of Transportation

training and emergency response training and are familiar with State Route 14 along the South Fork Clearwater River will drive escort vehicles.

10) An Emergency Spill Response Trailer provided by IGC and accompanied by personnel trained in hazardous material emergency spill response will accompany all chemical transportation convoys (excluding cement, petroleum products, and ammonium nitrate) traveling from Mount Idaho to the mine site.

11) Transportation of petroleum products from Mount Idaho to the mine site will occur in DOT approved compartmentalized trucks.

12) Transportation of chemical or petroleum products will meet IDT requirements (75 feet overall maximum length on State Route 14).

13) Transportation of chemicals (excluding cement, petroleum products, and ammonium nitrate) will be limited to the periods each year offering a low impact risk. Periods of high and low risk will be determined at coordination meetings between IGC and state and federal agencies prior to shipments.

14) Speed of transport vehicles will be controlled by pilot vehicles and will be determined by road conditions.

15) The Standard reporting procedure (format) for problem situations will will include:

a. Name and address of reporting person(s)
b. Telephone numbers where that person(s) can be reached
c. Date and time of accident
d. Weather conditions
e. Chemicals involved: products and companies
f. Quantity of chemical (estimate)
g. Exact location of accident (including direction to site)
h. Names and telephone numbers of eyewitnesses and/or contacts

i. Person(s) exposed (if any) and their condition
j. Emergency treatment required
k. Notification documentation of Emergency Supervisor
l. Photo-documentation of accident
m. Summary of containment, cleanup and monitoring activities

A light-duty Idaho Gold Corporation vehicle equipped with a flashing warning light will meet all process chemical delivery trucks and escort vehicles at the mine office in Elk City and escort those vehicles to the delivery site, minimizing road and traffic hazards. The IGC personnel will visually inspect the delivery truck(s) for leakage. If no leakage is observed, IGC personnel will lead the delivery truck(s) to its delivery site.

2.2.20 On-Site Chemical and Petroleum Product Storage and Spill Response

In order to minimize the potential for accidental on-site spills and environmental contamination, process chemicals on the project area will be stored in accordance with the following:

Liquid Cyanide will occur on-site only as a result of the mixing of dry cyanide with process waters in the ore leaching process. Liquid cyanide solution will be present only within the process ponds, collection ditches, and leach pad. A pH of 10 or higher will be maintained in the process ponds solution to avoid formation of highly volatile, toxic hydrogen cyanide (HCN) gas.

Dry Cyanide will be stored in 3000 pound Flo-bin shipping containers in the reagent storage area near the mine process plant. Flo-bin delivery, storage, and handling procedures are described in Appendix 3 of Appendix G of the Plan of Operations.

Diesel Fuel will be stored in approximately 6,000 gallon tanks (3) in compliance with provisions of the Uniform Fire Code administered by the State Fire Marshall. A fuel truck will be used to refuel heavy duty mining vehicles. The location of the storage tanks will be determined through consultation with and approval by the BLM and the State Fire Marshall during project construction.

Gasoline will be stored in an approximately 2,000 gallon tank at the on-site plant office area in compliance with provisions of the Uniform Fire Code administered by the State Fire Marshall. Light-duty vehicles will be refueled directly from the tanks.

Cement will be stored on-site in 100 ton silos (2), or portable silos in the process facilities area.

Hydrogen Peroxide (50 percent solution) will be stored in 55 gallon drums in the process plant area. A constant temperature will be maintained to avoid pressure buildup.

Caustic Soda will be stored in approximately four 55 gallon drums in the process plant. A valve will open the tank directly to the mixing area; therefore no handling of caustic soda is required.

Propane or LPG will be stored in 250 to 500 gallon tanks located at the processing facility. The tanks will be supported on concrete piers.

Hydrochloric Acid and Sulfuric Acid will be stored on-site in 30 to 50 gallon plastic drums in a segregated storage area in the process plant facilities. Approximately 220 gallons of hydrochloric acid, and 2,200 gallons of sulfuric acid will be stored on-site.

Boric and Soda Ash will be stored on-site in plastic containers in a segregated storage area in the process plant facilities. Approximately 1,000 pounds each of borax and soda ash will be stored on-site.

Antiscalant will be stored on-site in 55 gallon drums or bulk tanks in a segregated storage area in the process plant facilities. Approximately one ton of antiscalant will be stored on-site.

Anti-freeze will be stored on-site in 55 gallon drums in the shop area. Approximately 1,000 gallons will be stored on-site, primarily during the fall and winter months.

Ammonium Nitrate will be stored on-site in a silo separated from the storage of process chemicals. A maximum amount of 40,000 pounds will be stored on-site.

In addition to the above measures, IGC has developed an On-site Spill Prevention and Contingency Plan (SPCP) which will further reduce the risk of on-site spills of materials of concern and potential surface water contamination (Appendix G, Plan of Operations). The SPCP addresses prevention, response, communication, and remedial actions necessary in the event of a spill. On-site emergency spill response and cleanup materials will be maintained for the life of the project, as well as (OSHA/MSHA) training provided for all employees concerning the safe handling of project chemicals and fuels, including appropriate immediate remedial measures. The SPCP defines and describes basic management responses to spills and provides an emergency operational handbook to be utlized in the event of an accidental release of process chemicals or fuel in the project area. Potential environmental contaminants include cyanide (liquid and dry), petroleum products, and chemical reagents. Emergency responses to spills of these materials are treated in the SPCP.

The SPCP objectives are to:

a. reduce the potential for accidental spills and environmental contamination through a well-defined materials management program,

b. provide the operating staff with the necessary information to properly respond to a hazardous material or petroleum spill event,

c. clearly define responsibilities for spill notification and control of spills,

d. provide a response and clean-up program which minimizes or eliminates environmental impacts.

These objectives will be achieved under the direction of the Idaho Gold Corporation Emergency Response Team Coordinator, who will coordinate and direct a team of professionals trained in actual emergency response actions.

2.2.21 Project Schedule

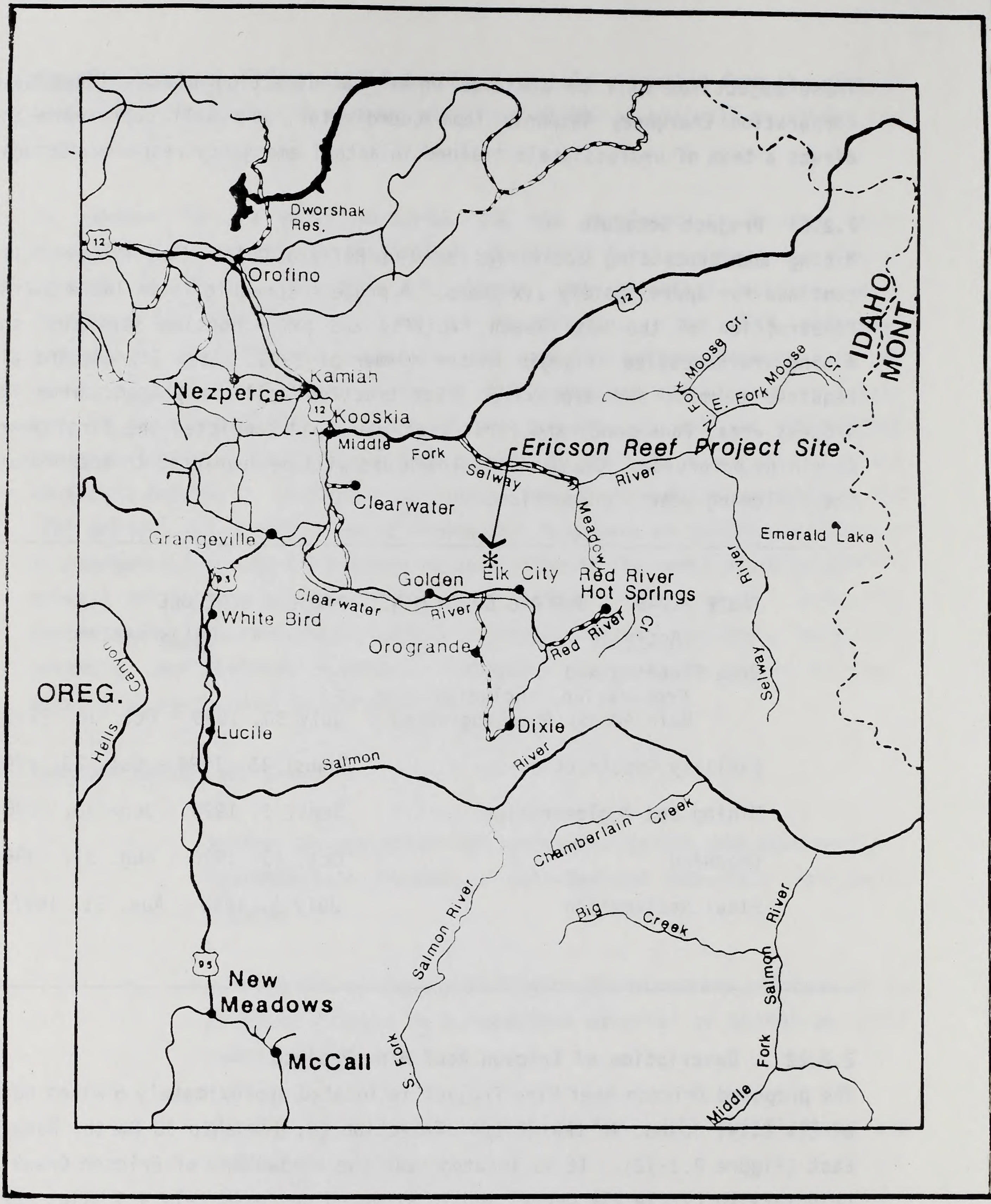
Mining and processing activities at the Buffalo Gulch Mine Project will continue for approximately six years. A project schedule is in Table 2.2-8. Construction of the heap leach facility and preproduction stripping and mining are scheduled to begin in the summer of 1990, after IGC obtains all required permits and approvals. Construction will be phased, with the process area, four ponds and first year leach pad completed the first year. As mining progresses, the ultimate leach pad will be developed to accommodate the following year's production.

TABLE 2.2-8 BUFFALO GULCH MINE - PROJECT SCHEDULE

Activity	Dates
Site Clearing and Preparation, including Main Access Road Upgrading	July 30, 1990 - Oct. 10, 1990
Facility Construction	August 15, 1990 - Oct. 30, 1990
Mining and Agglomeration	Sept. 1, 1990 - June 30, 1996
Leaching	Oct. 15, 1990 - Aug. 31, 1996
Final Reclamation	July 1, 1996 - Aug. 31, 1997

2.2.22 Description of Ericson Reef Mine Project

The proposed Ericson Reef Mine Project is located approximately 6 miles north of Elk City, Idaho, in the NE 1/4 of Section 29, Township 30 North, Range 8 East (Figure 2.2-12). It is located near the headwaters of Ericson Creek, a tributary to Little Elk Creek, and is situated approximately 4.5 miles north of the proposed Buffalo Gulch Mine. Most of the Ericson Reef Mine Project will be located near an elevation of 4,800 feet AMSL.



NORTH

Figure 2.2-12
Location Map
Ericson Reef Mine Project

Access to the proposed mine site is by gravel and dirt roads which begin in Elk City. The primary access route is northward along county road 1859 to its junction with USFS road 443, then northward on 443 to the junction with USFS/BLM road 283 (Ericson Ridge Road), then northward along 283 to the headwater area of Ericson Creek. USFS road 443 is currently closed to winter travel a short distance beyond its junction with county road 1859. Proposed upgrading of the existing access road would involve portions of the road administered by Idaho County, Idaho.

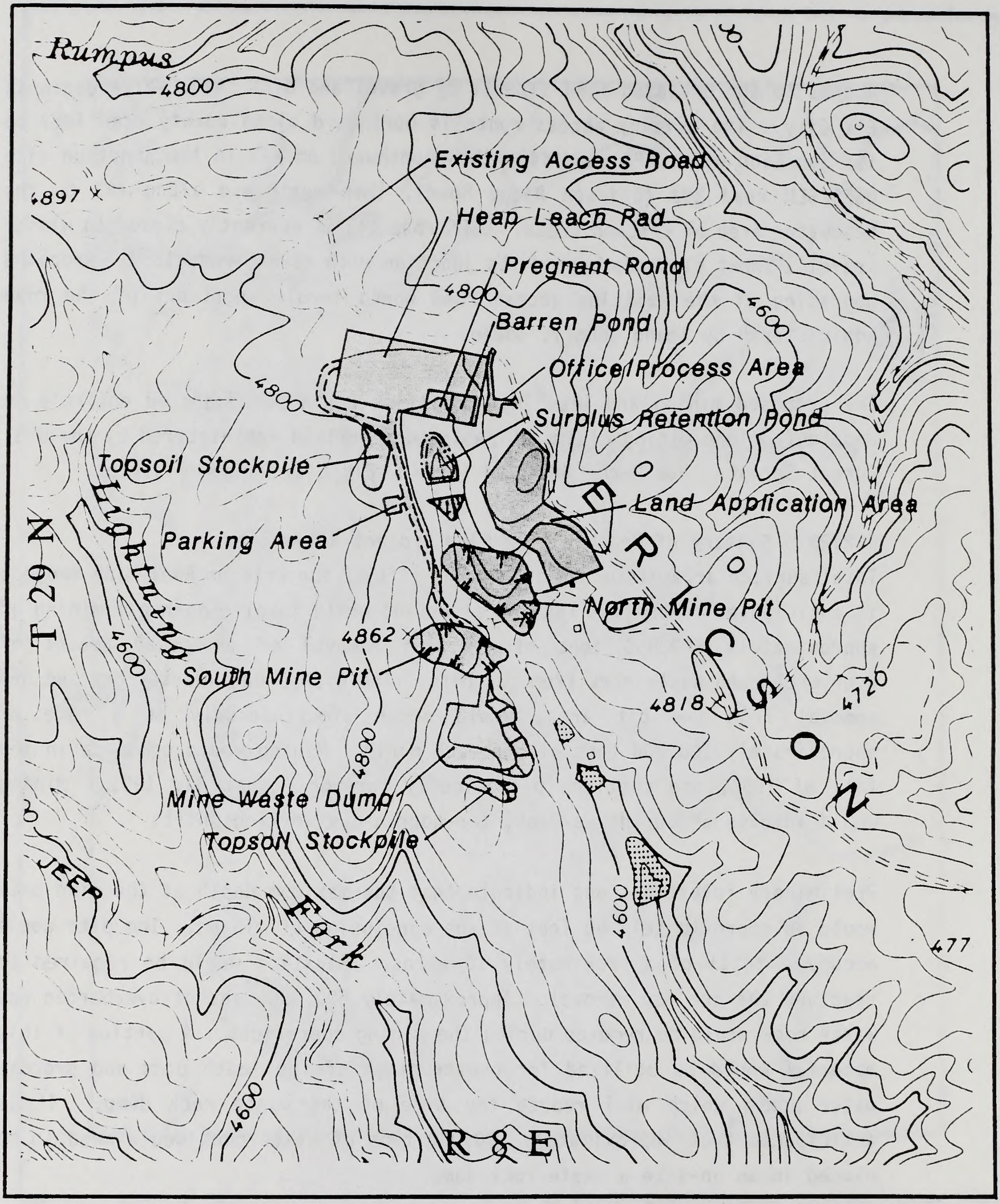
The proposed mining and leaching activities would be conducted entirely on unpatented lode mining claims on public domain land administered by the U.S. Forest Service, Nez Perce National Forest, Elk City Ranger District.

2.2.23 Summary of Ericson Reef Mine Project Activities

Total surface area disturbed during the life of the Ericson Reef Mine Project is anticipated to be less than 50 acres and would involve open-pit mining of approximately 600,000 tons of ore and removal of an equal amount of overburden and waste rock from two pits. The overburden, waste rock and ore removal from the pit areas would occur simultaneously at a rate of approximately 100,000 tons of ore each month. Mining would commence in the fall of 1990, and continue periodically through August 31, 1991. Mining would involve a four-day-a-week, ten-hour-a-day working shift.

Preliminary investigations indicate that the maximum depth of the mine pits would be approximately 60 feet at the conclusion of mining. The pits would occupy a total of approximately 10 acres. Blasting would be required to fracture the ore for removal. Approximately 600,000 tons of overburden and waste rock would be removed during the mining operations. A portion of this material would be utilized for construction of the leach pads and process water ponds which will reduce the size of the waste rock dump. It is anticipated that approximately 500,000 tons of waste rock would need to be placed in an on-site a waste rock dump.

The proposed heap leach facilities (Figure 2.2-13) would consist of a leach pad area, several water collection ponds (barren, pregnant, and excess storage), a small office and maintenance facilities, electrical generators,



SCALE: 1" = 1000 feet

NORTH

SOURCE OF BASE: U.S.G.S. 1:24,000, Lick Point, Idaho

Figure 2.2-13

General Project Layout
Ericson Reef Mine Project

an adsorption circuit, and a reagent storage facility. A leak detection system would be installed beneath the leach pad and the ponds. Water for the leaching operation is anticipated to be obtained from available on-site sources. The heap leaching and ore processing facilities would operate 24 hours per day, seven days a week from the fall of 1990 to August 31, 1991.

Site preparation and facility construction would employ about 37 persons, while the mining operation, including management personnel, would employ about 27 persons. Operation of the leach plant would employ about 8 persons.

The work force would be comprised of local labor to the extent that local skilled workers are available. The project work force would be shared with the Idaho Gold Corporation's Buffalo Gulch Mine proposed nearby. Both projects have a concurrent development and mining schedule.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER EVALUATION

2.3.1 Project Design

Sequenced Ridgetop Multiple Leach Pad Design

An initial Buffalo Gulch Mine Project development design proposed the sequential construction of six heap leach pads along the crest of the ridge located north of the open-pit mine, as well as one large waste rock dump located at the head of a small drainage above Maurice Creek. This design is detailed in Updated Plan of Operations, Buffalo Gulch Mine, Idaho County, Idaho, April 1989, prepared by Idaho Gold Corporation and Steffen Robertson and Kirsten (U.S.) Inc. Figure 2.3-1 presents the general facilities layout detailed in this initial project design document.

After initial discussions with the Bureau of Land Management, and other state permitting agencies, Idaho Gold Corporation decided not to carry this design proposal forward. This decision was based primarily upon potential adverse visual resource impacts associated with the location of the heap leach pads, and a desire to reduce the size of the waste dump facility, as well as the amount of potentially disturbed lands associated with the project.

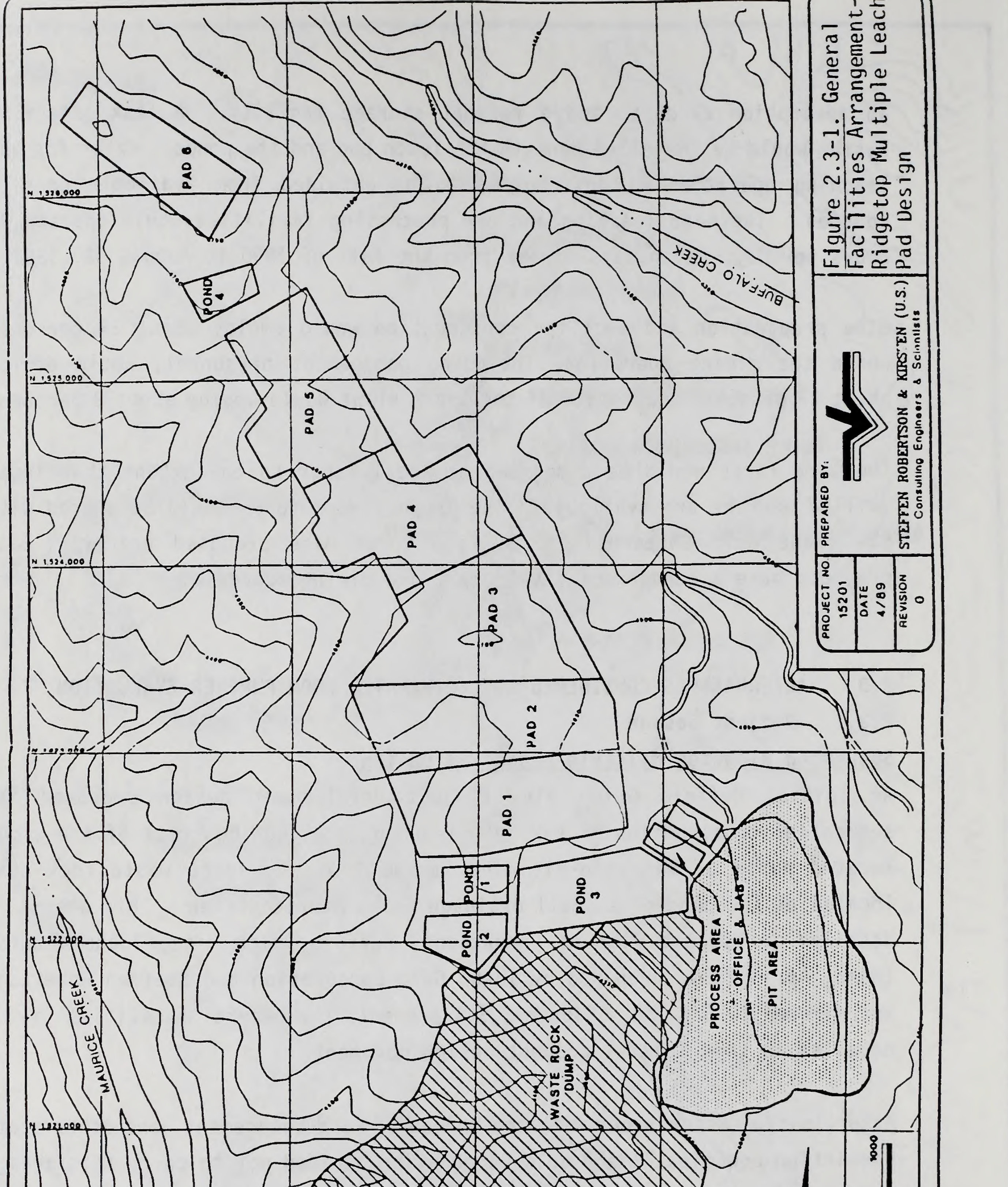


Figure 2.3-1. General Facilities Arrangement-Ridgetop Multiple Leach Pad Design

Double Waste Dump/Ultimate Leach Pad Design

An alternative project facility layout was developed by Idaho Gold Corporation which reduced the number of previously proposed heap leach pads to a sequential first year pad which would be extended to form an ultimate heap leach pad located nearer the open-pit mine. The new design also included the concurrent development of two smaller waste dumps. This design is detailed in Draft Design Report for Permitting, Buffalo Gulch Gold Project Heap Leach Facilities, September 1989, prepared for Idaho Gold Corporation by Welsh Engineering Inc. The general facilities layout detailed in this alternative project design document is in Figure 2.3-2.

An interagency review of this project design resulted in further revision of the design and development of the proposed project design described in Section 2.2.1. The revised design was developed by IGC to incorporate a desire by the BLM that post-operational drainage associated with the heap leach pad and process collection ponds be routed to the open pit. In addition, the proposed project design minimizes unavoidable impacts to the wetlands of the project area and provides increased opportunity for sediment control.

A Reusable Leach Pad

Heap leach processing facilities typically utilize one of the following design methods: 1) a reusable pad with on/off loading; 2) a valley leach; or 3) a permanent pad. Prior to selecting the combined valley - permanent pad design for the Buffalo Gulch Mine project, Idaho Gold Corporation examined a reusable leach pad design during the initial engineering design phase of the project.

The reusable pad method involves the cyclic loading, leaching, rinsing and unloading of the ore from a durable permanent pad. This method is most appropriate for ores that leach quickly and uniformly. The reusable pad method was considered inappropriate for the Buffalo Gulch Mine project because of the added costs involved in moving the ore twice, material handling and scheduling difficulties associated with loading and unloading ore on a regular basis, and the need for a disposal area (withouth PVC liner protection) for spent off-loaded ore which would create additional water quality and wetland impact concerns.

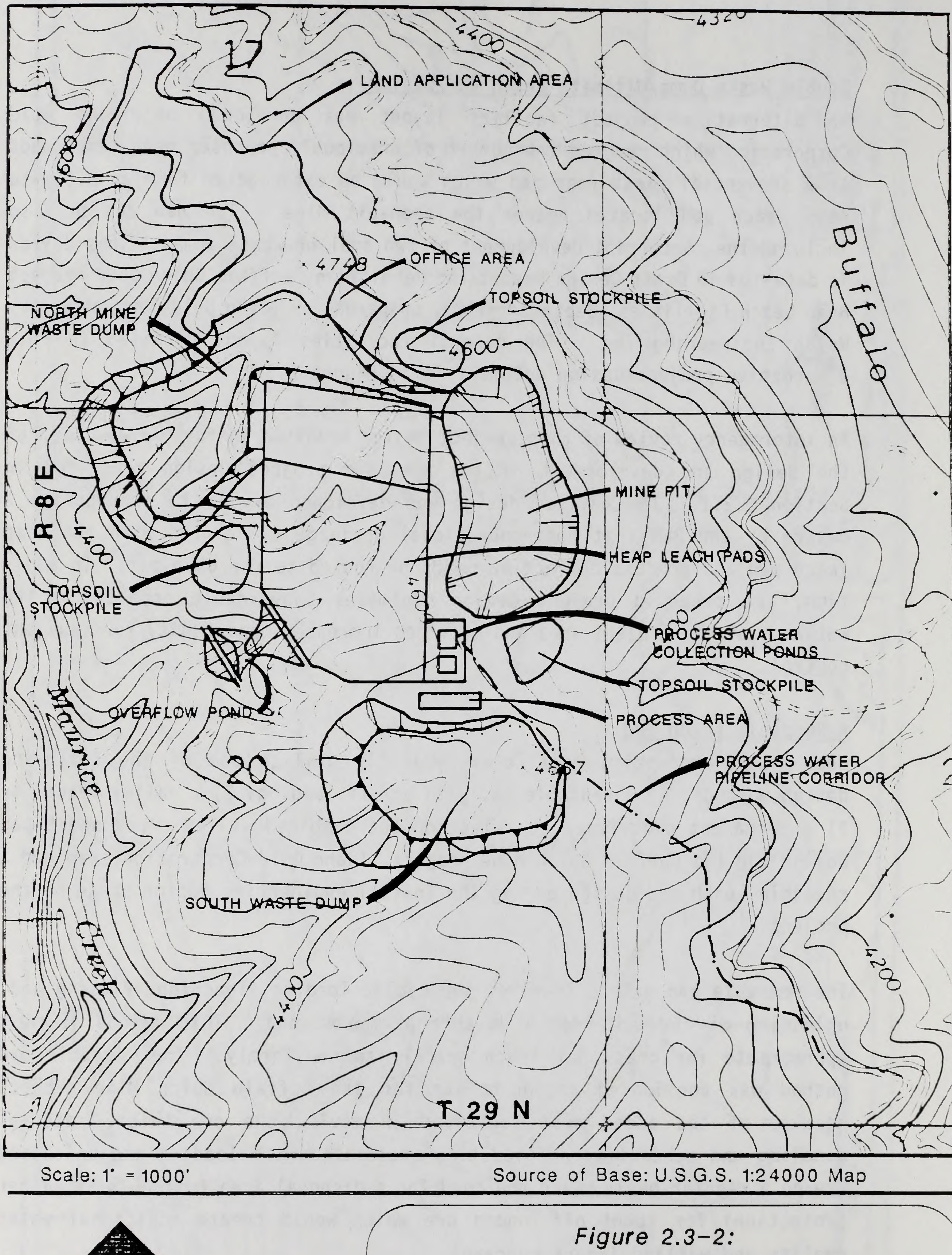


Figure 2.3-2:
Double Waste Dump - Ultimate Leach Pad
Alternative Facilities Layout

A Double PVC Lined Leach Pad

For mine projects located in areas with highly permeable soil liner fill materials and natural foundation conditions beneath leach pads, a double PVC lined pad is often constructed to reduce the potential of any pad leakage escaping to the groundwater beneath the pad. The soil liner fill material and foundation conditions at the Buffalo Gulch Mine Project leach pad location, however, are favorable for the use of a single PVC liner beneath the pad. The proposed system of a single 40-mil PVC liner (1×10^{-12} cm/sec permeability), with low permeability soil liner fill (1×10^{-6} cm/sec permeability) and favorable natural foundation conditions beneath the liner, will act as a composite liner system to adequately contain the dilute cyanide solutions and protect the underlying natural groundwater conditions without the installation of a second PVC liner beneath the leach pad. In addition, the proposed wick drain and leak detection system beneath the single PVC liner adds a further measure of protection.

PVC Lining of the Second Year Retention Berm in the Surplus/Retention Pond Storage Area

The first year surplus pond is planned to be single PVC lined to a storage capacity of 7.65 million gallons to provide for short-term emergency storage (beyond that provided by the collection ponds) of process waters associated with a total pad draindown in the event of an on-site power outage or temporary project abandonment in excess of 5 days.

Additional un-PVC lined storage capacity of 15.85 million gallons is available in the surplus/retention pond in year two of the operations with the proposed addition of 17 feet of freeboard with a retention berm. This would provide storage for excess waters from the process water system associated with a 100-year, 24-hour storm event (3.6 inches of rain) and average maximum snowpack snowmelt contributions (40 inches at 34 percent water), as well as total leach pad draindown. Low permeabilities of the compacted pond slopes (1×10^{-6} cm/sec) and foundation conditions, as well as the very dilute nature of the excess waters in this situation, and the short-term duration (30 days) of emergency storage of these waters in the portion of the pond not lined with PVC liner, are adequate to provide protection to the area's groundwater without the installation of PVC liner for the entire pond storage capacity.

Leak Detection System for the Surplus/Retention Pond

Leak detection systems are typically associated with project facilities that are designed to contain or transport process-contaminated waters for an extended period of time, such as collection ponds, containment ditches, and heap leach pads. The surplus/retention pond is not designed to contain process waters as a normal operational activity. It is designed to provide emergency short-term storage of total pad draindown waters, in addition to excess water derived from a design storm event plus snowpack melt. The short-term (30 days) use of the pond only in emergency conditions exceeding the storage capacity of the collection ponds, the low permeabilities of the compacted underlying soils and foundation conditions, and the very dilute nature of the stored process waters in this situation allow for the protection of the area's groundwater without the installation of a leak detection system beneath the surplus/retention storage pond.

2.3.2 Underground Mining

Underground mining methods are not suitable for use in the Buffalo Gulch Mine Project ore body, primarily because of the unconsolidated nature of the ore, and the high costs associated with underground mining. Underground mining is more suitable for high grade ores occurring in discrete zones such as veins and layers, neither of which is characteristic of the Buffalo Gulch ore body. For these reasons, underground mining is not a feasible option for the Buffalo Gulch mine project, and was eliminated from additional consideration.

2.3.3 Processing Rate and Capacity

Idaho Gold Corporation considered mining the Buffalo Gulch mine deposit at both higher and lower production rates than the proposed 900,000 tons of ore each year. Also considered was the development of a larger and smaller mining operation than that proposed. After detailed economic evaluation by IGC, the proposed project mining rate and size were judged to be the most feasible option, and other project mining rates and capacities were eliminated from further consideration.

2.3.4 Milling

Idaho Gold Corporation evaluated the feasibility of processing the ore using conventional milling techniques. Milling is generally used for ores that are either high grade or are difficult to process using heap leach technology. Conventional milling involves construction of expensive and complex facilities and also requires a tailing disposal facility. This alternative is not feasible for the Buffalo Gulch Mine Project because the ore is not sufficiently high grade to warrant milling, the ore can be processed economically using heap leach techniques, on-site topography is not conducive to the construction of a tailings disposal facility, and a tailings facility would result in additional concerns regarding potential water quality and wetlands impacts. For these reasons, the milling alternative was eliminated from further consideration.

2.3.5 Off-Site Processing

Off-site processing would involve direct bulk shipment of unprocessed ore to a processing facility located somewhere off the project site. The nearest appropriate site suitable for construction of an alternative heap leach facility site is located near Elk City, a haul distance of approximately five miles. The materials handling and transportation costs associated with this alternative processing site were judged by IGC to be prohibitively high. In addition, the Idaho Gold Corporation does not control this land, and such an alternative site would have additional potential water quality concerns because of its increased nearness to the American River, the South Fork of the Clearwater River, and the community of Elk City.

2.3.6 Use of Buffalo Gulch Ore Processing Facilities for Processing of Ericson Reef Mine Project Ore

The relatively small amount of ore (600,000 tons) projected to be mined concurrently at Idaho Gold Corporation's Ericson Reef Mine Project nearby could be processed at the Buffalo Gulch Mine Project facility. This would eliminate the need for the construction of a leach pad and processing facilities at the Ericson Reef Mine Project site. Although Idaho Gold Corporation has considered this possibility, several factors make this option not feasible: 1) considering the low grade of the ore, the cost of transporting the ore approximately four miles from the Ericson Reef Mine Project site to the Buffalo Gulch Mine Project site would be economically prohibitive, 2) the existing roads would need to be significantly upgraded and maintained to accommodate routine heavy ore haul truck traffic, which is judged not justifiable considering the short-term of the Ericson Reef Mine Project (1.5 years), and 3) this option would significantly disrupt existing local and recreational traffic use of these roads, and create noise and dust along the route.

2.3.7 Vat Leaching

Vat leaching is a processing technique suitable for certain types of ore with a narrow range of metallurgical characteristics. Generally, vat leaching is only appropriate for ores which have a predictable leaching cycle and which leach very quickly (within several days to several weeks). While vat leaching may be technically feasible for the Buffalo Gulch ore, the grade of the ore is not sufficiently high for economical recovery by vat leaching facilities which require the construction of costly facilities. This alternative was eliminated from further consideration.

2.3.8 Backfilling the Pit

The potential for backfilling a portion of the mine pit with waste rock was investigated by the Idaho Gold Corporation. Although some surface mines are large enough to accommodate both active and waste backfilling activities concurrently, the proposed Buffalo Gulch mine pit is not. The majority of the mine pit area will be actively included in mining activities, or will be used for haul roads and ramps. An operational potential for backfilling a portion of the mine pit would not occur until the last year (year six) of mining. Although this alternative has been rejected for the initial Plan of Operations, it does offer a possible economic and environmental incentive. Because of this, this option may be reconsidered by IGC once mining is initiated and additional detailed mining plans are developed with information gained from the actual mining operation.

Backfilling of the mine pit once mining is completed has also been considered. This activity would be economically prohibitive, as well as result in the destruction of concurrent reclamation planned for the waste rock dumps. In addition, it is estimated by Idaho Gold Corporation that the time required for a complete backfill of the mine pit once mining is complet-ed would nearly double the project life, adding significantly to the time required for ultimate reclamation and successful closure of the project area.

2.3.9 Power Generation Alternatives

Early in the project planning stages, Idaho Gold Corporation considered the possibility of building a powerline to the project site. This alternative was eliminated from detailed consideration for environmental and economic reasons. In addition, on-site power generation would be required regardless, to provide backup power for process water pumping and other project operations during power outages, which commonly occur in the area during adverse weather conditions. No utilities are in close proximity to the project site, and building a powerline to the site would increase the amount of disturbance associated with the project.

2.3.10 Heap and Process Water Neutralization Alternatives

Upon the completion of heap leaching activities, cyanide in the spent ore heaps and process waters must be rendered harmless. A description of the proposed heap and process water neutralization technique for the Buffalo Gulch Mine Project is in Sections 2.2.6 and 2.2.8 of this EA. In addition to the proposed natural neutralization technique, several alternative cyanide neutralization methods in use by the mining industry were considered by IGC for use, including chlorination, peroxidation, oxidation with sulfur dioxide, complexation with ferrosulfate, and biological treatment. While each of these alternative processes are effective in neutralizing cyanide, their overall favor for use can only be determined by considering the type of leaching or milling process involved, the characteristics of the spent ore and process waters, the disposal setting (heap/collection ponds or tailing impoundment), the environmental sensitivity of the project location, and (in some cases) the regulatory setting. In addition, the nature of the required neutralization must be considered: whether the neutralization need is for an emergency situation where immediate neutralization is a priority, or whether the neutralization need is longer-term and involves a planned neutralization program. A brief description of the alternative types of neutralization processes considered by IGC for the planned neutralization of spent ore piles and process water solutions at project closure follows.

<u>Chlorination (Alkaline)</u>

Alkaline chlorination is the most developed of all the available methods of cyanide neutralization in regard to background experience, operational simplicity, control techniques, availability of equipment, and engineering expertise (EPA, 1986). Typically, chlorine is added to process water solutions in collection ponds for neutralization prior to disposal by land application. This method can also be used to neutralize spent ore heaps through the circulation of water with elevated levels of chlorine. The alkaline chlorination method destroys free cyanide ion, hydrogen cyanide, and cyanide from most metal cyanides with the exception of iron cyanide complexes.

During operation of the Buffalo Gulch Mine Project, IGC will use the chlorine method to chemically neutralize excess process waters prior to their disposal by land application. At project completion, remaining barren process waters will be similarly neutralized (initially), supplemented with fresh water (natural neutralization), and circulated through the spent ore heap until acceptable neutralization of the heap is achieved. This solution will then be disposed through land application. While feasible for use by IGC, the neutralization of the spent ore heaps with a replenished elevated chlorine solution is not favored by IGC because of the potential for forming toxic chlorine derivatives (chlorinated organic compounds) which could require further treatment, the potential release of some metals held in complex, residual excess chlorine can be toxic to aquatic species (a detrimental consideration for the quality of the post-mining pit waters which will receive drainage from the reclaimed spent ore heaps), and additional costs associated with the use of additional amounts of chlorine.

<u>Peroxidation (Hydrogen Peroxide)</u>

The hydrogen peroxide neutralization method is well know and has been widely used in the treatment of effluents from the steel hardening and other industries, including gold ore processing. The hydrogen peroxide method destroys hydrogen cyanide, cyanide ion, and cyanide in copper, zinc, and nickel cyanide complexes. If copper is added, iron cyanide complexes may be precipitated. The hydrogen peroxide method offers environmental advantages in that no toxic by-products are generated, nor are additional chemicals added which may be detrimental to the environment.

Although the use of hydrogen peroxide is feasible for use by IGC in neutralization of the spent ore heaps and process water, its use is not favored for heap neutralization primarily because of additional costs when compared with the proposed natural neutralization process. Also, with the addition of hydrogen peroxide, there is a potential for the release of complexed metals through the enhanced oxidation process (a detrimental consideration for land application and residual drainage to the mine pit following reclamation of the spent ore heaps).

Oxidation with Sulfur Dioxide (Inco Process)

Although originally developed for base metal mining operations, this process is also used for the neutralization of cyanide associated with gold mining operations. Oxidation by sulfur dioxide in air in the presence of a copper catalyst causes the rapid removal of cyanide and metal cyanide complexes. Iron cyanide complexes are removed by precipitation as copper or zinc ferrocyanides. The metals, except for iron, are precipitated as metal hydroxides. The use of sulfur dioxide as a cyanide neutralization technique typically involves neutralization of cyanide in lined (contained) disposal situations such as a tailing impoundment. The planned disposal of neutralized heap solutions by land application, with ultimate drainage from the neutralized spent ore heaps routed to the mine pit preclude the consideration of sulfur dioxide as a viable neutralization alternative for the Buffalo Gulch Mine Project.

Biological Treatment

A biological filtering method for removing cyanide and metal ions from effluents has recently been developed by the mining industry. The two stages of the method are 1) bacterial oxidation of cyanide and thiocyanate to carbon dioxide, sulfate, and ammonia concurrent with the adsorption of metals by the bacteria and 2) bacterial nitrification of ammonia to nitrate. Soda ash must be added as an inorganic carbon source to aid nitrification, and phosphorus must be added as a trace nutrient. The process requires the maintenance of waste water temperatures of 50 to 65 degrees F. to sustain effective biological process rates. While this process may offer some promise in the future, it is relatively new, and its practical application to the neutralization of spent ore heaps is uncertain.

2.3.11 Facility Design and Location to Minimize Impacts to Project Area Wetlands

The final proposed facility design and location of the Buffalo Gulch Mine Project minimizes, to the greatest extent possible, unavoidable impacts to the on-site and off-site wetlands and wetland values of the project area. The proposed project design involves the placement of facilities in the minimum number of drainage and wetland areas possible when considering the topographic constraints and abundance of wetland areas in the general project area. Significantly greater on-site and off-site wetland areas and values would be affected with implementation of either the sequenced ridgetop multiple leach pad or initial double waste dump/ultimate leach pad design considered early on during the project design development. In addition, the preferred method of a combined valley - permanent leach pad design, as well as the proposed heap leach method of ore processing significantly reduces the potential impacts to wetlands associated with additional spent ore storage and a tailing impoundment facility needed for other methods of ore processing.

3.0 AFFECTED ENVIRONMENT

3.1 GENERAL SETTING

As described in Section 2.0, the Buffalo Gulch Mine Project is located in northcentral Idaho, 3 miles northwest of Elk City, in Township 29 North, Range 8 East. The project is located entirely on lands administered by the BLM. A section of state land lies just northeast of the project site. The sections in Township 29 North are a combination of BLM, state and private lands. Township 29 North is surrounded by Nez Perce National Forest lands administered by the U.S. Forest Service, Elk City Ranger District.

The project site is located on a forested ridge that has been selectively logged in the past. The ridge divides the Maurice Creek and Buffalo Creek drainages. Buffalo Gulch Creek is a small tributary to the American River a short distance upstream from where the South Fork of the Clearwater River is formed by the confluence of the American River and the Red River. Whiskey Creek, a small tributary to the South Fork of the Clearwater River, is located a short distance downstream from the confluence of the American River and the Red River. Maurice Creek is a small tributary to Whiskey Creek a short distance upstream from Whiskey Creek's confluence with the South Fork of the Clearwater River. The project site receives an average of 34 inches of precipitation annually in the form of rain and snow. The region surrounding the project site is sparsely populated and predominately pine and fir forest.

The proposed wetlands mitigation site is located along lower Buffalo Gulch Creek in the southeast quarter of the northeast quarter of Section 28, Township 29 North, Range 8 East, Idaho County, Idaho, about one mile southeast of the proposed mine site. The site has been previously disturbed by past placer mining operations.

3.1.1 Ownership

The proposed activities will be conducted entirely on unpatented lode mining claims controlled by Idaho Gold Corporation. The claims are on public domain lands administered by the Bureau of Land Management (BLM), Cottonwood

Resource Area Office, Cottonwood, Idaho. Appendix A of the Plan of Operations contains a listing of the claims directly involved in the development of the Buffalo Gulch Mine Project, and the wetlands enhancement site.

3.1.2 Previous Land Use

Historically, the area has been explored for valuable minerals on a small scale and old pits and trenches are still visible. More recently, the site has been selectively logged, and various surface and subsurface mineral exploration activities have been carried out. The area has historically been and is currently a summer grazing area for livestock. Pilot small-scale heap leach test operations (approx. 4 acres) have been conducted adjacent to the orebody by Idaho Gold Corporation since 1987 (BLM Serial Number SMP 86-13).

The wetlands enhancement site on lower Buffalo Gulch Creek has been historically disturbed by placer mining.

3.1.3 Affected Resources

Areas of Critical Environmental Concern (ACECs), prime or unique farmlands, Native American religious concerns, wild and scenic rivers, and wilderness will not be adversely affected by the proposed project. A small portion of the floodplain of lower Buffalo Gulch Creek would be affected by the wetlands enhancement mitigation project (see Section 4.7.3 of this EA).

The following sections address resources that may be affected by the proposed project.

3.2 AIR QUALITY

Air quality within the vicinity of the Buffalo Gulch Project is considered typical of natural background for mountainous areas of Idaho. Sources of air pollutants in the Elk City area are wood burning for home heating, slash burning from logging operations, travel on unpaved rural roads, and a sawmill located just west of Elk City. No measurements of air pollutants have been made in the Elk City area.

The area meets the National Ambient Air Quality Standards for all criteria pollutants. Under the Prevention of Significant Deterioration (PSD) regulations, the area is designated as Class II, allowing for moderate growth. The nearest Class I area is the Selway-Bitterroot Wilderness approximately 17 miles to the northeast.

3.3 WATER RESOURCES

Water resource field work and information gathering was initiated by Idaho Gold Corporation in 1986, and was continued with additional data collection in the summer and autumn of 1989. Appendix H of the Plan of Operations describes the surface water and groundwater resources of the Buffalo Gulch Mine project area, including water quality, and considers information including 1) surface water flow from the American River, South Fork Clearwater River, Maurice Creek, and Buffalo Gulch Creek, 2) groundwater levels of mine site drill holes remaining open in 1989, 3) an inventory of springs and seeps in the project area conducted in 1986, 1989, and 1990, and 4) water quality data from 11 surface water sites, three domestic water supplies, and six groundwater sites.

3.3.1 Surface Water

The proposed Buffalo Gulch Mine Project will be approximately 2.3 miles north of the confluence of the American River and the Red River which forms the South Fork Clearwater River. Flow measurements of the American River near Elk City from May 1978 to September 1981 show a minimum flow of 10 cfs (cubic feet per second) on September 17, 1981 and a maximum of 438 cfs on May 8, 1979. The South Fork Clearwater River, the major drainage in the area, flows west from the confluence of the American River and Red River near Elk City, then north to Kooskia, Idaho where it joins the Middle Fork Clearwater River which then flows northwest to Lewiston, Idaho where it enters the Snake River. The project area drainage system is shown on Figure 1.1-2 and available flow records for Buffalo Gulch Creek, Maurice Creek and the American River are in Appendix H of the Plan of Operations. Average monthly flows, and mean peak and mean low flow for these streams are illustrated in Figure 3.3-1.

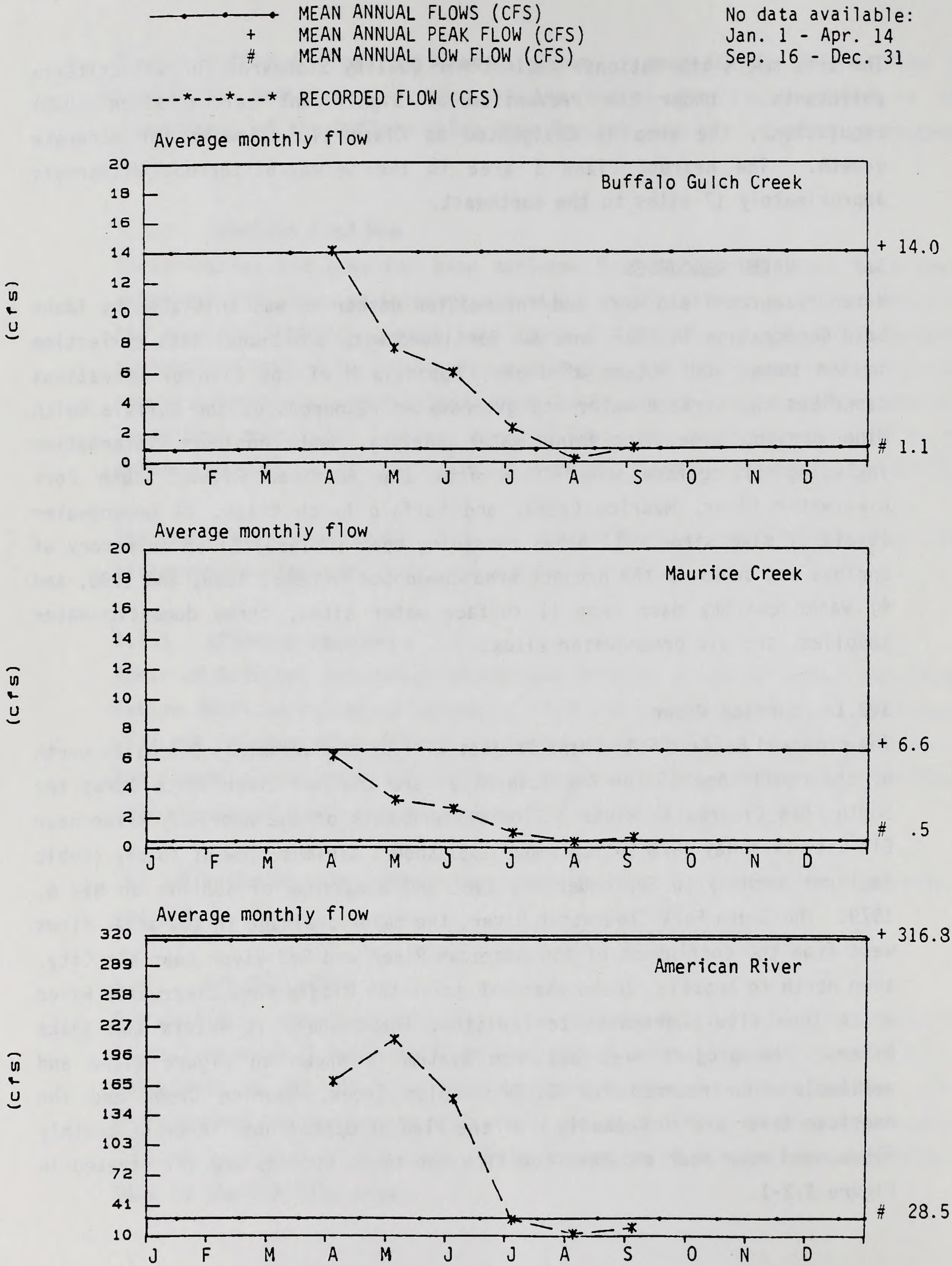


FIGURE 3.3-1. AVERAGE MONTHLY, MEAN ANNUAL PEAK AND MEAN ANNUAL LOW FLOWS FOR MAURICE CREEK, BUFFALO GULCH CREEK AND THE AMERICAN RIVER (1977-1981).
Source of Information: Idaho Gold Corporation's updated Plan of Operations for the Buffalo Gulch Mine, Idaho County, Idaho, April 1989

The proposed mining and heap leach facilities will be on a ridge between the Maurice Creek drainage on the west and the Buffalo Gulch Creek drainage on the east. Both creeks are perennial streams. Buffalo Gulch Creek flows approximately 5.5 miles southeast from its headwaters to its confluence with the American River. Flow measurements, as well as visual observations indicate Buffalo Gulch Creek is a gaining stream for its entire length.

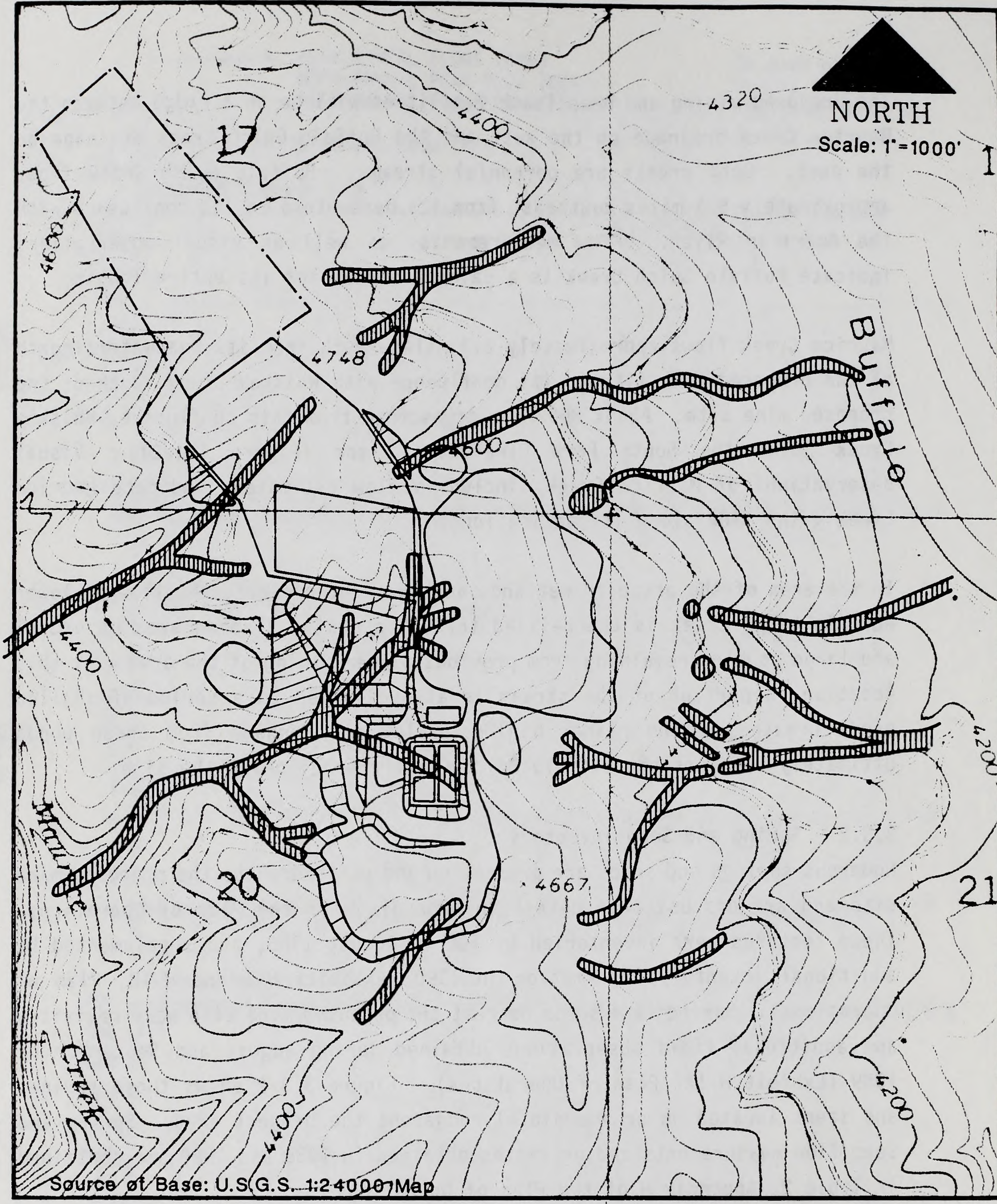
Maurice Creek flows approximately 2.3 miles south from its headwaters north of the proposed mine site to its confluence with Whiskey Creek south of the proposed mine site. About 800 feet downstream from this confluence, Whiskey Creek joins the South Fork Clearwater River (Figure 1.1-2). Visual observations of Maurice Creek, including flow estimates, indicate Maurice Creek gains flow along its entire length.

In the area of the proposed wetlands enchancement project, the flow of lower Buffalo Gulch Creek is channelized through a gently sloping area of gravel and large cobbles remaining from previous placer mining of the area. At this location, a portion of the stream is also diverted to a series of shallow ponds created by the placer mining. Flow and seepage from these ponds ultimately reenters the Buffalo Gulch Creek channel below the site.

3.3.2 Spring and Seep Inventory

Numerous springs and seeps are present on and peripheral to the proposed mine site and are discussed in detail in Appendix H of the Plan of Operations. These features were inventoried by IGC in August 1986, and supplemented by additional inventory information in 1990 (Exhibits H-1 and H-1B, Plan of Operations). Springs and seeps nearest the proposed mine site were revisited and additional field observations obtained during August and September of 1989 (Exhibit H-1A, Plan of Operations). Figure 3.3-2 shows those springs and seeps located on or immediately adjacent the project area. Spring and seep flow measurements and estimates obtained in 1986 and 1989 are contained in Table 2, Appendix H of the Plan of Operations.

In 1989, flows from springs and seeps ranged from zero, where only moist soil was present, to a maximum of 1.5 gallons per minute at one spring in a small drainage downstream from the western side of the ultimate leach pad in the



LEGEND

SPRINGS AND SEEPS

Figure 3.3-2
Springs and Seeps On and Adjacent to the Project Area

Maurice Creek drainage (SP-5). Special attention was given to elevations at which seeps originate and whether or not flow increased or decreased downhill of the spring or seep. The majority of the springs are characterized by an increase in flow downhill and originate at an elevation near 4,600 feet. Exceptions include springs originating at higher elevations in saddles between peaks along the ridge top and the area immediately south of the proposed mine pit where the springs originate at lower elevations. Twenty-one springs and numerous seeps were inventoried in the immediate project area.

Commonly, springs in the project area occur in small drainages and contribute a small flow of water to the drainage. This flow, together with the wet soils, has resulted in numerous long, narrow wetlands. Wetlands in and peripheral to the project area were inventoried and are described in detail in Appendix C of the Plan of Operations. For purposes of regulatory review and compliance with Section 404(b)(1) of the Clean Water Act, all springs and seeps inventoried on and immediately adjacent the project area were mapped and considered as wetlands by Idaho Gold Corporation.

Additional discussion of wetlands of the project and adjacent area is in Section 3.5.2 of this EA.

3.3.3 Groundwater

The Buffalo Gulch Mine project area is underlain by altered and weathered gneiss and schist of the Precambrian Belt Supergroup. Alteration and weathering of the bedrock extends to several hundred feet. There is a steeply dipping quartzite bed on the east side of the proposed open pit area that is not significantly weathered. The weathered and altered metamorphic rocks form the basic framework for the groundwater system and control the presence, movement and yield of water from these strata.

Groundwater data were obtained from numerous drill holes on the site as well as from the springs and seeps. Over 100 drill holes were placed in the ore body by Idaho Gold Corporation in 1986, as well as six additional holes drilled into or adjacent to the proposed mine facility sites in 1989. An August 1989 inventory of all the ore body drill holes determined that 18 holes remained open. Water levels were measured in these 18 holes and together with elevations of springs and seeps were used to construct a potentiometric map (Exhibit H-2 of the Plan of Operation). Five of these holes were cased with 2 inch diameter PVC pipe and aquifer tests were performed using the bailer method. Based on these tests, aquifer transmissivity ranged from 19.68 gpd/ft (gallon/ day/foot) to 67.88 gpd/ft. These values of transmissivity, along with total depth of the wells and depth to the water table give hydraulic conductivity values of 0.028 feet/day to 0.45 feet/day. This is a very low transmissivity and reflects the high clay and silt content of the aquifer material. Groundwater movement is very slow because of both low permeability and low groundwater gradients.

An unconfined aquifer is present beneath the proposed project area with groundwater levels occurring 50 to 80 feet below land surface. The aquifer is restricted to the upper altered and weathered schist and gneiss and may be perched upon the deeper, unweathered bedrock. Recharge to groundwater in the proposed mine site area is from precipitation alone, since the proposed mine site ridge is a topographic high. Water that infiltrates into these rocks percolates downward, then moves laterally towards the sides of the ridge as reflected by the site potentiometric map. Groundwater resource information obtained during this investigation indicates the water table surface is a subdued reflection of the ridge topography. The project area springs and seeps occur where the water table intersects the ground surface and thus can be used as control points on the potentiometric map. The correlation in elevations of the springs and seeps on either side of the proposed mine site ridge indicates groundwater flow is not controlled by any remnant geological structure of the aquifer, but that groundwater is being recharged by downward percolation of precipitation which flows radially outward towards the ridge sides.

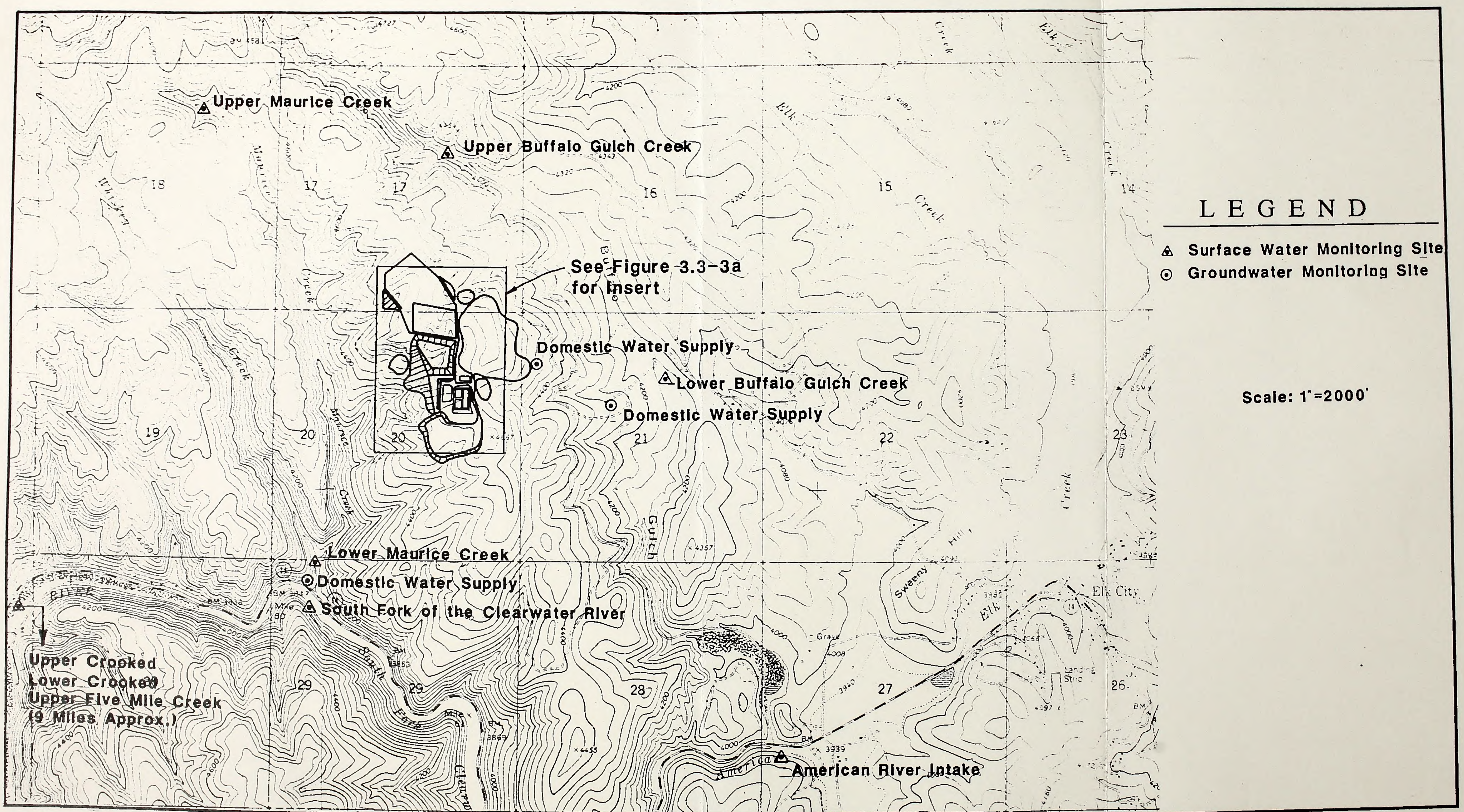
Discharge from the aquifer in the proposed mine site area is to small springs and seeps peripheral to the ridgetop. There is a seasonal variation of flow in springs in the area which is caused by shallow direct recharge to alluvium/colluvium and shallow bedrock in the drainages, and by the smaller component of groundwater flow from the bedrock groundwater system.

3.3.4 Water Quality

A total of 20 sites in the general Buffalo Gulch Mine project area have been monitored for water quality since 1987. These include 11 surface water sites, three domestic water supplies and six groundwater sites. Site locations, parameters and frequency of monitoring were specified by the Idaho Department of Health and Welfare, Division of Environmental Quality for most sites. Sampling was periodic with some sites being monitored in 1987 only and other sites being monitored from 1987 until August of 1989. Parameters measured included specific electrical conductance, pH, nitrate, arsenic, barium, cadmium, chromium, iron, lead, mercury, selenium, silver and cyanide. Water quality data are tabulated in Appendix 2 of Appendix H of the Plan of Operations. Sampling sites are shown on Figure 3.3-3. Water quality monitoring occurred on a regional basis (Crooked River, American River, South Fork Clearwater River and Upper Five Mile Creek), on a general area basis (Maurice Creek, Buffalo Gulch and 3 domestic water supplies) and on a site specific basis (seeps and monitoring wells). Data obtained from the Buffalo Gulch Mine project water quality monitoring program were furnished to the Idaho Department of Health and Welfare and the BLM as they were available from the laboratory.

Monitoring of the Crooked River, American River, South Fork Clearwater River and Upper Five Mile Creek showed these waters are all high quality with low concentrations of dissolved solids, and generally low concentrations of nutrients and metals. Of the parameters tested in samples from these streams, the only ones that exceeded the Idaho Water Quality Standards are selenium on a few samples from the Upper Crooked River and Upper Five Mile Creek. Detailed water quality data for each sample site is presented in Appendix 2 of Appendix I of the Plan of Operations. Exceedences for selenium were not consistent, which may reflect laboratory accuracy at these low concentrations. Cyanide also was present in measurable quantities in the Upper Crooked River and Upper Five Mile Creek in May 1987. Measurable cyanide was not detected in any other samples from these sites.

In the general project area, water quality of Maurice Creek and Buffalo Gulch Creek is very good with low concentrations of total dissolved solids and metals. The only parameter that exceeded water quality standards was one



NORTH

Figure 3.3-3:
Surface and Groundwater Quality Sample Sites In the Buffalo Gulch Mining Project Area

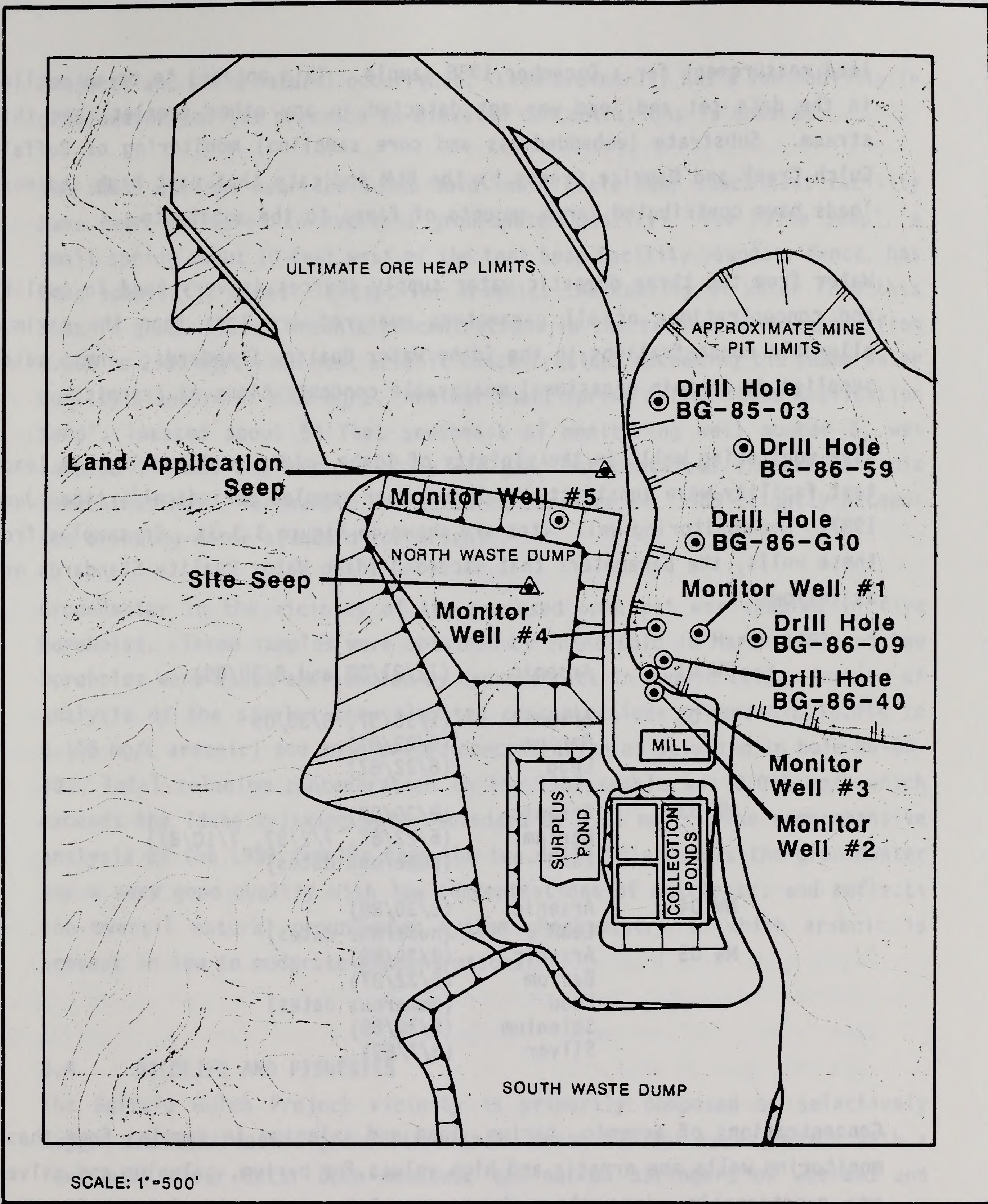


Figure 3.3-3a: Insert for Figure 3.3-3

lead measurement for a December 1988 sample. This appears to be an outlier in the data set and lead was not detected in any other samples from this stream. Substrate (embeddedness and core sampling) monitoring of Buffalo Gulch Creek and Maurice Creeks by the BLM indicate that past high sediment loads have contributed large amounts of fines to the substrate.

Water from the three domestic water supply sources is very good in quality and concentrations of all parameters measured are less than the maximum allowable concentrations in the Idaho Water Quality Standards. These water supplies do contain occasional measurable concentrations of arsenic.

Five monitoring wells in the vicinity of Idaho Gold's small scale heap leach test facility were constructed and have been sampled periodically since June 1987. The monitoring well sites are shown on Figure 3.3-3a. In samples from these wells, the parameters that exceeded Idaho Water Quality Standards are as follows:

MW 01	Arsenic	(12/21/88 and 8/30/89)
MW 02	Arsenic	(7/18/87, 8/30/89
	Barium	(6/22/87)
	Lead	(6/22/87)
MW 03	Arsenic	(8/30/89)
	Barium	(6/22/87, 7/2/87, 7/10/87)
	Lead	(numerous dates)
MW 04	Arsenic	(8/30/89)
	Lead	(numerous dates)
MW 05	Arsenic	(8/30/89)
	Barium	(6/22/87)
	Lead	(numerous dates)
	Selenium	(8/30/89)
	Silver	(8/7/89)

Concentrations of arsenic, barium, lead and selenium in samples from these monitoring wells are erratic and high values for barium, selenium and silver are questionable since there is no consistency to the data. Elevated concentrations of arsenic and lead are reported in numerous samples. Elevated levels of arsenic are often found in groundwater associated with mineralized zones and ore bodies of the type found at the Buffalo Gulch Mine

Project, and are a natural occurrence. Lead ordinarily has a low mobility in groundwater and its presence in elevated concentrations is unusual.

Two small springs near the Idaho Gold small scale heap leach test facility have been monitored to evaluate groundwater quality. The "Site Seep", a small spring about 10 feet west of the test heap facility boundary fence, has been sampled 11 times. Except for arsenic, the quality of water from this site is good. Total arsenic concentrations in the samples have ranged from 0.006 to 2.34 mg/L with most arsenic concentrations exceeding the Idaho Water Quality Standard of 0.05 mg/L. Another small spring called "Land Application Seep", located about 50 feet southeast of monitoring well number 5, was sampled 9 times and water quality was good but contained elevated arsenic concentrations. The sample collected on December 24, 1988 slightly exceeds the drinking water standard for arsenic.

Groundwater in the vicinity of the proposed open pit was sampled in five boreholes. Three samples were obtained by Idaho Gold in March 1987 and two boreholes were cased and sampled by Hydrometrics in August 1989. Results of analysis of the samples show elevated concentrations of arsenic (0.014 to 0.146 mg/L arsenic) and an elevated concentration of selenium in hole BG-86-40. Total selenium concentration in the 1987 sample was 0.018 mg/L which exceeds the Idaho drinking water standard of 0.01 mg/L. The comprehensive analysis of the 1989 samples from the two drill holes shows the groundwater has a very good quality with low concentrations of nutrients, and reflects the overall natural groundwater system geochemistry in which arsenic is present in low to moderate concentrations.

3.4 WILDLIFE AND FISHERIES

The Buffalo Gulch Project vicinity is primarily composed of selectively logged and unharvested grand fir climax forest habitat types, mixed with a few small clear cuts, open meadows, and narrow stringers of wetland and riparian habitats. The area is bounded by two second order perennial streams, Buffalo Gulch Creek and Maurice Creek. Buffalo Gulch Creek flows into the American River, which flows into the South Fork of the Clearwater River. Maurice Creek flows into Whiskey Creek, which then flows into the

South Fork of the Clearwater River. This habitat diversity consequently supports a good diversity of terrestrial wildlife, including big game (white-tailed deer, mule deer, elk, moose, black bear and mountain lion), furbearers such as marten, fisher, and beaver, a variety of non-game mammals, upland game birds including blue grouse and ruffed grouse, raptors and non-game birds.

The South Fork of the Clearwater River is a critical upstream and downstream passage for anadromous fish including, spring chinook salmon and steelhead trout. American River provides important spawning and rearing habitat for anadromous fish. Whiskey Creek, Maurice Creek, and Buffalo Gulch Creek provide primarily rearing habitat for anadromous fish. These streams provide spawning habitat for steelhead trout. However, steep gradients, low flows and partial or full barriers limit spring chinook salmon spawning in these waters. Resident salmonids occurring in Whiskey Creek include rainbow trout, cutthroat trout, and brook trout. Resident salmonids occurring in Maurice Creek and Buffalo Gulch Creek include cutthroat trout and rainbow trout.

Maurice Creek and Buffalo Gulch Creek substrate monitoring by the Bureau of Land Management indicates high past sediment levels. Embeddedness measurements range from 44 to 52 percent for Maurice Creek and 25 to 34 percent for Buffalo Gulch Creek. The BLM's Management Framework Plan has identified fishery objectives of 80 percent for Buffalo Gulch Creek and 70 percent for Maurice Creek (percent of habitat production potential).

Existing wetlands on the site of the proposed wetlands enchancement site on lower Buffalo Gulch Creek provide habitat for big game, furbearers, upland game birds, and non-game wildlife. Beaver have been observed in the uppermost pond at this site.

BLM sensitive species found in the project area include the fisher, chinook salmon, steelhead trout, westslope cutthroat trout and bull trout. The endangered bald eagle utilizes the river corridor of the South Fork of the Clearwater River.

Wildlife and fisheries resources and their habitats are described in greater detail in Appendix R of the Plan of Operations. A discussion of endangered, threatened, and sensitive species is in Section 4.6 of this EA.

3.5 VEGETATION

Vegetation baseline studies were conducted to obtain information in four general categories: (1) plant community types, (2) wetlands, (3) forest and range resources, and (4) threatened, endangered, or sensitive plant species and habitats. A detailed discussion of project study area vegetation is in Appendix O of the Plan of Operations and a vegetation survey map of the project area is shown in Figure 3.5-1.

3.5.1 Existing Vegetation and Forest Habitat Types

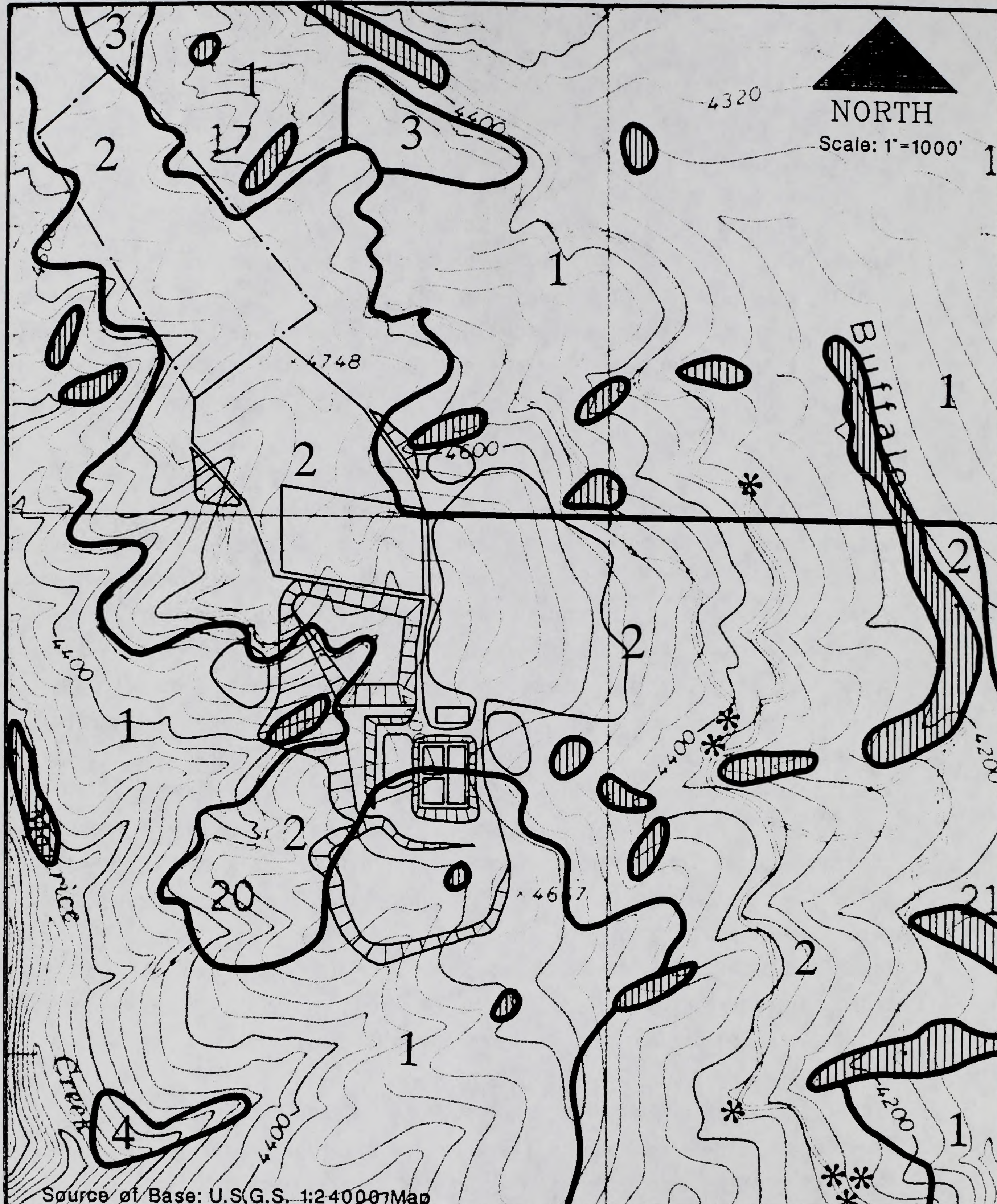
Closed canopy forests are the dominant plant community on the project study area. These are mixed conifer forests dominated by grand fir, but also supporting significant amounts of Douglas-fir, Engelmann spruce, and lodgepole pine. Other common trees are western larch and ponderosa pine. Understory shrub species composition varies considerably, and may include blue huckleberry, mock azalea, common snowberry, Pacific yew, Rocky Mountain maple, and twinflower. Typical herbaceous species are beargrass, queen cup beadlily, western goldthread, round-leaved violet, and wild ginger.

Logging activity has modified community structure and composition in many areas. Timber stands with a large proportion of overstory trees removed result in an open canopy forest with a well developed, diverse understory layer. Other sites have been clear cut, leaving few or no large trees standing. These clear cuts support a community of young tree seedlings and saplings, mixed shrubs, and herbaceous species.

There are four other plant communities which occur in limited sites on the study area. These include bluffs and rock outcrops, meadows, wetlands and riparian areas, and disturbed or developed areas.

3.5.2 Wetlands

Three criteria are used to characterize wetlands: wetland hydrology, hydric soils, and hydrophytic vegetation. On the project site, the sites exhibiting



LEGEND

1 CLOSED CONIFER FOREST
2 OPEN CONIFER FOREST
3 CLEAR CUTS
4 ROCK OUTCROPS/BLUFFS
RIPARIAN CORRIDORS
* IDAHO BARREN STRAWBERRY SITES

Figure 3.5-1: Plant Communities of the Buffalo Gulch Mine Project Study Area

Source of Information:
Steffen Robertson and Kirsten, Inc. Reno, Nevada

wetland hydrology features are springs and seeps on hillsides and in drainage bottoms. Wetlands in this area usually occur along the bottom of stream drainages where the seeps and springs supply water to the stream channel for extended periods during the year. Hydric soil in these wetlands is the Jughandle Variant Silt Loam, which is classified as a Humic Cryaquept. Hydrophytic (water-loving) vegetation comprises more than 90 percent of the vegetation on these wetlands. Most species are herbaceous, dominated by small-fruited bulrush, bigleaf sedge, arrowleaf groundsel, bluejoint reedgrass, and ladyfern. Other frequently occurring species include tall mannagrass, mountain boykinia, and Canby's lovage. Mountain alder is the most common shrub species.

Wetland vegetation at the site of the proposed wetland enchancement project on lower Buffalo Gulch Creek varies from high coverage of species typically associated with wetlands (sedges, bulrush, willow, etc.) adjacent to ponds, flowing water or in depressions to barren on more recent disturbances. Trees include lodgepole pine, grand fir, spruce and subalpine fir. Willow and alder are widespread.

Functional values of project-related wetlands include food chain production and habitat for a variety of wildlife; groundwater recharge/discharge areas; natural water filtration systems that maintain or improve water quality; storm water retention; and in the case of the proposed open-pit mine, domestic water for households farther down the watershed.

Prior to the 1989 wetlands field studies, project area information from aerial photographs, 1988 vegetation and soils surveys, and the National Wetlands Inventory maps (USFWS, 1980) were examined by Idaho Gold Corporation to determine site-specific areas for wetlands assessment. Spring and seep surveys in the vicinity of the proposed mine facilities were conducted by Idaho Gold Corporation in August of 1986 (Exhibit H-1, Plan of Operations). This information was augmented with a 1989 and 1990 project area springs and seeps inventory conducted by Idaho Gold Corporation (Exhibit H-1a and Exhibit H-1b, Plan of Operations). Figure 3.3-2 shows those springs and seeps on and nearest the Buffalo Gulch Mine Project site.

Following completion of the Buffalo Gulch Mine Project facilities permitting design by Idaho Gold Corporation in October of 1989, an on-site jurisdictional wetlands determination for the project area was conducted with representatives from the Army Corps of Engineers(COE), Environmental Protection Agency (EPA), Bureau of Land Management, Idaho Gold Corporation, and Hydrometrics, Inc. (10/12/89). This determination was accomplished using the on-site criteria described above. In addition, the proposed wetlands enhancement site on lower Buffalo Gulch Creek was inspected.

A detailed wetlands report is provided in Appendix C of the Plan of Operations. In addition, wetland information concerning the proposed wetland enhancement site on lower Buffalo Gulch Creek is contained in Appendix T of the Plan of Operations. Appendix 3 of Appendix H of the Plan of Operations contains field observations for springs and seeps (wetlands) in the Buffalo Gulch Mine Project area.

3.5.3 Forest Resources

The open canopy forest stand in the vicinity of the proposed project is composed of mixed conifer species, including western larch, lodgepole pine, grand fir, Douglas-fir and Engelmann spruce. Although the stand was selectively logged in the 1970's, full stocking of merchantable trees still remains. Average stand volume per acre is approximately 5 thousand board feet. Conifer reproduction is low throughout the stand.

At the site of the proposed wetland enhancement project on lower Buffalo Gulch Creek, the hummocky, irregular topography of the area previously disturbed by placer mining has created habitat microsites, and trees are well established on these sites, including lodgepole pine, grand fir, spruce, and subalpine fir. Stand age varies from seedling to mature. The stand volume in this area, however, is low.

3.5.4 Range Resources

There are two grazing allotments, parts of which occur on the project area. They are the Whiskey Creek allotment and the Buffalo Gulch allotment. The Whiskey Creek allotment covers 3,762 acres with a forage allocation of 20 animal unit months (AUM) each for cattle and horses. The Buffalo Gulch allotment occupies 2,688 acres, with a forage allocation of 42 AUM for cattle.

3.5.5 Threatened, Endangered, or Sensitive Plant Species

When field studies began in early summer, 1988, one federal candidate species, Idaho barren strawberry (Waldsteinia idahoensis), was known to occur in the vicinity of Elk City. By fall of 1988, its status changed and it is now federally listed as a former candidate species, and is also on the Idaho State Monitor list (Pers. Comm., P. Peterson, Idaho Natural Heritage Program, September 14 and October 3, 1988). Four populations of this species were found within the project study area; however, none of these were within the boundaries of the proposed project development (Figure 3.5-1).

3.6 GEOLOGY

The Elk City Region is located in the drainage of the upper South Fork of the Clearwater River, with a highly dissected upland with generally similar ridge levels. Locally, the region has been subjected to four metamorphic sequences with the latest episode occurring during the Laramide Orogeny. Later faulting, perhaps in the Miocene, produced basins, such as Elk Valley, in which gravels accumulated. After the gravel deposition period, additional Tertiary faulting and uplifting is thought to have occurred on the low ridge at the western edge of Elk Valley. This ridge is typified by gentle to moderately steep slopes (4 to 30%).

The proposed Buffalo Gulch Mine Project area bedrock consists of highly folded metamorphic rocks with quartzite and muscovite pegmatite dike intrusions. The dikes are thought to be Cretaceous to Tertiary in age. The surface and bedrock geology of the project area are illustrated in Exhibits 1 and 2 of the Plan of Operations. The most abundant rock types in the area are medium grained quartz-feldspar-biotite gneiss/schists of the Precambrian Belt Supergroup. Within the project area and near the ridgetops, the bedrock has been weathered and is, therefore, relatively soft to a depth of several hundred feet.

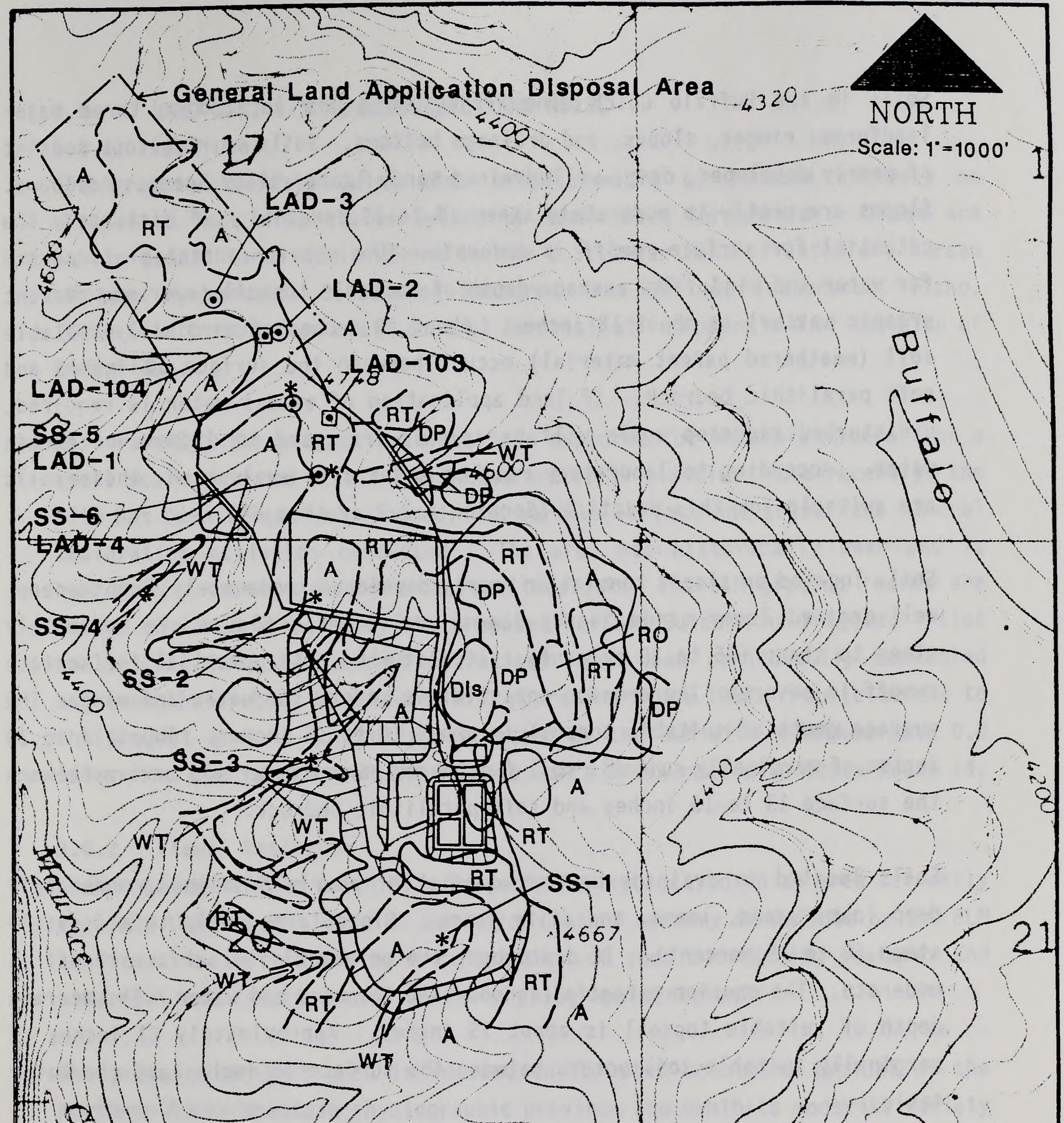
The Buffalo Gulch Mine Project ore zone consists of oxidized and intensively clay-sericite altered gneiss and schist up to 300 feet thick. This is cut be irregular masses of muscovite pegmatite. All these rocks are underlain by a flat-lying intrusive of leucocratic quartz monzonite containing 1 percent to 10 percent disseminated pyrite-arsenopyrite. Tabular zones with the intrusive carry gold values similar to the gneiss and schist.

The intensity of hydrothermal alteration and the disseminated nature of mineralization indicate that the gold was derived from hot, aqueous solutions which emanated from the intrusive. Distribution of these solutions were controlled, in part, by several intersecting faults.

In the proposed mining project area, broad generalized seismic (earthquake) activity is associated with specific geologic structural features such as fault zones. The Buffalo Gulch Mine Project is located within the Idaho Batholith zone, which is seismically classified as Zone 2. The maxium magnitude for earthquakes associated with this source zone, which includes central Idaho, has been determined to be 6.1 on the Richter scale. Peak ground accelerations in this area using probabilistic methods has been determined to be 0.04 g and 0.06 with 90 percent probability of not being exceeded in 50 and 250 years, respectively (Algermissen, et al, 1982).

3.7 SOILS

A detailed soil survey of the proposed Buffalo Gulch Mine Project area was conducted by Hydrometrics Inc. in 1989. The soil survey was conducted following standard procedures of the USDA Soil Conservation Service (SCS) current soil survey guidelines outlined in the National Soils Handbook (July, 1983), Soil Survey Manual (1951), and Soil Taxonomy (1975), and verbal guidelines provided by the BLM, U.S. Forest Service, and the Idaho Department of Health and Welfare. The purpose of the soil survey was to 1) determine the location and extent of major soils in the area, 2) assess the hydrological characteristics and stability of each soil, and 3) to serve as a general guideline to predict availability, quantity, and quality of soil materials suitable for use in reclamation. An earlier project area soil survey by Scoles Associates, Inc. (1988) was used as a reference in soils mapping. The 1989 soil survey is discussed in detail in Appendix N of the Plan of Operations. A soils survey map of the project area is shown in Figure 3.7-1.



A Sandy Loam, 25 to 50% Slope
RT Sandy Loam, 0 to 15%
WT Loamy Sand, 0 to 15% Slope
DP Sandy Loam, 15 to 30% Slope
RO Rock Outcrop
Dis Previous Mining Disturbance
* Soil Sample Sites
⊙ Land App Disposal Soil Analysis Site
⊡ Double Ring Infiltration Test Site

Figure 3.7-1.
Buffalo Gulch Mine Project
Soils Survey Map

Soils in the Buffalo Gulch Mine Project area are located on three major landforms: ridges, slopes, and drainage bottoms. Soils on ridgetops consist of poorly developed, deep, well-drained sandy loams, silty loams, and loams. Slopes are gently to moderately steep (0 to 15 percent). If disturbed, the potential for surface runoff is moderate. The erosion potential is severe for water and wind. The average depth of suitable topsoil (over one percent organic matter) is about 18 inches. About 29 inches of marginally suitable soil (weathered parent material) occurs between the surface 18 inches and soft paralithic bedrock. If land application of excess water is required, undisturbed ridgetop soils will be spinkle-irrigated to dispose of excess water. According to laboratory results and a site evaluation, these soils are suitable for this practice (Section 4.3.2 of this EA).

Soils located on slopes consist or poorly developed, moderately deep to deep, well-drained loamy sands, sandy loams, and loams. Slopes are moderately steep to steep (15 to 20 percent). If disturbed, the potential for surface runoff is severe. The erosion potential is severe for water and wind. The average depth of suitable topsoil is about 13 to 15 inches. About 22 to 39 inches of marginally suitable soil (weathered parent material) occurs between the surface 13 to 15 inches and soft paralithic bedrock.

Soils located in drainage bottoms consist of poorly developed, moderately deep loamy sands, loams, and silty loams. Slopes are gently to moderately steep (0 to 15 percent). If disturbed, the potential for surface runoff is moderate. The erosion potential is moderate for wind and water. The average depth of suitable topsoil is about 15 inches. Approximately 21 inches of marginally suitable soil occurs between the surface 15 inches and the water table.

Soil resources at the site of the proposed wetland enchancement project on lower Buffalo Gulch Creek are limited because of historic placer mining. Approximately 2,500 cubic yards of soil material is available for salvage on-site. This material was moved to the site as a result of a stream improvement project on the South Fork Clearwater River. The material is gravelly, sandy loam, and contains some organic matter. Although coarse textured, this material is superior to the placered gravels and will support plant growth.

3.8 LAND USE, VISUAL RESOURCES, AND NOISE

3.8.1 Land Use

The proposed Buffalo Gulch mine project would be located entirely on unpatented lode mine claims leased by Idaho Gold Corporation. These are public domain lands administered by the U.S. Department of Interior, Bureau of Land Management, Cottonwood Resource Area Office, Cottonwood, Idaho. Idaho Gold Corporation claim control is detailed in Appendix A of the Plan of Operations.

Historically, the project area has been explored for valuable minerals on a small scale, and old pits and trenches are still visible. More recently, the site has been selectively logged, and various surface and subsurface mineral exploration activites conducted. The area has historically been and is currently a summer grazing area for livestock. Two BLM grazing leases are active on lands affected by the proposed Buffalo Gulch Mine Project. Pilot small-scale heap leach test operations have been periodically conducted adjacent the orebody by Idaho Gold Corporation since 1987. Public access to the project area is currently restricted by the BLM with a locked gate 0.8 miles from the junction of the Buffalo Gulch Creek road with State Route 14.

3.8.2 Visual Resources

The proposed Buffalo Gulch Mine Project area is located in an area currently rated by the BLM as class "B" scenery. Class B scenery is defined by the BLM as "areas in which there is a combination of some outstanding features and some that are fairly common to the physiographic region".

The proposed project area is located in forested mountains typical of the Northern Rocky Mountain physiographic province and exhibits moderate variety in landscape features. The project area is considered to be foreground-middleground as seen from medium use volume roads.

The proposed project area is managed by the BLM under a Visual Resource Management (VRM) Class III designation. This management class allows contrasts to the basic landscape elements to be evident and begin to attract attention. However, the changes should remain subordinate to the existing characteristic landscape.

3.8.3 Noise

The proposed Buffalo Gulch Mine Project area is located in an area with typical low noise levels for sparsely populated mountainous areas. Under favorable weather conditions, background noise associated with the operation of a lumber mill, as well as heavy truck traffic on State Route 14 located approximately two miles south of the proposed mine site can occasionally be heard.

3.9 TRANSPORTATION AND ENERGY

Elk City, Idaho, and the proposed mine project area are served from the west by State Route 14, a good quality two-lane asphalt surfaced highway. Highway 14 begins at a junction with Highway 13 approximately 10 miles east of Grangeville, Idaho and terminates in Elk City, a distance of approximately 50 miles. Use of Highway 14 is characterized by local vehicular traffic to nearby commerce centers, seasonal recreational vehicle traffic, service truck traffic to Elk City, and heavy truck traffic associated with a local lumber mill. The current traffic count for State Route 14 between the Elk City area and State Route 13 is 450 vehicles per day (Pers. Comm., E. Kassen, Idaho Department of Transportation, November 1989). No public transportation is available in the Elk City area.

The Buffalo Gulch Creek road, a gravel and dirt road, provides the main access route to the proposed mine site from State Route 14, a distance of approximately 2.5 miles. Public use of the Buffalo Gulch Creek Road is currently restricted by the Bureau of Land Management with a locked gate approximately 0.8 miles from its junction with State Route 14. The area of the proposed wetlands enchancement project is located along a portion of the lower Buffalo Gulch Creek road that is accessible to the general public.

Electrical energy to the Elk City area is provided by the Washington Water and Power Company. The Washington Water and Power Company powerline is located approximately two miles south of the proposed mine site, and parallels the South Fork of the Clearwater River and State Route 14. There are no electric power service lines immediately adjacent to or on the site of the proposed Buffalo Gulch Mine Project.

3.10 SOCIAL AND ECONOMIC ENVIRONMENT

A social and economic study of the Elk City, Idaho area was conducted under the direction of Hydrometrics, Inc. in 1989. A detailed description of the results of the study are contained in Appendix S of the Plan of Operations.

3.10.1 Background and Overview

Elk City is an unincorporated townsite, located in Idaho County, Idaho. It is located approximately 60 miles east of Grangeville, the county seat. The Elk City area is a 36 square mile township of privately owned property surrounded by Federal and State owned lands. The Nez Perce National Forest dominates the area, contributing to forestry, logging and tourism as the predominant land use in the area. Elk City was first developed in the spring of 1861, when gold was discovered in the area. Today, it is home to about 600 residents.

A local lumber mill and the U.S. Forest Service are the major employers in the township. Several motels, restaurants and stores serve a growing tourism industry. Hunting, fishing, camping and snowmobiling are the prime recreational activities. Elk City has been described in the following manner: "...residents have not characterized it as close-knit, but they do place a high value on the individual lifestyles that such an environment allows. The turnover rate among its residents is high compared to other subareas." (Nez Perce Forest Plan Background Paper, undated).

As Elk City is unincorporated, Idaho County is the most local governing body. There is no zoning ordinance or comprehensive plan for the area. Idaho County contains 5.4 million acres and is one of the largest counties in the State of Idaho. Nearly 85 percent of its land is publicly owned. Forest is the predominant land use, covering nearly 80 percent of the total. Rangeland accounts for another 18 percent of the land use.

Lumber products, cattle ranching and agriculture have traditionally been the major industries in Idaho County. Recent data show that the public sector is the largest employer, with over 1500 employees.

3.10.2 Economy

The economy of Idaho County has grown more slowly than has the overall economy of the State of Idaho. From 1969 through 1987, employment growth, total personal income and per capita income were lower and unemployment rates and the incidence of poverty higher than for the state as a whole. In 1989, Idaho County was classified as an Economically Distressed Area by the State of Idaho and a Labor Market Surplus area by the federal government (Pers. Comm., Douglas Tweedy, Idaho Department of Employment, October 1989).

The economy of the Elk City area has generally followed the performance of the county-wide economy (Pers. Comm., John Purdy, Idaho Department of Employment, October 1989). Both economies are strongly influenced by employment levels in the local wood products manufacturing industry. This industry has been subject to cycles of high and low activity. The industry's poor performance in the 1980s has contributed importantly to economic problems in Idaho County and Elk City. In 1989, the Elk City lumber mill increased employment from 40 to about 100 persons. The resurgence of wood products employment has improved the economic situation in the Elk City area.

3.10.3 Population

In 1980, 14,760 persons were living in Idaho County, of which 516 lived in the Elk City enumeration district (U.S. Department of Commerce, 1981). Most residents of the Elk City enumeration district lived within the Elk City townsite.

In the 1980s, the population of the Elk City area increased while the Idaho County population decreased. Current estimates place the Elk City area population at about 600 people. Much of the recent increase in population is caused by the addition of another shift at the local lumber mill. Mine-planning activities by the Idaho Gold Corporation also brought a few new residents into the area (Idaho County Free Press, 1989).

The 1988 population estimate for Idaho County was 13,600. From 1980 to 1988, the county experienced a natural population increase of 750 persons (births minus deaths), but lost population due to a net out-migration of an estimated 1900 persons (Idaho Department of Commerce, 1989).

3.10.4 Housing

A recent survey completed for the Elk City Fire Department inventoried 262 dwelling units in the Elk City township. The community's temporary housing stock consisted of 61 motel rooms and travel trailer spaces. The local demand for all types of housing tends to be greater during the summer months because of seasonal residents and recreational visitors.

Discussions with residents indicated that the existing housing market is very "tight" (Pers. Comm., Harry Owens, Idaho County Commissioner, October 1989). The housing survey identified only nine vacant houses and mobile homes. The baseline inventory did identify 19 apartments and 22 recreational vehicle hookups for rent. Some mobile home spaces were also available for rent.

3.10.5 Community Services

Water Supply: Elk City water is taken from a local creek. There are currently 90 connections using 30,000 gallons of water per day. The capacity of the system is 90,000 gallons per day. All water is treated with chlorine before delivery. The water is tested for coliform on a weekly basis and for twenty-one metals on an annual basis (Pers. Comm., M. Nelson, Elk City Water and Sewer Board, September 1989).

Sewage Treatment: The sewage treatment lagoon is being upgraded and changed to a gas injection system. Wastewater will be better than EPA and State of Idaho recreational standards. Treated water is released into Elk Creek. The system has capacity for 75 more hookups, with an average of four persons per hookup, for a capacity of 300 people (Pers. Comm., M. Nelson, Elk City Water and Sewer Board, September 1989).

Septic tanks are also allowed in Idaho County. Individual sites are inspected by the County Health Department before a permit is issued (Pers. Comm., Don Sokolowski, Idaho County Health Department, October 1989).

Fire Protection: Elk City is served by a voluntary fire association. Several vehicles are available for service. One is a 4 x 4 fire truck formerly used by the BLM. Another vehicle is currently being overhauled. There are an average of three or four house fires reported each year. Grassfires and forest fires are handled by the U.S. Forest Service (Pers. Comm., T. Bettencourt, Elk City Fire Department, September 1989).

Medical Services: There are five teams, or 12 to 15 volunteer emergency medical technicians providing medical services to Elk City residents. The one ambulance available for calls is eight years old and is in fair shape (Pers. Comm., B. Nafziger, S. Phillips, and B. Bauer, Elk City Emergency Medical Services, October 1989).

On the average, there are 30 ambulance runs per year, with about half of the calls being life-threatening. There were over 35 transport runs in 1989. The nearest doctors and medical facilities are in Grangeville. Life support services are available from Missoula, Spokane, and Boise.

Education: In the 1989-90 school year the Elk City School had an enrollment of 121 students and was overcrowded. This represented a 36 percent increase over the 1988-89 enrollment of 89 students. Increases in enrollment have been attributed to the addition of a shift at the lumber mill. The Idaho Gold Corporation has also brought in several students (Idaho County Free Press, 1989).

Grades K through 10 are accommodated at the Elk City School. High school juniors and seniors commute 60 miles to Grangeville or 65 miles to Kooskia on a weekly basis. Ninth and tenth graders have the option of attending the local school or commuting. This year all ninth and tenth graders chose to go to school locally (Pers. Comm., L. Butler, Headmaster, Elk City School, September 1989).

The School Board has purchased a double-wide trailer to reduce crowding. The two upper grades will be located in the temporary classrooms (Pers. Comm., Trent Woods, District 241 School Board, and L. Butler, Headmaster, Elk City School, October 1989).

The State Superintendent of Public Education has established standards for the maximum number of students per classroom in Idaho. Table 3.10-1 shows the maximum class size for each grade (Pers. Comm., Jerry Pelton, Idaho Department of Education, October 1989).

Increases in student enrollment were discussed with a member of the local school board. He indicated that almost any increase in enrollment would require additional classrooms. Additional student enrollment would particularly impact the lower grades. The lower grades in the Elk City School are combined and have reached the state maximum class size standards. Additional students would require the combined grades to be split into separate classes (Pers. Comm., Trent Woods, District 241 School Board, October 1989).

<u>Transportation</u>: The Elk City Road Department is responsible for approximately 100 miles of road in the township. Nearly all of the roads are dirt and gravel. The department is also responsible for snow removal. Equipment consists of a road grader, a dump truck, and a pickup truck. Public transportation is not available in the area. Discussions with local road department personnel indicate that the location of additional population would determine impact on the road department. If the new residents were located in town, maintenance and snow removal would be easier than if the population was scattered throughout the township (Pers. Comm., M. Jones, Idaho County Road Department, September 1989).

Sixty miles of State Highway 14 connects Elk City and the Grangeville-Kooskia area. It is a two lane, asphalt surfaced road. The current traffic count is 450 cars per day. Officials from the Idaho Transportation Department indicated that an increase in traffic due to the population gain in Elk City could possibly generate another 100 cars per day. Some delays and inconvenience would be experienced as a result of increased traffic. Passing would become more difficult. Drivers would not suffer a substantial reduction in level of service (Pers. Comm., Elmer Kassen, Idaho Department of Transportation, September 1989).

TABLE 3.10-1. IDAHO STUDENTS-PER-CLASSROOM STANDARDS

Grade	Maximum Number of Students
Kindergarten	25
1	25
2 & 3	28
4 - 8	32
High School	25

Law Enforcement: The Idaho County Sheriff is responsible for law enforcement in Elk City. Currently, there are two Deputies on patrol in the area. The Idaho County Sheriff's office indicated that the two deputies are sufficient to handle the existing caseload (Pers. Comm., Lt. D. Ziegler, Idaho County Sheriff's Department, September 1989).

Solid Waste: Trash pickup is the responsibility of Idaho County. Currently, trash is loaded into dumpsters stored on the eastern edge of town. The dumpsters are emptied weekly (Pers. Comm., Harry Owens, Idaho County Commissioner, October 1989).

Utilities: Electricity is provided by Washington Water and Power Company. Engineers from Washington Water and Power state that there is additional capacity in the transmission line. Line extension policy within Elk City is reviewed on a case-by-case basis (Pers. Comm., R. Petersen, Washington Water and Power Company, September 1989).

Telephone: CONTEL provides telephone service to Elk City. Company representatives indicated that the existing trunkline could handle additional customers. The company uses a formula to determine if a hookup fee is charged for new connections within the city (Pers. Comm., E.J. Hewlett, CONTEL, September 1989).

Social Services: Idaho County provides a variety of services for indigent clients. They include a food bank, emergency medical services, and welfare for emergency services. The Grangeville office also houses the Veteran's

Service Offices for Idaho County. The county has applied for a FEMA grant to assist indigent families. A one month payment for rent or utilities will be made available under provision of the grant (Pers. Comm., M. Kase, Idaho County Welfare Director, October 1989). The Idaho Health and Welfare Department also maintains an office in Grangeville. Financial and social services are available from the office. Social services include family counseling, mental health counseling, and child abuse or neglect services. Financial services are food stamps, medical assistance for children from low income families, and assistance for low income, pregnant families (Pers. Comm., Patti Pratt, Idaho Social Services, October 1989).

3.11 RECREATION

Abundant recreational opportunities are available regionwide in the Elk City area. The majority of these activities are located on lands administered by the U.S. Forest Service, Elk City Ranger District, and the U.S. Bureau of Land Management, Cottonwood Resource Area Office, Cottonwood, Idaho. A large percentage of the lands with the Elk City area are public lands. These lands provide popular seasonal recreational activities, including hunting, fishing, hiking, camping, snowmobiling, cross country skiing, huckleberry picking, firewood gathering, and sightseeing. In addition, the South Fork of the Clearwater River provides seasonal rafting and kayaking opportunities. Much of the land in the Elk City Valley is privately owned, and public access for recreational activities is limited.

The proposed Buffalo Gulch Mine Project area is characterized as a roaded-natural recreation setting as a result of the presence of roads in and adjacent to the area. The proposed project site contains no unique recreational features or attractions, nor are any BLM managerially significant recreation activities provided by the area. Public access to the proposed project site is restricted by the BLM with a locked gate on the Buffalo Gulch Creek Road approximately 0.8 miles from its junction with State Route 14. The proposed wetlands enchancement site, however, is along a portion of the lower Buffalo Gulch Creek road that is accessible to the general public.

3.12 WILDERNESS

The Gospel Hump Wilderness Area, an area of approximately 206,000 acres, is located approximately 11 air-miles southwest of the proposed project site. Other wilderness and primative areas in the region include the Salmon River Breaks Primitive Area, located approximately 18 air-miles southeast of the proposed project site, and the Selway-Bitterroot Wilderness Area, located approximately 17 air-miles northeast of the proposed project site.

3.13 CULTURAL RESOURCES

Several cultural resources surveys have been conducted by the Bureau of Land Management on lands potentially disturbed by the proposed Buffalo Gulch mine project. Several features were located and recorded by the surveys, primarily involving evidence of past mining and exploration activities. None of these features were considered significant. These surveys and their results are detailed in Appendix Q of the Plan of Operations.

4.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATING MEASURES

4.1 INTRODUCTION

The discussion of project impacts includes consideration of impact mitigation as a result of project design measures and operational and post-operational resource monitoring discussed in detail and included in the Plan of Operations. References to the location of detailed discussions of project design measures and information concerning Idaho Gold Corporation's resource monitoring plans are given wherever possible to assist in the review and understanding of impact reduction measures incorporated into the Buffalo Gulch Mine Project Plan of Operations. For purposes of transportation-related impact and mitigation measure analysis, on-site impacts are considered to include the transportation corridor from the junction of State Route 14 and the Buffalo Gulch Creek road to and including the mine site, and off-site impacts are considered to be any area beyond the on-site area.

Where appropriate, the following discussion of impacts considers cumulative impacts and mitigation measures associated with the proposed concurrent development by Idaho Gold Corporation of the Ericson Reef Mine Project located approximately four miles north of the Buffalo Gulch Mine Project (see Section 2.2.22). Additional detailed project information is contained in the Ericson Reef Mine Project Plan of Operations filed with the Elk City Ranger District, Elk City, Idaho, and the Nez Perce National Forest, Supervisors' Office, Grangeville, Idaho.

4.2 AIR QUALITY

Impact Summary:

The primary air pollutants emitted will be particulate matter from the mining and ore/waste rock hauling activities, and some gaseous pollutants from vehicle exhaust, blasting, and a diesel generator. Based upon emissions modeling conducted for particulate and gaseous emissions, as well as dispersion modeling, the impact of the proposed mine activities on the air quality of the area will be minimal and short-term. Concurrent reclamation of disturbed areas will reduce the potential for air quality-related effects.

No Idaho or Federal air quality standards will be approached or exceeded because of the mine construction or operation.

4.2.1 Particulate Emissions

The primary air pollutant from the mining operation will be fugitive dust. The sources for fugitive dust include drilling, blasting, hauling, dumping, and wind erosion. These sources will be held to a minimum by good operating procedures. Appendices A and B of Appendix U of the Plan of Operations show detailed calculations of the fugitive dust emissions. Table 4.2-1 summarizes the PM-10 particulate emissions from uncontrolled and controlled mine related activities. The controlled PM-10 emissions are estimated at 36.33 tons per year. No significant particulate emission-related air quality impacts are indicated.

4.2.2 Gaseous Emissions

Gaseous emissions are generated in combustion processes and blasting. Combustion sources will include an on-site diesel powered 270 KW generator and diesel powered mine equipment. Appendic C of Appendix U of the Plan of Operations shows the detailed calculations of gaseous emissions. Table 4.2-2 summarizes the gaseous emissions from mine related activities. The maximum emissions are from the oxides of nitrogen, totaling 23.85 tons per year for stationary sources and 107.29 tons per year for mobile sources. No significant gaseous emission-related air quality impacts are indicated.

TABLE 4.2-2 Buffalo Gulch Mine Project Gaseous Pollutant Emissions

Activity	Sulfur Oxides tpy	Carbon Monoxide tpy	Hydro-Carbons typ	Nitrogen Oxides tpy
Vehicle Exhaust	11.70	46.31	7.84	107.29
Generator	2.34	9.26	1.54	21.46
Explosives	0.28	9.41	NA	2.39
TOTAL	14.32	64.98	9.41	131.14

TABLE 4.2-1. BUFFALO GULCH PROJECT

FUGITIVE PM-10 PARTICULATE EMISSIONS

ACTIVITY	UNCONTROLLED EMISSIONS TON/YR	OPERATION HR/YR	CONTROL MEASURES	PERCENT	CONTROLLED EMISSIONS TON/YR
Topsoil Stockpiles	0.54	4412	Re-vegetation	75	0.14
Disturbed Areas	7.40	4412	None	0	7.40
Waste and Ore Drilling	3.18	2000	Cyclone	90	0.32
Ore and Waste Blasting	1.43	17	Min. Area & Overshoot	0	1.43
Ore/Waste Removal	0.13	4000	Minimize Fall Distance	0	0.13
Ore/Waste Dumping	0.13	4000	Minimize Fall Distance	0	0.13
Coarse Ore Stockpile	0.14	4412	None	0	0.14
Haul Roads - Waste	16.04	4000	Watering	50	8.02
Haul Roads - Ore To Heap	14.26	4000	Watering	50	7.13
Diesel Generator	1.33	4000	Operation	0	1.33
Vehicle Exhaust	6.64	4000	Operation	0	6.64
Access Road	7.04	4000	Watering	50	3.52
	58.26				36.33

4.2.3 Dispersion Modeling

The air pollutant emissions were simulated in a dispersion model (Industrial Source Complex Model) using a hypothetical worst case meteorological data base to predict the air quality impacts of the mine. The results of the modeling showed a maximum 24-hour PM-10 particulate concentration of 90 micrograms per cubic meter. The Federal and Idaho 24-hour PM-10 standard is 150 micrograms per cubic meter. Using the oxides of nitrogen emissions, the resulting annual maximum air quality impact would be 81 micrograms per cubic meter (0.04 parts per million). The Idaho and Federal nitrogen dioxide standard is 0.05 parts per million. No Idaho or Federal ambient air standards will be exceeded by the Buffalo Gulch Mine Project construction or operation.

4.2.4 Mitigation Measures

On April 3, 1990, Idaho Gold Corporation received approval from the Idaho Department of Health and Welfare for a Permit to Construct regarding the Buffalo Gulch Mine Project in compliance with the provisions of IDAPA 16.01.1012 of the Rules and Regulations for the Control of Air Pollution in Idaho. The Permit to Operate for the Buffalo Gulch Mine Project, including required conditions of operations regarding emission limits, monitoring requirements, operating requirements, and reporting requirements is included as Attachment 4 to this EA.

4.3 WATER RESOURCES AND WATER QUALITY

Considerable planning and coordination between IGC, BLM, the Idaho Division of Environmental Quality (DEQ), and other regulatory agencies were involved in the proposed location and design of facilities for the Buffalo Gulch Mine Project. Based upon these efforts, initial mine and facility conceptual designs and layouts were revised by IGC to decrease potential impacts on water resources (including wetlands) and to provide better sediment control. The final IGC proposed configuration of the mining and ore processing facilities was reached after consideration of alternative plans. Location of facilities as much as possible near ridge tops, and keeping the operation as small and as compact as possible were among the basic impact reduction principles upon which IGC based the project design. The resulting project design and layout by IGC (Figure 2.2-1 and Appendix L of the Plan of Operations) achieves these objectives.

4.3.1 Surface Water Impacts

Impact Summary:

Impacts to surface water can potentially occur through 1) on-site spills of project-related chemicals, reagents, petroleum products, and process water, 2) off-site transportation-related spills of project-related chemicals, reagents, and petroleum products, 3) leakage of process water from project facilities, 4) overtopping of process water containment facilities in extreme runoff events, 5) increased sediment contribution during project construction and operations, including development of the proposed wetlands enchancement area on lower Buffalo Gulch Creek, 6) surface runoff from waste dumps, 7) unavoidable alteration of surface flows expressed as seeps and springs on or adjacent the project area, and 8) land application disposal of excess process waters. IGC implementation of the project design measures, including water resource monitoring comprehensively addressed in the Plan of Operations, as well as compliance with state and federal laws concerning sediment production, and the transportation, use, handling, storage, and disposal of project chemicals, reagents, and petroleum products will significantly reduce the potential for operational and post-operational impacts to the surface water quality of the project area. In addition, IGC compliance with the Interagency Transportation Task Force recommendations concerning the transportation of project chemicals and petroleum products will further reduce the risk associated with the transportation-related spill of these materials and potential impact to area surface waters. In consideration of IGC's adherence to the above measures, operational and post-operational impacts to surface waters are expected to be below the threshold of significance.

The above categories of surface water impact potential are discussed below.

Impacts

1) On-Site Spills:

The greatest risk for significant on-site spills of project-related chemicals, reagents, and petroleum products involves a transportation related accident and introduction of spilled material into Buffalo Gulch Creek.

Along the Buffalo Gulch Creek road, the greatest risk for a transportation vehicle accident and introduction of spilled materials to Bufflao Creek is along the portion of the Buffalo Gulch Creek Road from the junction with State Route 14 to approximately one-half mile beyond the bottom of the hill below the project site. In these areas, the creek is near or adjacent to the road. From the end of this section to the mine site, the greatest risk for introduction of spilled material to Buffalo Gulch Creek occurs at three locations where small seepage-feed drainages cross the road. Materials of greatest concern include cement, ammonium nitrate, calcium or sodium hypochlorite, hydrogen peroxide, caustic soda, anti-scalant, hydrochloric acid, borax, soda ash, diesel fuel, gasoline, and anti-freeze. Introduction of these materials to Buffalo Gulch Creek or its small tributary drainages, would adversely effect the quality of these waters. Depending upon the location of the spill, amount of material introduced, and the time of year (winter low flow - summer low flow), impact to the water quality of Buffalo Gulch Creek could be significant and long-term. In addition, since Buffalo Gulch Creek is a tributary to the South Fork of the Clearwater River, the potential exists for adverse water quality impacts to the river in the event of a spill to Buffalo Gulch Creek. The potential for material introduced to Buffalo Gulch Creek to reach the river without prior control actions, however, is greatest during the spring high flow runoff period, which would provide a significant dilution factor and potentially reduce the impact potential to water quality in the river.

In response to the above risk of a transportation-related spill to Buffalo Gulch Creek, IGC, in consultation with regulatory agencies and local emergency planning officials, has developed an Off-Site Transportation and Spill Contigency Plan as a portion of the Plan of Operations (see Section 2.2.15 and Attachment 3 of this EA, and Appendix M, Plan of Operations). Implementation of this transportation plan by IGC will significantly reduce the potential for a transportation-related spill of chemicals, reagents, and petroleum products that could potentially affect Buffalo Gulch Creek.

In addition to the above transportation plan, IGC, in consultation with the BLM, has developed a plan to upgrade the Buffalo Gulch Creek road (see Section 2.2.3 of this EA, and Appendix V, Plan of Operations) prior to the transport of project-related chemicals, reagents, and petroleum products. The proposed upgrading plan has been designed to increase the level of transportation safety and hence will reduce the risk of transportation-related accidents and spill of project materials of concern along the Buffalo Gulch Creek Road.

At the project site, spills of chemicals, reagents, petroleum products, and process water can occur. As a result, there is a potential for soil contamination and leaching of contaminants into water systems through spring runoff events. These type of spills, however, would be small and cleanup response would be immediate (see Section 4.9.1). The location of the storage and use areas for materials of concern will not have a substantial risk for small spills of these materials reaching surface water systems. Nearly all of the on-site project area drainage is to Maurice Creek, with a small portion of the heap leach pad fill, the mine pit, and two topsoil stockpiles located within the Buffalo Gulch Creek drainage. Because of the distance from the mine facilities to these streams, daily inspections by IGC personnel, construction and operation of petroleum storage facilities and protective spill containment berms in compliance with the Uniform Fire Code administered by the State Fire Marshall, and the immediate on-site availability of spill response equipment, it is unlikely that a petroleum product, or chemical or reagent spill of potentially harmful magnitude (with the exception of a catastrophic failure of the surplus/retention pond during a major runoff event) would reach these waters without prior effective corrective actions being taken.

The consideration of spills of process water associated with overtopping of containment facilities is found below in 4.3.1, section 3) Process Water Collection System Storage Capacity and Design Storm Events.

Proper storage and handling of substances with contamination potential will significantly reduce the risk of a spill (Section 2.2.20 of this EA). In addition to a comprehensive materials management program, special safety provisions at IGC include an on-site, fully equipped spill treatment trailer, and an escort for vehicles transporting processing chemicals. Five hundred gallons of liquid hydrogen peroxide (an effective neutralizing agent for cyanide) will be maintained on-site. In the event of a large spill, additional hydrogen peroxide will be available from the primary supplier.

2) Leakage of Process Water:
All process facilities which contain process water during normal operating conditions will be either double or single PVC lined with leak detection systems. Leakage of process waters, however, can occur from PVC lined process facilities, which include the leach pad, the process water collection ditches, the collection ponds (pregnant, barren, and holding), and the surplus pond (when used as emergency storage of process contaminated waters). Process water leakage would be characterized by high concentrations of cyanide and moderate to low concentrations of dissolved solids, metals and nutrients. Leakage could contaminate soils beneath the facilities and the local groundwater, which occurs on the project site as surface springs and seeps. Flow from these contaminated springs and seeps could introduce contamination to Maurice Creek and Buffalo Gulch Creek.

The potential for leakage of process waters from project facilities will be substantially reduced through the use of state-of-the-art engineered foundations, and properly installed synthetic PVC liners and leak detection systems. The proposed system of PVC liners, low permeability soil liners, and favorable natural foundation conditions beneath the liner, will act as a composite liner system to adequately contain the cyanide solutions and protect the underlying natural groundwater. In addition, the surface and groundwater monitoring program to be implemented for the project (see Section 2.2.16 of this EA, and Appendix I, Plan of Operations) in compliance with State of Idaho regulations (Ore Processing by Cyanidation, Title 1, Chapter 13) will provide an effective and prompt means for detection, correction and mitigation of any leakage associated impacts to soils and surface water. Based upon these protective designs and regulatory compliance measures, the risk of significant impact to the area's surface water as a result of leakage of process water is considered very low.

a. Foundation Preparation and PVC Liners

Leach pad foundation preparation will include stripping to suitable foundation soils; scarifying, moisture conditioning, and recompacting final excavation and fill areas prior to fill placement; placement of compacted fill for site leveling and grading; and preparation of the final graded surface for synthetic liner placement. Existing bore holes and monitoring wells within construction areas will be plugged with a bentonite or cement slurry, and will have a cement plug extending a minimum of six feet down from the surface.

The foundation preparation for the leach pad will include the placement of select finer materials (25 percent passing 200 mesh). Laboratory test results of site specific samples selected as representative of compacted fill conditions (ASTM D-698 compaction standard) are included in Appendix B of Appendix L of the Plan of Operations. The compacted fill will have a minimum hydraulic conductivity of 1×10^{-6} cm/sec, which will be verified during construction by quality assurance testing through gradation testing of in-place liner fill materials. The testing will be conducted by the engineer in charge of the quality assurance program during construction. Standard 40-mil PVC liner material will be placed over the prepared foundation of compacted fill, in compliance with the manufacturer's specifications and a quality assurance/quality control program approved by the Idaho Department of Health and Welfare, Division of Environmental Quality as a portion of Idaho Gold Corporation's Ore Processing by Cyanidation Permit Application.

The 40-mil PVC liner will perform satisfactorily considering the natural foundation conditions at the project site and the proposed foundation preparation and drain fill design criteria discussed in detail in Appendix L of the Plan of Operations. Prudent design practice assumes that all liners have the potential to leak. Recent published data (Bonaparte, et al., 1989) indicate that leakage through a hole in a plastic liner is reduced if the liner overlies and is in direct contact with a fine-grained soil (permeability of 1 X 10^{-4} to 1 X 10^{-6} cm/sec). Leakage through a liner underlain with a clean sand bedding or continuous leak detection layer can be as much as 2,000 times higher. Therefore, the pad will be designed as a composite-lined system with localized strips of leak detection drains (discussed below) sandwiched between the 40-mil liner and soil liner fill. The leak detection drains will be spaced at 50-foot maximum centers beneath the synthetic liner to intercept the pad drainpipe alignments where the majority of solution flows occur above the liner. Each pad cell leak detection system will be routed to individual detection wells along the collection ditch alignment to enable isolating and monitoring the cell from which leakage is detected. If leakage is significant, the cell will be rinsed by IGC and repaired or abandoned.

Synthetic liner hydraulic conductivity is estimated to be 1 X 10^{-12} cm/sec or less (U.S. Federal Register, 1987). The subgrade liner fill hydraulic conductivity is estimated to be 1 X 10^{-6} cm/sec, based on laboratory test results on remolded mine waste borrow and assumed scarified and recompacted natural soil conditions.

The 40-mil PVC liner with low permeability liner fill and natural foundation conditions beneath the liner will act as a composite liner system to adequately contain the diluted cyanide solutions, and protect the underlying natural groundwater conditions.

b. Collection Ditches

Collection ditch exposed surface areas will be covered with an ultraviolet resistant 40-mil PVC liner (UV-PVC). The 40-mil UV-PVC liner is resistant to sunlight degradation, and chemically resistant to the solutions used in the heap leach operations. Standard 40-mil PVC liner material will be used in the compacted fill valley area where drain material can cover the liner surface shortly after installation. The collection ditch will be double synthetically lined, significantly reducing the risk of process waters reaching project area surface or groundwaters in the event of a liner leak. The lined collection ditches will provide an effective containment function in the event of process water leakage from the collection pipes.

c. Collection Ponds

Each of the solution collection ponds (pregnant, barren, and holding) will be double lined with plastic membranes and will include a leak detection system (discussed below) similar to the collection ditch with 40-mil UV-PVC on top and 30-mil PVC bottom liners below the 40-mil liners, and a geodrain between the liners draining to a leak detection sump and well. The 40-mil PVC primary liner is of greater thickness than the underlying 30-mil PVC bottom liner to provide greater protection from sunlight deterioration and pond solutions. The holding pond will be used as a spare pregnant or barren pond in the unlikely event of a pond leak.

d. Leak Detection System

A leak detection system will be constructed beneath the synthetic liner, perimeter collection ditch, containment ditch, and collection ponds. The leak detection system will provide rapid response to seepage in the event of a leak in the primary synthetic liner. The surplus pond is for temporary storage of excess dilute runoff solutions and likely will remain dry for much of the project life. A leak detection system for this pond is not proposed, although the project water resources monitoring plan (Appendix I, Plan of Operations) includes monitoring of surface and groundwater adjacent the pond.

The pad leak detection system will consist of four-inch wide wick drains on maximum 50-foot centers parallel to the interior berm cell alignments. The concept of the wick drains as a leak detection system is as follows: the interface between the PVC liner and the subgrade material will have a much higher permeability than either and will, therefore, be a path of least resistance. Leakage through the PVC liner will flow along the interface and will be intercepted by high permeability wick drains. The wick drains will overlap and connect to a common wick drain and four-inch diameter perforated PVC detection well at the exterior collection ditch slope. The leak detection wells for each pad cell will allow for monitoring of individual cells. One of wick drain will be located directly beneath the main six-inch diameter pad drainpipe associated with each leach pad cell.

The collection ditch and pond leak detection systems are similar. The geodrain between the liners will route leaked solution, if any, by gravity flow to the leak detection sump and well area. A suitable diameter PVC detection well pipe will allow placement of a submersible pump in the sump for removal of any solutions collected.

The hydraulic conductivity of the wick drain fabric is approximately 2×10^{-2} cm/sec, which is about 200 to 2,000 times higher than the permeability of the underlying subgrade soils. This will create a path of least resistance for solutions to flow along the wick drains. The four-inch wide wick drains have a design flow capacity of about 1.5 gpm each and a loading strength sufficient to support the applied load.

Potential leakage to the natural ground during operations will be negligible, considering the composite-lined leach pad system discussed above with low hydraulic head on the surface; and the double liner systems where solutions are collected and ponded. After construction, the lined collection ponds will be leak tested. These ponds will be filled to 60 percent or more of capacity with fresh water and observed for one week. Daily measurements will be taken of the water level in the ponds. The water level in the leak detection wells will be measured and pumped dry (if necessary) on a daily basis. Information obtained from the measurements above will be used to verify that no leaks are present in the pond liners, and that the ponds are acceptable for containment of process water.

3) Process Water Collection System Storage Capacity and Design Storm Events:

The process water collection system storage capacity for normal operating conditions and design storm runoff events has been designed to comply with the process water containment requirements of the State of Idaho's Ore Processing by Cyanidation Permit regulations. In addition, the process water collection ponds and surplus/retention pond have been designed to meet the public safety requirements of the State of Idaho Dam Safety Act regulations. As a result, the risk of facility overtopping or failure, and subsequent introduction of process waters to surface waters is considered low.

On-site spillage of process water can occur if the process water system facilities are overtopped or fail during extreme storm runoff events, or if the process water containment facilities are breached or fail during normal operating conditions.

The potential threat of impact to surface water from the on-site spillage of process water associated with a facility failure or overtopping will depend upon the amount and location of the spill, as well as whether the spill occurs during an extreme runoff event. During normal operating conditions, and without an extreme runoff event, the potential for process water spillage through facility failure is considered very low. The collection ponds will be excavated significantly below the existing topography. This will create a closed collection area basin (with the exception of the western berm of the pregnant pond) that prevents perimeter berm failure or overtopping to surface drainages for three sides of the collection pond system. The western berm on the pregnant pond is located upstream of the surplus/retention pond. As designed, discharge caused by a failure of the western pregnant pond berm would flow to the surplus/retention pond and would be fully contained. In addition, the pregnant pond western berm is designed to spill to the surplus/rentention pond at two feet below the berm crest, which will significantly reduce the risk of berm overtopping and failure.

During an extreme runoff event, the greatest risk for contamination of surface waters would occur from a failure involving the surplus/ retention pond berm. If a partial failure were to occur, the amount of dilute process waters discharged to the small drainage above Maurice Creek would depend upon the amount of process water in storage within the failed pond. The risk of significant water quality impact to Maurice Creek is considered low because of the very dilute nature of the process waters in this situation.

If a complete failure of the surplus/retention pond were to occur at peak storage associated with a 100-year, 24-hour storm event, total leach pad draindown, and 48 hour total snowmelt of a snowpack of 40 inches at 34 percent water, approximately 23.5 million gallons of very dilute process water could be discharged to the small drainage leading to Maurice Creek.

Compliance with State of Idaho regulations (Ore Processing by Cyanidation, Title 1, Chapter 13) require that the process water facilities be designed to safely convey and contain the normal water balance for the leaching operations, as well as additional water contributions to the system from a 24-hour, 100-year storm event, with a consideration of snowpack/snowmelt contributions. In addition, compliance with the State of Idaho Dam Safety Act (Title 1, Chapter 17) requires that the process water containment facilities be constructed in compliance with regulatory standards designed to assure structural integrity and public safety. The process water facilities for the Buffalo Gulch Mine Project, including the containment ditches from the leach pad, collection ponds (pregnant, barren, and holding), and the surplus/retention pond, have all been designed by IGC to meet these regulatory standards.

Attachment 7 of this EA contains design calculations for the sizing of solution collection and spillway structures. Design and worst case inflow calculations involving both a maximum solution application rate of 1,000 gpm, and an average solution rate of 800 gpm at a maximum leach heap height of 90 feet are presented for leach pad collection pipes and containment ditches, collection pond spillway pipes, collection ponds, and the surplus retention/pond. The project impoundment system, including the collection ponds and surplus/retention pond (without operational contingency measures) has been designed to safely accommodate a maximum storage event of 29.5 million gallons. A review of the calculations in Attachment 7 indicates a need for storage of 30 million gallons of water should the maximum storage event occur under a heap application rate of 800 gpm and heap height of 90 feet. This storage need is increased to 32.36 million gallons if the storage event occurs under a heap application rate of 1000 gpm. Although there is a shortfall in storage capacity of about 500,000 gallons for the impoundment system with an application rate of 800 gpm, additional sufficient storage to assure full containment can be acquired by operational adjustment in the timing of a 90 foot height in the active leach heap. This maximum heap height (which provides additional volume of stored process waters for contribution to a potential draindown under worst case conditions) typically occurs for only a short (30 to 45 day) period annually. To assure that full containment of process waters is achieved under the maximum storage event during an average precipitation year (as detailed in the project water balance, Appendix E, Addendum 1, Table E-1, Plan of Operations), Idaho Gold Corporation has committed to maintaining the height of the active leach heap at a level not exceeding 60 feet (see Section 5.8, Plan of Operations) during the period of greatest potential maximum storage need (March through June annually). This commitment, as well as the low probability of the occurrence of the combined worst case storage events, will mitigate the potential need to pump excess waters (approximately 500,000 gallons) to the mine pit for additional storage capacity under average precipitation year (40 inch snowpack at 34 percent water) worst case storage needs.

The surplus/retention pond will be able to store 100 percent draindown of the heap (at a maximum application rate of 1,000 gpm and heap height of 90 feet) at 7.65 million gallons of PVC lined storage. A soil lined backup retention berm will provide 17 feet of freeboard above the surplus pond crest level by the second year of operations for storage of simultaneous total draindown, design storm, and snowmelt runoff of a total of 23.5 million gallons (not including an additional six million gallons of storage available in the collection ponds).

Snowmelt contributions to the process water system from snowpack depths in excess of the average maximum snowpack of 40 inches have been considered by Idaho Gold Corporation in contingency planning. For this contingency planning, a maximum snowpack of 50 inches under 10-year maximum precipitation conditions was determined to be appropriate for use in the "wet year" water balance scenario (see Appendix E, Addendum 1, Table E-1). The project impoundment system, including the collection ponds and surplus/retention pond (without operational contingency measures) has been designed to safely accommodate a maximum storage event of 29.5 million gallons. A review of the calculations in Attachment 7 of this EA indicates that the project impoundment system is capable of storing 100 percent design runoff and draindown for all years of the operation (without flooding of the collection pond system or pumping waters to the mine pit) under average and 10-year snowpack conditions with a heap application rate of 800 gpm and a heap height limited to 60 feet during the spring of each year. If the heap height was allowed to rise to 90 feet, with an application rate of 800 gpm, full containment of the 10-year precipitation design events would still be provided, but would require flooding of the collection ponds or pumping of excess waters (approximately 1.65 millon gallons) to the mine pit for temporary storage. With the exceeding of the 4590 foot elevation storage in the retention/surplus pond (and flooding of the collection ponds), an additional 8.9 millon gallons of storage would become available within the impoundment system, with a one foot dry freeboard remaining on the retention berm. Although flooding of the collection ponds would be required, this addition storage capacity would fully contain excess waters from a 10-year precipitation year and design storm events.

To assure that full containment of process waters is achieved (without flooding of the collection ponds or pumping of waters to the mine pit) during a maximum storage event during an average and 10-year precipitation year, the height of the active leach heap will be limited to 60 feet or less, and the heap application rate will be a maximum of 800 gpm during the period of greatest potential storage need (March through June annually).

Additional temporary emergency storage can be accommodated through pumping of excess waters (very dilute process waters) from the surplus/retention pond to the mine pit (in anticipation of the extra storage need), where the water would be neutralized (if necessary) and land applied to the designated land application disposal area at the soonest appropriate time. The occurrence of an excessive snowpack condition will be apparent prior to snowmelt and the potential need for additional storage, and can be mitigated through contingency operational procedures. Snowpack depth and collection pond levels will be monitored by Idaho Gold Corporation daily and weekly. Idaho Gold Corporation project management and the Idaho Department of Health and Welfare, Division of Environmental Quality (DEQ) will be kept routinely informed of these conditions. When snowpack conditions near, or exceed 40 inches, Idaho Gold Corporation will promptly notify the DEQ and the Bureau of Land Management personnel to advise of the specific contingency steps that project management proposes to undertake to reduce the potential risk of a need for emergency additional water storage. An on-site contingency meeting may be called with appropriate agency personnel for a review of the situation and the selection of appropriate contingency measures which may include the following:

1). Snow Removal from the Ore Heaps and Leach Pad Area

Clean, uncontaminated snow can be removed from the heap area and containment ditch, eliminating the introduction of additional snowmelt to the process water system. The most appropriate equipment and methods available for snow removal would be used. As an added precaution for potential contamination, the snow removed from the heap leach and containment ditch would be placed in the mine pit and be compacted to slow melting. Samples of the removed snow and resultant snowmelt would be analyzed for the parameters listed in the weekly water monitoring plan, and the DEQ and BLM promptly provided with the results. If warranted, measures for neutralization of any traces of cyanide in the removed snow would be undertaken.

2). Pond Solutions Moved to the Mine Pit

Controlled pumping of neutralized process water solutions from the holding pond or surplus/retention pond to the mine pit can be conducted in anticipation of additional storage required for excess snowmelt. Submersible pumps would be used to move neutralized water from the pond(s) to the mine pit. The neutralized process water contained in the mine pit will be land applied in the designated land application area at an appropriate future time.

4) Springs and Seeps:
The mining project will unavoidably affect several springs and seeps in the project area through burying of these areas during construction of the leach pad and waste dumps, development of the open-pit mine, and rerouting of surface water runoff contributions during and following project operations.

Approximately 46 acres of the Maurice Creek drainage will be covered by synthetic liners (PVC) associated with the project facilities, while an additional 48 acres will be covered by waste rock dumps and other facilities.

Approximately 10.3 acres of wetlands located within subdrainages of the Maurice Creek watershed potentially will be affected by the proposed project. Of this 10.3 acres, approximately 2.1 acres of wetlands will be overlain by synthetic liners, while another 3.7 acres will be covered by waste rock dumps and other project facilities. The remaining wetlands will be affected by reduced recharge from the project area.

Valley underdrain systems will be installed prior to placement of fill for the leach pad and waste dumps, and will continue to provide drainage of these areas during the project operational period and after reclamation. These valley underdrains would consist of coarse drain rock placed either on the surface to a minimum depth of 3 feet, or in shallow trenches within the main drainage and wet seep areas. The coarse drain rock would be enclosed in filter fabric to prevent fine sediment from entering the drain rock. The underdrain fill dimensions would be reduced in the smaller local side drainages. Flow from the valley underdrains will be routed to brush filters and small sediment control structures to be constructed downstream from the waste dumps and leach pads and other site disturbed areas prior to installation of the valley underdrains.

Some precipitation contribution in spring and seep areas, primarily in the Maurice Creek drainage, will be unavoidably intercepted by synthetic liners and the rerouting of surface drainage from project facilities during and following project operations. Surface drainage from approximately 93 acres, which previously contributed to downstream spring and seep flows in the Maurice Creek drainage, will be routed to the process water ponds during operations and to the mine pit (Buffalo Creek drainage) following project closure and reclamation. Although the valley underdrain system for the leach pad and mine waste rock dumps will continue to allow subsurface recharge from this area following project closure, it is likely that following the first year of project operations, flows from these underdrains, and hence contributions to downstream springs and seeps, will be unavoidably reduced because of the synthetic liner capture and surface rerouting of available precipation.

Within the Maurice Creek subdrainages affected by the project, the total area currently contributing water to springs and seeps is approximately 192 acres. The portion of this total that will be affected by the capture and rerouting of runoff during project operations, and following reclamation, is about 93 acres, or 49 percent. Based upon this relationship, it is anticipated that the project may have a long-term, unavoidable significant affect on flows of springs and seeps in the small drainages downstream of the project facilities.

Development of the mine pit will likely reduce or eliminate some down-gradient springs and seeps within the Buffalo Creek drainage that receive a portion of their flow contribution from areas to be removed by mining. As with the springs and seeps in the Maurice Creek drainage, it is difficult to quantify this impact. During year two of the mining operations, the mine pit will encounter groundwater in the pit at a depth of about 50 to 80 feet. Intercepted groundwater, as well as contributions from precipitation will be captured in the pit and used for process water makeup or land applied in the designated land application area on a ridge north of the leach pad. Thus, in the pit area the present groundwater contribution to the flow of downstream springs and seeps in the Buffalo Gulch drainage will be removed.

The total surface drainage area of springs and seeps in the Buffalo Creek drainage that would potentially be affected by the operational capture of mine pit ground water is about 223 acres. The portion of this drainage area that will involve the mine pit is approximately 28 acres, or 13 per cent of the total. Based upon this comparison, it is likely that only those springs and seeps nearest the open pit will be significantly affected during the mining operations. This may include one spring used as a private water source (SP-19). Although during the mining operations the flow from this spring is likely to be reduced, flow at this site is expected to be restored, and perhaps enhanced following reclamation and the ponding of water in the mine pit. Idaho Gold Corporation has agreed to provide an alternative water supply in the event the private water supply is disrupted as a result of the mine pit development.

Several springs and seeps adjacent to the Land Application Disposal (LAD) area will be affected by the disposal of excess neutralized process water. Land application of neutralized excess process water, however, will occur in full compliance with State of Idaho Water Quality Standards, and the Idaho Department of Health and Welfare's Guidelines for Land Application of Municipal and Industrial Waste Water. No significant impacts to the water quality of these springs and seeps is excepted. The disposal of these waters to the LAD area, however, may result in a short-term increase in vegetative productivity in these small drainages and a short-term limited expansion of adjacent wetlands. A detailed discussion of the groundwater impacts associated with the LAD area is in Section 4.3.3, Item 3) of this EA.

Springs and seeps constituting wetlands under the jurisdiction of the U.S. Army Corps of Engineers (COE), if unavoidably adversely effected by the project, must be mitigated through either reestablishment, enhancement of degraded wetland sites on or near the project area, or through other compensation. A wetlands mitigation plan has been developed by Idaho Gold Corporation which proposes to enhance a wetlands site (4.74 acres) on lower Buffalo Gulch previously affected by placer mining activities, as well as six to eight acres of wetland developed during reclamation of the collection pond and surplus/retention area, and an approximately 17.5 acre pond in the mine pit following reclamation. The mitigation plan is discussed in Section 2.2.15 of this EA.

5) Sediment:

Project construction, operational, and reclamation activities have the potential to increase sediment loads to the Maurice Creek drainage and to a lesser extent to the Buffalo Gulch Creek drainage. Sediment production estimates and considerations for the mine project have been obtained through the use of the Sedimot II model, and the R1/R4 NEZSED (USFS) model. The sediment modeling analysis is included as Appendix J of the Plan of Operations.

On-site areas with the greatest potential for sediment production are the compacted fill edges peripheral to portions of the heap leach pad, the west edge of the north mine waste dump, the south mine waste dump, topsoil stockpiles, access roads, some haul road segments, and trails. For all of these potential areas of erosion, sediment control measures (as summarized in Section 2.2.14 of this EA, and detailed in Appendix K, Plan of Operations) will be used including a primary sediment trapping system of single and multiple brush filter windrows, as well as resoiling and revegetation, fiber matting, mulching, straw filter bales, and sediment control berms.

The potential sedimentation related to the Buffalo Gulch Mine Project was investigated using two different sediment models: 1)SEDCAD^{+}; and 2) NEZSED (R1/R4). The NEZSED model involved use of the Nez Perce National Forest Watershed Data Base and the Forest's R1/R4 sediment yield prediction model. Full documentation and sediment yield project file information is on file at the BLM Cottonwood Resource Area Headquarters, in Cottonwood, Idaho. The results from the two models are much different in that SEDCAD^{+} reports sediment yield in response to specific design storm events, and NEZSED reports sediment yield in terms of average annual yield. The NEZSED model also estimates sediment yield for any number of years throughout the project life and into reclamation. It is important to note, however, that the NEZSED model is not designed to quantitatively predict sediment yield, rather percent increase caused by management activities.

The NEZSED sedimentation model results show that existing activities in Whiskey Creek, Buffalo Gulch Creek, and Maurice Creek peak at 56%, 135%, and 57% increase in sediment production over base sediment yield, respectively. These peak values all occurred in 1987. The existing condition values are never met or exceeded by mining related activities. The model predicts peaks of 23%, 53%, and 49% increase in sediment yield over base due to the proposed mining activity, or during the period of 1990 to 1999). When the mining activity is compared to existing conditions rather than to base sediment yield in Whiskey Creek, Buffalo Gulch Creek and Maurice Creek, the predicted peak sediment yields are 12%, 36%, and 30%. Table J-4, Appendix J, Plan of Operations, presents a summary of the NEZSED results.

It is very difficult to actually model the sediment control efficiency of sediment control measures, such as silt fences and hay bales. The primary sediment control measures for the Buffalo Gulch Mine Project will include resoiling and revegetation, fiber matting, mulching, straw filter bales, sediment control berms, and brush filter windrows. Small perimeter collection ditches may be used as a secondary sediment control measure if necessary. For the NEZSED model, joint discussions between regulating agencies and Idaho Gold Corporation reviewed the plan for the proposed sediment control practices to which model mitigation factors were then attached. It was decided that additional sediment control practices will be added to the sediment control plan, consisting of multiple brush filter windrows. The interval spacing of the windrows will be approximately 30 feet. With all control practices in place as outlined in Appendix K - Sediment Control and Monitoring Plan, the resulting mitigation factor used for the NEZSED model was 0.95. This relates to a 95% cumulative trapping efficiency for all sediment control measures.

A 95% efficiency for sediment trapping is higher than erosion control methods normally produce (85% is the practical maximum for roading projects). To achieve a 95% efficiency, all sediment control measures will need to be implemented in a technically proper manner at the exact time required. Improper use of the control measures or lack of absolute timeliness in their application would result in an efficiency level lower than 95% with possible adverse impacts increasing accordingly.

BLM personnel initially set a percent sediment increase ceiling at 60% for the Buffalo Gulch Mine Project. Results from the NEZSED sedimentation model show that with a 95% sediment trapping efficiency during the course of the project, the 60% increase in sediment yield ceiling is never exceeded. Buffalo Gulch Creek displays a peak (year 1990, 53% increase over base) in relation to construction of waste rock dumps and then decreases to a constant level (years 1992-1999, 15% increase over base). Maurice Creek displays a more sinuous result with two peaks (year 1990, 49% increase and year 1993, 43% increase over base) before stabilizing (years 1996-1999, 21% increase over base). Whiskey Creek below Maurice Creek also displays a sinuous nature by peaking twice (year 1990, 23% increase and year 1993, 20% increase over base) before stabilizing (year 1995, 13% increase over base). When the percent increase comparison is made between the sediment yield due to mining and existing sediment yield, Buffalo Gulch Creek peaks at only 36% rather than 53% and stabilizes at 3% rather than 15%. Maurice Creek peaks at 30%

rather than 49% and stabilizes at 6% rather than 21%, and Whiskey Creek peaks at 12% rather than 23% and stabilizes at 3% rather than 13%. During the entire life-of-mine, the percent increase estimated is below the 60% ceiling for all three drainages as long as proper sediment control measures are implemented. If the 95% efficiency is not reached, the predicted sediment yield exceeds the 60% ceiling with a 40% increase predicted for Whiskey Creek, 96% predicted for Maurice Creek and 53% predicted for Buffalo Gulch Creek.

Short-term impacts to Whiskey Creek, Maurice Creek and Buffalo Gulch Creek will not be severe enough to cause a sedimentation issue. The actual sediment yield increase observed in Whiskey Creek, Maurice Creek and Buffalo Gulch Creek could be lower than predicted as the NEZSED model displays an acknowledged deficit in the sediment routing routine of the model. After reclamation of the project, the predicted increase in sediment yield for Whiskey Creek, Maurice Creek and Buffalo Gulch Creek, over existing conditions is 3% and 6%, respectively. Although water quality objectives are being met, fishery objectives will not be met because existing embeddedness levels and impacts from the proposed mining project will further reduce fish production potential.

Development of the wetlands enhancement site on lower Buffalo Gulch Creek could potentially add sediment to Buffalo Gulch Creek. With implementation of the sediment control measures identified above, the potential for sediment-related impacts to lower Buffalo Gulch Creek from the mitigation site development will not be significant. Excavation of the wetlands ponds will not involve a discharge of sediment-laden waters to the adjacent stream. A sediment monitoring station will be established downstream of the wetland enchancement site.

6) Mine Pit Hydrology and Water Quality:

During and after completion of mining and reclamation, water will accumulate in the pit. During operations, this water will be derived from precipitation and groundwater seepage. During the post-mining period, this water will be derived from runoff from the reclaimed leach dump and runoff from the reclaimed process pond, surplus/retention pond and office areas and from direct precipitation into the pit. Quality of water that will accumulate in the pit after mining has been completed can be estimated based on quality of water from the various sources that will contribute water to the pit. Based on information from Post Operational Pit Hydrology (Section 7.8.1, Plan of Operations), the average annual net contribution of water from the various sources is an estimated 98 acre-feet from natural precipitation, 80 acre-feet of runoff from the reclaimed heap leach area and 13 acre-feet of runoff from the reclaimed ponds and office area.

Direct precipitation into the pit will be the major source of pit water. As a result the quality of the operational and post-mining pit water is expected to be good. Post-mining runoff from the heap leach, pond, and office areas will have some geochemical interaction between the runoff water and the soil placed on these facilities during reclamation. In addition, although the spent ore heap will have been neutralized to state standards prior to discharge to the mine pit, reclamation and recontouring activities may disturb small areas within the heap containing elevated cyanide levels. As a result, short-term elevated cyanide levels may occur in the discharge to the mine pit. These elevated cyanide levels, if they occur, will not significantly effect the quality of the mine pit water. Upon exposure to sunlight, this cyanide would rapidly be destroyed by oxidation and volatilization.

The soil to be used in reclamation is topsoil stripped from areas that will be disturbed during the mining operation. Quality of this water draining from these reclaimed areas should be similar to water present in streams in the area. Based on data from Buffalo Gulch and Maurice Creek (see Appendix H, Plan of Operations) water in these streams (except during high sediment flows) is of good quality with a very low concentration of dissolved solids, near neutral pH and low concentrations of nutrients, metals, arsenic and other trace elements. Groundwater peripheral to the pit will contain arsenic, but inflow of groundwater will be less than 17 percent of the total inflow, so only small concentrations of arsenic (within State Water Quality Standards) are expected to occur in the pit.

As water accumulates in the reclaimed pit, there will be some geochemical interaction between the walls and bottom of the pit and the ponded water. Most of the gold-bearing, mineralized zone will have been removed by mining and the pit walls and bottom will be similar to the natural weathered and altered bedrock present in the area. Mining will be entirely in the oxide zone and there will be no acid water production from sulfide minerals. The reaction of the pit wall and bottom with water should not significantly change water quality in the pit pond. There may be a slight increase in mineralization and in the concentration of some trace elements, but the overall quality of the pit water is expected to be excellent.

Should it become necessary for IGC to implement the operational contingency measures described in Section 4.3.1, item 3) of this EA to accommodate snowmelt from a snowpack in excess of 40 inches, snow removed from the heap would be deposited in the mine pit and be compacted to retard melting, and/or excess waters would be pumped from the holding and/or surplus retention pond to the mine pit for containment. Waters from this snowmelt and/or pumping would be analysed for the parameters listed in the weekly water monitoring plan, and the DEQ and BLM promptly provided with the results. If warranted, neutralization of these solutions would be undertaken prior to disposal by land application to the designated land application area at an appropriate time. Waters pumped from the holding and/or surplus retention pond in this situation would be very diluted process waters, and no significant adverse water quality impact from the seepage of these waters into the groundwater below the pit bottom is expected. In addition, storage of these waters in the mine pit would be of a short-term.

Following project closure and reclamation, water levels in the mine pit will rise until an equilibrium is reached between inflow and outflow. Post operational inflows into the pit include runoff from facilities, groundwater and precipatiation. Outflows include evaporation, transpiration, seepage to groundwater and, when pit water levels rise sufficiently high, surface water outflow.

Based upon surface topography and the groundwater potentiometric surface (Exhibit H-2 of Appendix H, Plan of Operations), the pit is on a ridgetop in a groundwater recharge area, and permeability of pit walls is low. During the operational period, the pit will be excavated to approximatley 90 feet below the pre-mining water table and water levels peripheral to the pit will decline. Placement of the leach pad process ponds and north waste dump peripheral to the pit will significantly reduce groundwater recharge. The post-operational water table along the ridgetop where these facilities are located will be significantly lower than pre-mining water levels as a result of a reduction in recharge. Based on pre-mining calculations of pit inflow and changes in the area, post-mining groundwater inflows are expected to be a maximum of 20 gpm. As the pit fills, groundwater inflow to the pit will be significantly reduced.

The post-operational cumulative net inflow of water to the pit is estimated to be 191 acre-feet annually (Section 7.8.1, Plan of Operations). This pit water will begin to accumulate, a pond will be created and water levels will rise. As water levels in the pit pond rise, groundwater seepage from the pit and the area of evaporation will increase. Seepage from the pit will occur radially, but, because of topography, will be most predominant in the east, west, and south directions. Based on a depth of water in the pit of 70 feet, flow paths proportional to the pit length and width, and a gradient to the adjacent small drainages, it is estimated groundwater outflow will be less than 33 acre-feet annually. An additional loss caused by evaporation will occur from the 17.5 acre pit pond. Based on annual evaporation data, the pit pond evaporation will be 31.5 inches or 47 acre-feet per year.

The net post-operational accumulation of water in the pit (at a maximum water pond elevation of 4500 feet) is estimated to be about 110 acre-feet/year. The pit will have a volume of 509 acre-feet at the 4500 foot elevation, and will require about four years from mine closure to fill to the point of potential outflow. The pit will then potentially have a surface water outflow averaging about 110 acre-feet per year, or an average of 68 gpm.

The point at which the pit pond will outflow will be determined during mine pit reclamation activities, when there is an opportunity to direct the future outflow to the upper end of either of two small drainages on the eastern boundary of the pit. A domestic groundwater source (DWBG-1, see Figure 2.2-11a) is currently located a short distance below the potential outflow point on the most southern of these drainages. It is anticipated, however, that the use of this site as a domestic water source will have been preempted by the mining operation as recharge to this supply is captured by the mine pit. The Idaho Gold Corporation will provide an alternative domestic water source to the user of this site. Whichever of the two drainages is selected to receive the pit outflow, either are expected to be able to accomodate the outflow without excessive erosion. During spring snowmelt and in response to intense rainstorms, however, the outflow may exceed 68 gpm and some erosion of the drainage channel may occur.

During operation of the project, the accuracy of the pit inflow-outflow water balance will be evaluated by IGC based on hydrological measurements. Additionally, the small drainages that may receive pit outflow will be examined by Idaho Gold Corporation to determine natural flows in the drainages, natural erosion, and drainage bottom conditions. This information will allow an accurate determination of probable post-mining erosion in these drainages and the selection of the most appropriate drainage to receive the pit outflow. As outflow from the pit is not anticipated to occur until year four following closure of the project, ample time is available for a complete analysis of the condition of these small drainages, and development of erosion mitigation measures if necessary. If the drainage evaluations show that excessive erosion may occur, erosion contol measures will be used in the selected drainage, which may include bank and bottom stabilization, or other measures necessary to reduce erosion to an acceptable rate.

7) Drainage from Waste Rock Dumps:

Drainage of precipitation from the surface and exposed slopes of the north and south waste dumps, as well as seepage from beneath the dumps expressed as surface flow, is a potential concern regarding contamination of surface waters with metals, and acid drainage. Examination of these concerns, indicate that the waste rock will not be the source of elevated metals, and will not generate acidic waters.

Waste rock associated with the mining project was evaluated to determine its potential for affecting the water quality of the project area through seepage and runoff from the waste dumps. Laboratory tests were conducted on representative waste rock material to determine chemical characteristics. Weak acid extractions (EP Toxicity) of waste rock were analyzed to determine leachable metals in solution, and a whole rock analyses were conducted on the waste rock to determine elemental composition. In addition, an acid-base potential analysis of waste rock was performed. A detailed discussion of this testing is contained in Section 7.3 of the Plan of Operations. Results of the waste rock testing are shown in Tables 4.3-1, 4.3-2, and 4.3-3.

Whole rock analysis (Table 4.3-1) indicates iron, aluminum, and silicon are the major elements in waste rock. The abundance of trace elements in waste rock are within the ranges reported (Kabata-Pendias and Pendias, 1984) for igneous and sedimentary rocks, with the exception of arsenic. The waste rock analysis reported an arsenic concentration of 1480 mg/L whereas the typical values of arsenic for rocks are much lower. The elevated arsenic value in the whole rock analysis reflects the mineralization processes that created the Buffalo Gulch Mine Project gold deposit.

Procedure (EP) Toxicity analyses (Table 4.3-2) indicate low concentrations of leachable metals in the waste rock. Concentrations of metals in waste rock extract solutions were all better (lower) than U.S. Environmental Protection Agency limits for "nonhazardous waste".

The acid-base potential of the waste rock (Table 4.3-3) indicates very slight potential for acid generation. Waste rock has a net acid potential of 3 ppt (parts per thousand or tons of calcium carbonate per thousand tons of waste rock). Acid-base accounting is a dependable criterion by which overburden materials can be evaluated. An acid-base account consists of two measurements: 1) total or pyritic sulfur and 2) neutralization potential. The accounting balances maximum potential acidity against total neutralizers from

TABLE 4.3-1 WHOLE ROCK ANALYSIS OF BUFFALO GULCH MINE WASTE ROCK

	mg/L	
Constituent	Detection Limit	In Sample Extract
Aluminum	1000	74500
Antimony	2	<2
Arsenic	5	1480
Barium	1	465
Beryllium	1	4
Cadmium	1	20
Calcium	10	1820
Chromium	3	12
Cobalt	1	18
Copper	1	1
Iron	10	33400
Lead	5	43
Manganese	5	450
Mercury	1	<1
Molybdenum	1	<1
Nickel	1	16
Selenium	5	<5
Silicon	1000	263000
Silver	1	1
Vanadium	5	36
Zinc	1	81

Analysis by Energy Laboratories, Billings, Montana 9/29/89

TABLE 4.3-2 EP TOXICITY ANALYSIS OF BUFFALO GULCH MINE WASTE ROCK

Sample Appearance: Light red-brown fine to coarse particulate.

Extraction and analysis performed according to SW-846, Test Methods for Evaluating Solid Waste.

	mg/L	
Constituent	Detection Limit	In Sample Extract
Arsenic	0.5	<0.5
Barium	10.0	<10.0
Cadmium	0.1	<0.1
Chromium	0.5	<0.5
Lead	0.5	<0.5
Mercury	0.02	<0.02
Selenium	0.1	<0.1
Silver	0.5	<0.5

Analysis by Energy Laboratories, Billings, Montana 9/29/89

TABLE 4.3-3 ACID-BASE POTENTIAL ANALYSIS OF BUFFALO GULCH MINE WASTE ROCK

Sample Number: 13836

Location: Buffalo Gulch Mine
Representative Waste Rock

Lime, %	<0.1
Neut. Pot., ppt (1)	<1
Acid Pot., meq/100g	7
Acid-Base Pot., (1)	-3

alkaline carbonates, exchangeable bases, weatherable silicates or other rock sources capable of neutralizing strong acids as measured by the neutralization potentials.

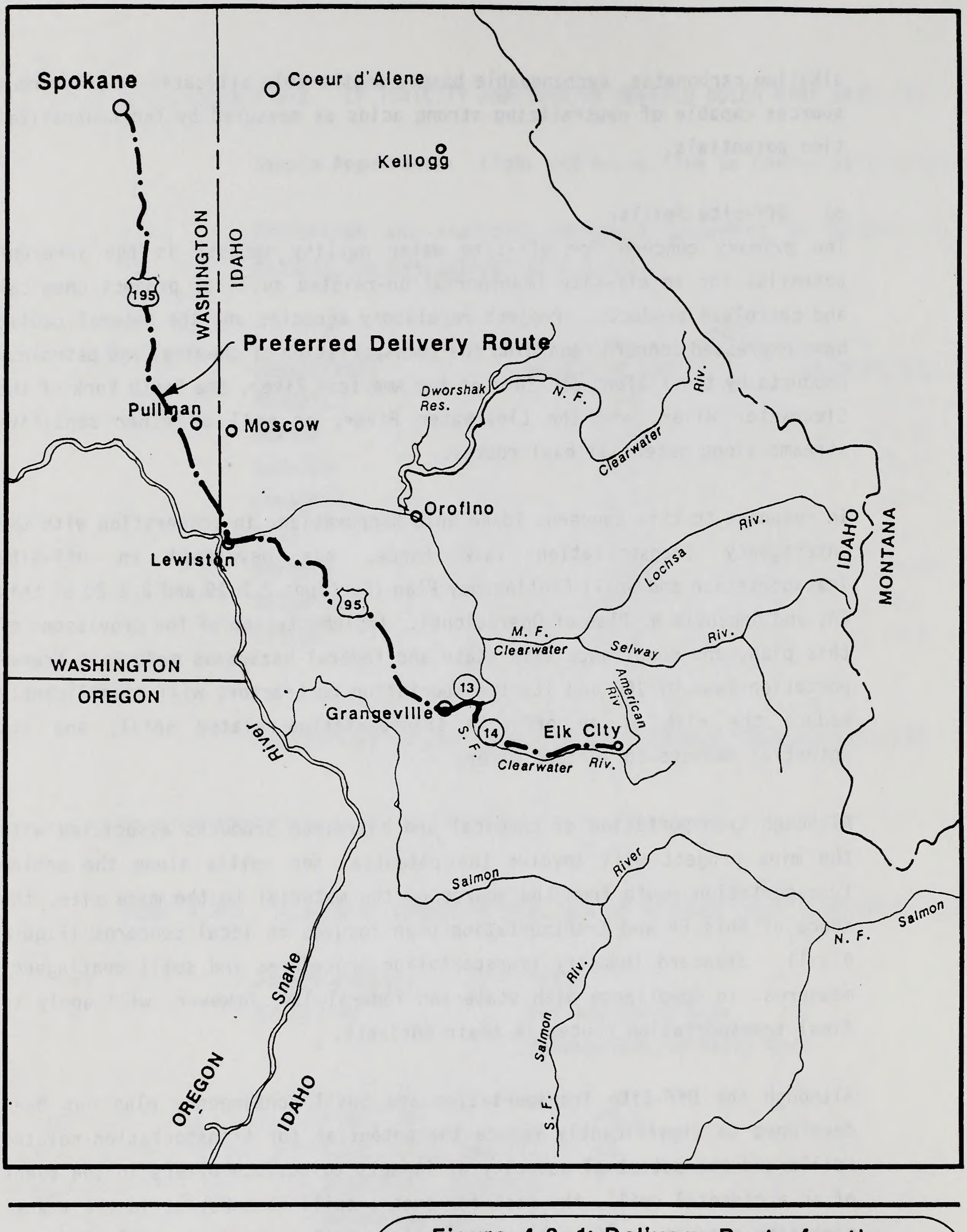
8) **Off-site Spills:**

The primary concern for off-site water quality impacts is the inherent potential for an off-site transportation-related spill of project chemical and petroleum products. Project regulatory agencies and the general public have expressed concern regarding the transportation of chemical and petroleum products by truck along portions of the American River, the South Fork of the Clearwater River, and the Clearwater River, as well as other sensitive streams along potential haul routes.

In response to this concern, Idaho Gold Corporation, in cooperation with the Interagency Transportation Task Force, has developed an Off-Site Transportation and Spill Contingency Plan (Sections 2.2.19 and 2.2.20 of this EA, and Appendix M, Plan of Operations). Implementation of the provisions of this plan, and compliance with state and federal hazardous materials transportation laws by IGC and its transportation contractors will significantly reduce the risk of an off-site transportation-related spill, and its potential impacts to surface waters.

Although transportation of chemical and petroleum products associated with the mine project will involve the potential for spills along the entire transportation route from the source of the material to the mine site, the scope of this EA and transportation plan focuses on local concerns (Figure 4.3-1). Standard industry transportation procedures and spill contingency measures, in compliance with state and federal law, however, will apply to final transportation routes in their entirety.

Although the Off-Site Transportation and Spill Contingency plan has been developed to significantly reduce the potential for transportation-related spills and the potential severity of impacts to surface waters in the event of an accidental spill, the risk for such a spill is inherent in the transportation process. If such an accidental spill of project chemical or



NORTH

Figure 4.3-1: Delivery Route for the Buffalo Gulch Mining Project Preferred by the Interagency Task Force

petroleum products were to occur, the severity of the impact to surface waters would depend upon the amount of material released, the stream or river affected, the time of year, and the point of entry. Regardless, it is likely that a fish kill would occur in the immediate area of the entry point if significant amounts of cyanide, process chemicals, or petroleum products were to be introduced to the stream or river. In addition, other beneficial uses of the downstream water, such as irrigation, or human and livestock consumption, could potentially be adversely affected by reduced water quality. The introduction of a significant amount of petroleum product would likely provide the longest-term impact to such uses.

If dry cyanide were introduced to surface waters from a ruptured flow-bin(s), the impact would be immediate, and would not exhibit any direct long-term or residual effects except for the localized reduction in the population of aquatic organisms. Cyanide is an extremely reactive chemical, and does not remain in an active form in the environment for an extended period of time. If dry cyanide were to be introduced to flowing surface waters, it would be rapidly diluted and its toxic properties significantly reduced by dilution, dispersion, oxidation, and chemical complexation. Cyanide does not display cumulative characteristics in biological organisms (McKee and Wolf, 1963).

Idaho Gold Corporation, with technical assistance from E.I. Du Pont De Nemours and Co., Inc. (Du Pont), supplier of sodium cyanide for the Buffalo Gulch Mine Project, developed a worst case "credible" spill scenario concerning a spill of dry cyanide to the South Fork Clearwater River along State Route 14 enroute to the mine site. The Interagency Transportation Task Force recommended that a worst case scenario should be based upon a transportation accident involving the integrity of a single cyanide flo-bin container being violated as a result of a transportation accident, and the flo-bin's entire contents of 3000 pounds of sodium cyanide being exposed to dissolution by the river. The recommendation for a signle flo-bin incident is based on flo-bin safety information provided by Du Pont at an April 19, 1990 meeting of the task force in Lewiston, Idaho.

In addition to several assumptions necessary to address the worst case spill scenario, several other assumptions are inherent in setting the stage for a transportation accident spill of cyanide to the South Fork Clearwater River. It must first be assumed that in the event of a transportation accident, the accident occurs at a location on State Route 14 that entry of a flo-bin to the river is possible, either while remaining on the transportation vehicle, or after being dislodged from the vehicle. This initial possibility is considered very low, as cyanide transportation vehicles will be escorted by a pilot car, and will be traveling only during safe road conditions and at a reduced speed. In addition, with the reduced speed, it is unlikely that a transportation vehicle would breach highway guardrails located along many portions of the highway closest to the river. The low number of annual shipments (approximately 30) further reduces the risk of an accident. As the transportation safeguards built into IGC's transportation plan, however, cannot account for the actions of other vehicles and drivers along the transportation route, the possibility of an accident caused by another vehicle(s) must be considered a valid concern, and cannot be ruled out.

The second assumption that must be made is that if a flo-bin container reached the river, it would be damaged to the extent that river water would not only have access to the contents, but would also be able to produce a "discharge" of the dissolved contents directly to the river flow. Based upon flo-bin design information provided by Du Pont (Pers. Comm., Ron Geyer, Technical Services Consultant, Du Pont), the flo-bins are constructed of heavy gauge steel, and are designed to be very resistant to damage (because of the nature of cyanide). Catastrophic failure of the flo-bin is considered very remote, and the most likely damage would involve a puncture of the flo-bin. Du Pont has indicated that a discharge of 1000 pounds of sodium cyanide from a damaged flo-bin is the largest spill that should be considered credible in this situation. The Interagency Transportation Task Force, however, recommended that the worst case scenario should examine the effect of a total discharge of the contents of a flo-bin (3000 pounds) to the river. The following discussion is based upon the task force's recommendation.

The worst case cyanide spill scenario to the South Fork Clearwater River is based upon the following assumptions:

1) Based upon historic record, the seasonal flow rate of the South Fork Clearwater River downstream from the confluence of the American and Red Rivers varies on average from about 40 to 1000 cubic feet per second (cfs).

2) The river water pH averages about 6.7 based upon water resource monitoring.

3) In common reaches, the river flow averages about 1.5 to 3 feet per second (fps), with flow rates during low flow periods averaging about 0.5 to 1.5 cubic feet per second (cfs).

4) A single cyanide flo-bin enters the river and is punctured on two sides below the water level, allowing entry of river water, dissolution of the entire contents (3000 pounds) of sodium cyanide, and a direct discharge to the river. Based upon the weight of the flo-bin and contents (in excess of 3000 pounds) and the entry of water to the flo-bin through duel punctures, the flo-bin will remain stationary in the river, or travel only a short distance before being captured by rocks of other river obstacles.

5) The flow of the river is sufficient to assure mixing of discharged sodium cyanide to achieve a rapid downstream homogeneity of discharge concentration.

6) A sodium cyanide dissolution rate of approximately 0.167 pounds/second to 0.238 pounds/second (pers. comm., Omar Muhtadi, Metallurgical Consultant, Reno, Nevada). It is very difficult to quantify the actual dissolution rate given the cold water temperature of the river (colder water retards cyanide dissolution). In addition, the following factors can significantly influence the rate of dissolution: the degree of agitation, the flow rate through the container, the precise pH, the actual wetted surface, and the amount of cyanide lost to volatilization and formation of HCN gas.

7) Only the dilution factor is used to decrease cyanide concentration in the stream (no loss to volatilization) since there is no actual data available on the attenuation of cyanide in streams, and because experimental data show volitilization to be a relatively slow process compared to dilution by the stream flow rate (EPA, 1986).

Based upon the above assumptions, the following are potential cyanide concentrations in the downstream area of the South Fork Clearwater River in the immediate vicinity of the spill discharge:

FLOW RATE (cfs)	**CYANIDE CONC.* (ppm) AT DISSOLUTION RATE OF :** (0.167 lb/sec.)	(0.238 lb/sec.)
25	107.05	152.56
50	53.53	76.28
100	26.76	38.14
200	13.38	19.07
300	8.92	12.71
400	6.69	9.54
500	5.35	7.63
1000	2.68	3.81
1500	1.73	2.54
2000	1.34	1.91
2500	1.07	1.53
3000	0.89	1.27
3500	0.76	1.09
4000	0.67	0.95
4500	0.59	0.85
5000	0.54	0.76

* Assumes no loss to volatilization for worst case scenario.

Attachment 6 to this EA contains historic flow information from three stations on the South Fork Clearwater River: above the confluence with the Crooked River, Between Mt. Idaho and Harpster Bridges, and at Stites. A review of the flow information from the sites indicates that the potential for the highest levels of spill-related cyanide would be along the upper portions of the river where flows and the potential for rapid dilution are lowest. This increased potential for impact, however, is offset by the similarily reduced risk that a double punctured flo-bin would be introduced to a flow situation where both punctures were located beneath the water line. Although the risk for this occurence is greater downstream where the depth and flow of the river increase, there would also be significantly greater amounts of water available for rapid dilution. The greatest potential for dilution at each of the three sites occurs during spring high flows in April, May, and June, which is displayed in the hydrographs for each station presented in Attachment 6.

The estimation of cyanide concentrations resulting from a discharge to the river (under the worst case conditions) are extremely difficult to quantify, and the values presented above are considered conservative, in recognition of the probable loss of a portion of the introduced cyanide to volatilization and complexation. The U. S. Environmental Protection Agency (1986) reports that "volatilization is probably the most significant process in the natural degradation of cyanide in surface waters."

When the spilled sodium cyanide comes in contact with the river water, because of the river's pH (about 6.7), several reactions will simultaneously take place: 1) production of hydrogen cyanide gas, 2) complexation of cyanide with other elements, which significantly reduces its availability and potential toxicity to living organisms, and 3) the production of free cyanide which is available and toxic to living organisms. Below a pH of about 9.5, sodium cyanide is unstable and will produce the above reactions. The assumed pH value for the receiving water in this case is sufficient to produce hydrogen cyanide gas. This reaction, however, is neither instantaneous nor rapid, and will not create a potential human health hazard in that the gas produced will not be contained and will be rapidly dispersed. (Pers. Comm., Omar Muhtadi, Metallurgical Consultant, Reno, Nevada, April 27, 1990)

Although the calculated worst case cyanide values are all in excess of the Environmental Protection Agency (EPA) and State of Idaho drinking water criteria for cyanide (0.2 ppm, free cyanide), the health and safety risk to humans is minimal considering the safety factor built into the standard and the significant downstream dissolution that will occur (Pers. Comm., F.W. DeVries, Senior Consultant, Du Pont, April 27, 1990). The risk to human health and safety would be greatest (although still very small, short-term, and limited to the immediate downstream vicinity of the spill) if the worst case cyanide spill occurred during a period of low flow in the upper portions of the river, with a significantly reduced opportunity for dilution.

Based upon the estimated cyanide concentrations resulting from a worst case spill and a review of the river flow information in Attachment 6, there is a significant potential for damage to fish and other aquatic life in the vicinity of the cyanide spill discharge, regardless of where it occurs along the river. The EPA and State of Idaho Ambient Surface Water Quality Criteria for cyanide, developed for the protection of aquatic life (in consideration of the broad range of sensitivities to cyanide of aquatic life), states that aquatic life and its uses should not be unacceptably affected, except where locally important species are very sensitive (the salmonid fisheries of the South Fork Clearwater River are considered very sensitive), if the four day average concentration of cyanide does not exceed 0.0052 ppm more than once every three years on the average, and if the one hour average concentration does not exceed 0.022 ppm more than once every three years on the average. These regulations are most useful in evaluating situations concerning the acceptable levels of chronic (long-term) cyanide exposure for aquatic life. The worst case transportation-related spill scenario being evaluated in this EA, however, involves a single, short-term (acute exposure) large dose of cyanide to the flowing water system of the South Fork Clearwater River.

Doudoroff (1976), in a report comprehensively reviewing available world literature concerning the toxicity to fishes of cyanide and related compounds, reports that acute lethal threshold concentrations (for salmonid fishes) may be as low as 0.020 to 0.025 ppm. Doudoroff further reports that salmonid fishes are the most sensitive group of fishes to cyanide, and that their sensitivity is greatest (under well-oxygenated conditions) at lowered water temperatures (which would be the case in the South Fork Clearwater River).

Characterization of the potential cyanide/stream flow situation at the spill site (for consideration of aquatic life impacts) would most likely involve a combination of the following: 1) an area of high concentration of cyanide in a small area confined to adjacent and immediately downstream from the damaged flo-bin (smallest area during high flows - largest area during low flows), 2) a mixing and dilution zone on either side and downstream of the zone of high cyanide concentration, 3) areas of little or no cyanide contamination within the river flow below the spill site, and 4) rapidly reduced cyanide concentrations in a contaminated flow "slug" as it moves downstream (depending upon river flow available for dilution). The uppermost reaches of the South Fork Clearwater River would offer the least opportunity for the dilution of cyanide concentrations.

Concerning potential fish mortality, there is little doubt that immediate fish mortality would occur involving those fish exposed to the highest cyanide concentrations nearest the spill. The extent of the river area experiencing immediate fish mortality is likely to be small, however, and confined to immediately adjacent the damaged flo-bin. The impact of such a fish kill would be most significant if it involved spawning adult or returning juvenile anadromous fish which are known to occur in the South Fork Clearwater River. Available literature indicates that the lethal effect of cyanide appears to be related to the metabolism and therefore the size of fish (Anderson and Weber, 1975). Larger fish are less tolerant to cyanide than are embryos and sac fry.

If the cyanide spill occurred during low flows in the river, short-term concentrations of cyanide lethal to fish could be present in at least a portion of the river flow for some distance below the spill site. In this instance, the duration of the exposure of fish to the cyanide would become the determining factor in whether or not mortality or significantly disabling impacts resulted. Based upon a review of cyanide related fish mortality studies (Doudoroff, 1976), however, it is highly unlikely that the short-term duration of cyanide exposure in this area of the river flow (because of rapid spill response procedures required in IGC's transportation and spill response plan) would be sufficient to cause a substantial risk of fish mortality or impairment. In addition, Doudoroff (1976) reports that, based upon field observations and experimentation, it appears that fish can sense the presence of harmful concentrations of free cyanide in their medium before they are overcome by the poison, and they are probably able to escape from lethal concentrations present only in the immediate vicinity of a specific outfall (such as a damaged flo-bin). If the anticipated rapid spill response procedures were not to occur, however, an increased risk of downstream fish mortality or impairment would be caused by the prolonged exposure to the concentrations of cyanide in the river below the spill site.

In addition to fish mortality in the immediate vicinity of the spill, it is likely that other aquatic life, including invertebrate and macroinvertebrate (aquatic insects) populations would experience significant mortality. Invertebrates and macroinvertebrates, however, are much more tolerant to cyanide than are salmonid fish species (EPA, 1986), and reestablishment of these populations would be expected to occur fairly rapidly through invasion of the area by adjacent unaffected populations following the spill incident.

In determining the potential for significant impacts associated with the accidental spill of cyanide to the South Fork Clearwater River as a result of a transportation-related accident, the following must be considered:

- The low likelihood of an accident-related spill incident.

- The likely volatilization and complexation of a portion of the cyanide upon entering the South Fork Clearwater River with an assumed river pH of 6.7.

- The potentially significant effect of downstream dispersion and dilution of cyanide concentration from river flows.

- The likely occurrence of areas of uncontaminated water near the river bottom and edges away from the cyanide concentrations in the river's main flow.

- The unlikely occurrence of two punctures to the flo-bin, and the location of both of these punctures below the water level (a further reduced probability during low flows).

- The rapid spill response included in IGC's Off-Site Transportation and Spill Contingency Plan.

Based upon the above information, the following can be concluded:

1) The likelihood of a transportation-related accident involving cyanide flo-bins, the entry of a flo-bin to the river, the flo-bin being double punctured as a result of the accident, and both punctures being located below the water line is very remote.

2) If the worst case scenario and associated cyanide discharge assumptions were to occur:

   - No threat to human health as a result of cyanide discharge to the river would result.

   - Fish and other aquatic life mortality in the river immediately adjacent and for a short distance downstream of the cyanide discharge will occur for the duration of the spill incident. The significance of this mortality would be greatest if it occurred during the spawning run or juvenile return period for anadromous fishes.

   - A large fish-kill involving a significant portion of the river downstream of the cyanide discharge is unlikely.

   - A rapid response as provided in IGC's Off-Site Transportation and Spill Contingency Plan would significantly reduce the threat of downstream fish and aquatic life mortality.

4.3.2 Surface Water Impact Mitigation Measures

1) On-Site Spills

The risk for an on-site (from junction of State Route 14 and Buffalo Gulch Creek Road to mine site) transporation-related spill of project-related chemicals, reagents, and petroleum products is inherent in the transportation of these materials. The timing, frequency, and characterization of the transportation of cyanide, and other chemicals and reagents to the mine site along the Buffalo Gulch road offers an opportunity for spill-related surface water impact mitigation. Transportation recommendations developed by the Interagency Transportation Task Force (Attachment 3 of this EA) and included by IGC in the Plan of Operations (Appendix M of the Plan), although primarily addressing off-site impact reduction, also provide substantial mitigation for on-site transporation-related concerns.

The following mitigation measure could further reduce the potential for an on-site transportation-related accidental spill.

- A public information sign could be installed at the junction of the Buffalo Gulch Creek road and State Route 14 informing the public of the use of the road by trucks hauling project-related chemicals, reagents, and petroleum products to the mine site. In addition, a speed limit designed to protect the both the public and transport vehicles could be posted and enforced on that portion of the Buffalo Gulch Creek road open to both the public and mine project-related vehicles.

Effective mitigation of concerns regarding the potential for contamination of soils and surface water during the storage, handling, and use of chemical and petroleum products at the mine-site will be accomplished by enforcement of IGC compliance with all state and federal laws pertaining to these activities and the rapid spill response and cleanup measures provided by the On-Site Spill Prevention and Contingency Plan (Appendix G, Plan of Operations).

2) Leakage of Process Waters

The operation of the mining project as proposed in the Plan of Operations does not offer a significant risk of contamination of surface waters as a result of leakage of process waters. The following mitigation measures offer an opportunity to further reduce the risk of leakage of process waters and subsequent potential impact to surface waters:

a. Approval of the Plan of Operations could require that the leach pad be double PVC lined to further reduce the risk of process water leakage. See Section 2.3.1 for a discussion of the consideration of this design alternative.

b. Approval of the Plan of Operations could require that the leach pad draindown capacity of the surplus/retention pond (7.65 million gallons) be double PVC lined to further reduce the risk of process water leakage in the event of pad draindown. As with the leach pad, however, the high level of protection provided by the proposed liner system does not warrant the installation of a second PVC liner. In addition, the surplus/retention pond will contain process waters only in the event of a need to store a pad draindown and/or extreme runoff event, and then only temporarily.

c. Approval of the Plan of Operations could require that the entire storage capacity (23.5 million gallons) of the surplus/retention pond be double PVC lined to further reduce the risk of process water leakage in the event of draindown or extreme storm runoff events. See Section 2.3.1 for a discussion of the consideration of this design alternative.

3) Process Water Collection System Storage Capacity and Design Storm Events
The proposed designed storage capacity of the collection system facilities (including operational procedure commitments by IGC), in consideration of the potential need to store project waters from the combined events of a 100-year, 24-hour storm event, a total pad draindown, normal operating process water volumes, and a 48 hour snowmelt from the average maximum snowpack of 40 inches at 34 percent water, accommodates the storage requirements of the State of Idaho Ore Processing by Cyanidation Permit regulations. In addition, with the implementation of operational contingency measures described previously (Section 4.3.1, item 3), additional temporary storage can be accommodated (by snow removal and pumping of water to the mine pit) for waters resulting from a snowpack snowmelt event in excess of the 40 inch snowpack.

It is potentially possible to provide for additional storage of the excess waters (potentially without pumping to the mine pit) associated with a snowmelt event of a snowpack in excess of 40 inches through the raising of the retention pond berm. This action, however, would significantly flood the collection pond system. Given the unlikely occurrence of these combined events, the planned implementation of operation contingency measures to accommodate these events, and the availability of the mine pit to provide safe containment of waters in excess of the designed storage capacities, the need for additional berm height is not considered necessary.

4) Springs and Seeps

The Plan of Operations provides for compliance with the wetland impact mitigation provisions of Section 404(b)(1) of the Clean Water Act, administered by the U.S. Army Corps of Engineers (see Section 2.2.15 of this EA). The BLM has selected Option 3 of the lower Buffalo Gulch Creek wetlands enchancement plan as the preferred mitigation option for this site, with the implementation of several additional mitigation measures to benefit wildlife use of the site (see Section 4.4.4 of this EA). In addition, a comprehensive water resources monitoring plan including springs and seeps (Appendix I, Plan of Operations) is required by the State of Idaho for project approval (Ore Processing by Cyanidation Permit). No additional mitigation is necessary.

5) Sediment

Compliance by IGC with the comprehensive sediment control and monitoring plan (Appendix K, Plan of Operations) will provide effective mitigation for sediment-related impacts. No additional on-site mitigation measures are necessary. An opportunity exists, however, for further reducing the potential for sediment impact to surface waters in the Maurice Creek and Buffalo Creek drainages through off-site mitigation of existing areas (not IGC project-related) contributing sediment to these drainages.

a. Approval of the Plan of Operations could provide that IGC cooperatively evaluate with BLM the potential for an off-site sediment mitigation project(s) to further reduce the existing off-site sediment loads in the Buffalo Gulch and Maurice Creek drainages. Idaho Gold Corporation could cooperatively participate with the BLM in such a project(s) if such a project(s) could meaningfully reduce the cumulative sediment-related impacts occuring in these drainages when considering the mining project-related sediment impact potential.

6) Mine Pit Hydrology and Water Quality

No significant impact to surface waters as a result of the operational and post-mining pit hydrology and water quality is anticipated. Compliance by IGC with the provisions of the Water Resources Monitoring Plan (Appendix I, Plan of Operations) required by the State of Idaho Ore Processing by Cyanidation Permit regulations (see Section 2.2.16 of this EA) provides effective mitigation of potential impacts to operational and post-mining pit hydrology and water quality. No additional mitigation measures are necessary.

7) Drainage from Waste Rock Dumps

No significant impact to surface waters will result from drainage from waste rock dumps at the Buffalo Gulch Mine Project. Compliance by IGC with the provisions of the Water Resources Monitoring Plan (Appendix I, Plan of Operations) required by the State of Idaho Ore Processing by Cyanidation Permit regulations (see Section 2.2.16 of this EA) provides effective mitigation of potential impacts associated with drainage from the waste rock dumps.

8) Off-Site Spills

Enforcement of IGC's compliance with the provisions of the Off-Site Transportation and Spill Contingency Plan (Section 2.2.19 of this EA, and Appendix M, Plan of Operations), and all applicable state and federal hazardous materials transportation laws and regulations will reduce the potential for significant impact to off-site surface waters to a level considered to be the maximum reasonable extent possible. Compliance by IGC with the Off-Site Transportation and Spill Contingency Plan incorporates transportation-related mitigation measures beyond the scope of existing state and federal law concerning transportation of hazardous materials on state and federal highways. Interagency Transportation Task Force recommendations (which have been incorporated into the Off-Site Transportation and Spill Contingency Plan) are in Attachment 3 of this EA.

4.3.3 Groundwater Impacts

Both short-term and long-term effects on groundwater resources of the project area will occur primarily as a result of development of an open pit, placement of the leach pad and other project facilities, and from disposal of neutralized process water in the designated land application area. These effects to groundwater will not be significant impacts.

1) Open Pit:

The proposed open pit will encompass an area of about 48 acres at full development. The weathered metamorphic rocks associated with the pit have a low permeability and will transmit only small quantities of groundwater. The pit is on a ridgetop and a portion of the 35 inch per year annual precipitation recharges the underlying water table which is 50 to 80 feet beneath the ground surface. During mining, the pit bottom will be excavated to approximately 90 feet below the pre-mining water table. This will result in a slow inflow of groundwater into the pit, and lowering of the pre-mining water table adjacent to the pit will occur. See Section 4.3.1 of this EA for a discussion of pit operational impacts on adjacent springs and seeps, and additional impact discussion concerning mine pit hydrology and water quality.

After mining is completed, the pit will receive runoff from reclaimed facilities and from precipitation, as well as groundwater seepage. After mining and reclamation are completed, a pond will develop in the pit and water levels will rise in the pit and in strata peripheral to the pit. Based on the post-mining configuration of the pit, post-mining water levels in the pit will range from 10 to 100 feet lower than the pre-mining groundwater levels. Because of low permeability of the weathered bedrock in which the pit is developed, the post-mining water table will be much less affected a short distance away from the pit. In the local vicinity of the pit, however, there will be a long-term lowering of the water table north and southeast of the pit, with less change to the east and west. After mining is completed and the in-pit pond develops, pit water will be a source of recharge to the groundwater system east and west of the pit, as well as a contributor of surface outflow to a small drainage east of the pit in the Buffalo Gulch Creek drainage estimated to average 68 gpm beginning in year 4 following project closure (see Section 4.3.1, 6) Post-Mine Pit Hydrology and Water Quality).

2) Placement of Facilities

Project features including the leach pad, collection ponds, surplus/retention pond, plant site and waste dumps, will cause short-term and long-term effects on the local groundwater system that underlies these facilities. Approximately 5.8 acres of wetlands will be covered by these project features (see Section 4.3.1, Item 4). An underdrain system will be placed in these wetlands to allow continuous drainage of water from the narrow drainage bottoms that will be covered by the project facilities.

The leach pad, collection ponds, and surplus pond will have synthetic liners which will prevent downward movement of water, and the waste dumps and earth dikes will reduce the rate of recharge to the underlying soils. The net effect will be a long-term reduction in groundwater recharge beneath these features and a reduced groundwater flow in the upper ends of some of the small drainages peripheral to the project.

The unavoidable loss and reduction of wetland values in the small drainages peripheral to the project will be mitigated by a wetland enhancement project in lower Buffalo Gulch (4.74 acres). Additionally, as part of the project's reclamation plan (Section 7.0, Plan of Operations) upon completion of mining, wetland areas will be created in the open pit and will develop in shallow depressions left in the collection and surplus/retention pond areas proposed as part of the project's reclamation plan. Proposed project wetland mitigation is described in Section 2.2.15 of this EA.

3) Land Application Disposal

The State of Idaho's Ore Processing by Cyanidation Permit regulations contain environmentally protective standards for land application disposal of neutralized process water. IGC compliance with the State of Idaho land application standards would result in no significant impacts to groundwater in or peripheral to the land application area.

As part of the Buffalo Gulch Mine Project, excess water will be periodically disposed of through land application by sprinkler irrigation on the designated LAD (land application disposal) area during the life of the project (Section 2.2.10 of this EA, and Appendix F, Plan of Operations). This excess water will result primarily from rainfall and snowmelt on the proposed heap leach pad, open pit and process pond area. Excess water will include runoff that can be applied to the LAD area without treatment (other than settling of dissolved solids), and also excess process water that will require neutralization to destroy cyanide before applying the water on the LAD area.

The LAD area is on a ridgetop that is 100 to 200 feet wide with deep, well-drained soils that range in texture from loams to sandy loams. Infiltration rates of these soils are moderate and meet the State of Idaho guidelines for LAD sites. Land application of neutralized excess process waters would occur in full compliance with State of Idaho Water Quality Standards, and the Idaho Department of Health and Welfare's Guidelines for Land Application of Municipal and Industrial Waste Water.

Discharge will be visually monitored daily to ensure that overland flow off the land application area does not occur. The application rate will be reduced if overland runoff occurs. Application will not occur during frozen or completely saturated soil conditions. It is anticipated that land application will be limited to the period from June to October.

Based on the project water balance (Appendix F, Plan of Operations), it is anticipated a total of 41.6 acre-feet of water will be disposed of by land application under average precipitation conditions. No land application disposal will be required during the first year of operation. During this period, the project has an adequate water retention capacity. In the remaining years of operation, it is estimated that 3 acre-feet during years 2 and 3, and 18 acre-feet during years 4 and 5 of water will need to be handled by the disposal system.

Neutralized process water to be disposed of by land application will primarily originate from the holding pond during project operations, and from the holding and/or barren pond at project closure. In addition, water may come from the open pit and potentially the surplus/retention pond. Water from these sources will vary in quantity seasonally, and quality of the water from the pit will be good, with the exception of excess waters pumped to the pit in the event of a need to store snowmelt runoff in excess of a 40-inch snowpack (see Section 4.3.1, Item 6). Should the need arise to remove process waters temporarily stored in the surplus/retention pond as a result of emergency storage for excess storm event-related waters, this water would contain very dilute amounts of cyanide and would require neutralization prior to land application.

To determine the quality of land application disposal water, neutralized barren pond solution from Idaho Gold Corporation's small scale heap leach testing facility was sampled and analysed by Idaho Gold Corporation. Results of chemical analysis of the neutralized barren solution are in Table 4.3-4. Neutralized barren pond solution is low in cyanide, indicating the cyanide neutralization process is successful. Neutralized barren solution meets Federal Drinking Water Standards for all parameters with the exception of pH, arsenic, chromium, and mercury. In addition, neutralized barren solution contains elevated levels of nitrate, nitrite, and ammonia.

Cumulative mass loading rates for trace elements on the land application site are presented and compared with State of Idaho guidelines in Table 4.3-5. These loading rates are based on the annual disposal of an average of 13 acre-feet of neutralized barren solution on the land application site. Trace element cumulative loadings to the site are several orders of magnitude below the recommended maximum for land application.

The impact of disposal of excess water in the land application area will be a short-term increase of water on the site from 2.9 feet (natural precipitation) to an average of about 3.4 feet per year beginning in year two of the project. This will result in short-term increased recharge to the local groundwater system, increased production of vegetation, and increased evapotranspiration from the site. The small drainages peripheral to the LAD are likely to receive short-term increased recharge from groundwater as water periodically applied to the site infiltrates and travels to these small drainages. This may result in a short-term increase in vegetative productivity in these small drainages and a short-term limited expansion of adjacent wetlands.

Table 4.3-4 Neutralized Barren Solution Water Quality - Buffalo Gulch Mine Project

LABORATORY DATA:

Potassium, Dissolved	(mg/l)	14
Sodium, Dissolved	(mg/l)	563
Calcium, Dissolved	(mg/l)	33
Magnesium, Dissolved	(mg/l)	<1
Sulfate as SO4	(mg/l)	56
Chloride	(mg/l)	19
Carbonate as CO3	(mg/l)	210
Bicarbonate as HCO3	(mg/l)	0
Conductivity, @ 25 degrees C	(umhos/cm)	3140
pH @ 25 degrees C, s.u.	(s.u.)	12.2
Nitrogen, Nitrate	(mg/l)	1.70
Nitrate + Nitrite as N	(mg/l)	3.20
Cyanide, Total	(mg/l)	0.61
Cyanide, Weak Acid Dissociable	(mg/l)	0.08
Nitrogen, Ammonia	(mg/l)	49.8
Fluoride	(mg/l)	2.9
Aluminum, Total Recoverable	(mg/l)	1.6
Arsenic, Total Recoverable	(mg/l)	0.722
Barium, Total Recoverable	(mg/l)	<0.1
Boron, Total Recoverable	(mg/l)	<0.1
Beryllium, Total Recoverable	(mg/l)	0.005
Cadmium, Total Recoverable	(mg/l)	0.007
Chromium, Total Recoverable	(mg/l)	0.23
Cobalt, Total Recoverable	(mg/l)	0.35
Copper, Total Recoverable	(mg/l)	0.46
Iron, Total Recoverable	(mg/l)	0.09
Lead, Total Recoverable	(mg/l)	0.02
Lithium, Total Recoverable	(mg/l)	<0.1
Manganese, Total Recoverable	(mg/l)	<0.02
Mercury, Total Recoverable	(mg/l)	0.028
Molybdenum, Total Recoverable	(mg/l)	0.145
Nickel, Total Recoverable	(mg/l)	0.06
Selenium, Total Recoverable	(mg/l)	0.005
Silver, Total Recoverable	(mg/l)	0.009
Zinc, Total Recoverable	(mg/l)	3.62

TABLE 4.3-5 CUMULATIVE MASS LOADING RATES - LAND APPLICATION DISPOSAL SYSTEM - BUFFALO GULCH MINE PROJECT

Constituent	Neut. Barren Solution Concentration (mg/L)	Idaho Gold Mass Application to Soil (kg/ha)	Recommended Maximum Application To Soil * (kg/ha)
Aluminum	1.6	10.2	4570
Arsenic	0.722	4.6	92
Berylium	0.005	0.0	92
Boron	<0.1		680
Cadmium	0.007	0.0	9
Chromium	0.29	1.8	92
Cobalt	0.35	2.2	46
Copper	0.46	2.9	184
Cyanide (WAD)	0.08	0.5	**
Fluoride	2.9	18.4	920
Iron	0.09	0.6	4570
Lead	0.02	0.1	4570
Lithium	<0.1		***
Manganese	<0.02		184
Molybdenum	0.145	0.9	9
Nickel	0.06	0.4	184
Selenium	<0.005		18
Zinc	3.62	23.0	1840

* Source: Guidelines for land application of municipal and industrial wastewater. March 1988. State of Idaho Department of Health and Welfare.

** Cyanide has a water quality standard of 0.2 mg/L.

*** Lithium toxicity is suggested at 2.5 mg/L. Soil retention is extremely limited.

NOTE: Mass application based on application of 41.6 acre-feet of neutralized barren solution to 20 acre site.

Water resources monitoring (as detailed in Section 2.2.16 of this EA, and Appendix I, Plan of Operations) will be conducted by IGC to document successful neutralization of barren solution; quantity and quality of water applied to the land application site; and quality of shallow groundwater in the land application area. A total of 4 shallow monitoring wells will be constructed peripheral to the LAD site for groundwater quality monitoring. In addition, 4 surface water sites adjacent to the shallow monitoring wells will also be monitored for water quality.

4.3.4 Groundwater Impact Mitigation Measures

Reduction of the potential for groundwater impacts will be accomplished through measures previously described to further reduce the potential for surface water impacts, including on-site spills, leakage of process waters, post-mining pit hydrology and water quality, drainage from waste dumps, and off-site spills (see Section 4.3.2 of this EA).

The IGC's compliance with the State of Idaho's regulations concerning land application disposal (LAD) and Idaho's water quality standards will protect the area's groundwater and will not require the implementation of additional LAD mitigating measures.

4.4 WILDLIFE

There is a potential for direct and indirect impacts to occur to wildlife associated with the Buffalo Gulch Mine Project. For purposes of this analysis, direct impacts are those associated with the mine itself, while indirect impacts are those associated with increasing human population in the Elk City area as a response to the development of the Buffalo Gulch Project. Based upon a review of baseline wildlife information for the mine project area (Section 3.4 of this EA, and Appendix R, Plan of Operations), no significant impacts to wildlife are anticipated as a result of the proposed mining project.

4.4.1 Direct Impacts

1) Wildlife Habitat Loss

Long term (approximately 7 years, or until successful reclamation) near complete loss of security, hiding and thermal cover on about 72 acres of wildlife habitat will occur within the approximately 200 acre permit area. Most of this habitat loss will be selectively logged coniferous forest (grand fir climax habitat types), with small amounts of unharvested coniferous forest and wetlands (wetlands are represented by seeps and small springs in drainages throughout the area). This loss will remove feeding sites for white-tailed deer, elk, moose and black bear, snags for cavity-nesting species of birds and mammals, and general habitat for a wide variety of other wildlife. No known raptor nests, black bear dens or other site-specific habitats will be disturbed. None of the lost habitat values are unique to the mine site; all are available in the surrounding area. The loss of 72 acres of wildlife habitat at the mine site for approximately 7 years does not represent a significant impact to the area's wildlife.

Upgrading of a portion of the existing main access road to the mine (Buffalo Gulch Creek Road) will not result in a significant loss of wildlife habitat. No new roads other than haul roads in the immediate project vicinity, will be constructed.

2) Wildlife Displacement

Displacement of wildlife species away from the mine site will occur. In addition, because public vehicle access to the project vicinity has been prohibited for several years by a gate installed by the BLM, and vehicle access during the construction and operation of the test facility has been limited, the substantial increase in vehicles along the access road will cause some wildlife displacement. This impact will vary between species or species groups. For example, a species such as the coyote may leave the project vicinity when mine construction starts, but will return within a short time.

Within a given species, the effect of displacement may vary between individuals. For example, some raptors may abandon nest sites near the project site or along the access road, while others of the same species will not be affected. Because of this, the impact of displacement is difficult to quantify. Among big game species, elk will probably be most displaced, although not significantly, by routine traffic to and from the mine, while white-tailed deer or moose may be less influenced. During the life of the

Buffalo Gulch Mine Project, public access to the general area will continue to be restricted beyond the main project gate on the lower portion of the main access road, and some wildlife species/individuals may habituate to normal mine-related traffic.

Prior to the development of the Buffalo Gulch Mine Project test facility, estimated elk use of the Project area was 55 percent of its potential, derived from criteria presented by Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho. Based on factors such as habitat loss (discussed above) and displacement, use during the life of the Buffalo Gulch Mine Project will decline to about 45 percent of its potential. While this loss is a 10 percent decline from the maximum 100 percent, it represents an 18 percent decline from the existing condition. It may be 5 to 10 years following Project reclamation and initiation of road closures in the area before elk use will increase above 50 percent of potential.

3) Wildlife Mortality

Loss of small mammals, birds, reptiles and amphibians that are unable to avoid earthmoving equipment will occur. Certain species or species groups, such as northern pocket gophers, salamanders or fledgling birds, will be lost when their habitats are destroyed. All these species that are known to occur at or near the Buffalo Gulch Mine Project site are comparatively common. All have relatively high biotic potential, and their loss will be easily compensated by the surrounding population. Most of these species will readily reoccupy the project site when it is reclaimed, and some will reoccupy it during the life of the mine. Thus, this impact will be insignificant.

Vehicle/wildlife accidents may occur along the access road. Although vehicles will maintain low speeds along the access road, some animals (particularly small mammals such as red squirrels) will be lost. As with the loss of these animals caused by surface disturbance of the mine site, this loss will not be significant.

Some wildlife species may be attracted to the heap leach pad, collection ditches, or process water ponds. These sites will be fenced with an eight foot high chain link fence to exclude entry by larger wildlife species. The entire outer boundary of the project area will be fenced with a four foot high buck and pole fence fence to prevent entry to the project area by livestock.

In compliance with the intent of the Federal Migratory Bird Treaty Act (16 U.S.C. 701-718h) process water ponds will be covered with overhead netting to prevent the use of ponds by migrating waterfowl and other birds. Because of the small size of the ponds and their location in forested habitat, however, the ponds are not expected to attract waterfowl or shorebirds.

Some small species of wildlife may be attracted to areas of the project site where various process-related chemicals are stored and used, and where process water occurs. As a result, they may be poisoned, depending on the chemical content of the consumed material. Cyanide is not a bio-accumulator (passed through the food chain) and ingestion of poisoned small wildlife species by raptors or other predatory species will not harm these species. While this loss of small wildlife species is expected to be minimal, such losses will be monitored by IGC.

Because of the low concentrations of metals and other contaminants in the neutralized process water sprinkled periodically at the land application disposal area, no impact to wildlife species is expected.

4.4.2 Indirect Impacts

1) Wildlife Habitat Loss

Some wildlife habitat loss may occur from the development of new or expanded housing in the Elk City vicinity as a result of increased mining-related employment, particularily those areas developed where no homes now exist. Based upon the short-term duration of the mining project, however, it is likely that the amount of new home development will be limited, and not pose a potential for significant wildlife-related habitat impacts.

2) Wildlife Displacement

Hunters or other recreationists will be displaced from the mine site, which may result in additional impact on wildlife species in other places. Even though the main access road to the project site has been closed to public use for several years, it is assumed that some use has occurred by walk-in hunters, skiers, snowmobilers, etc. Since this use will be prohibited during the life of mine, these individuals will have to go elsewhere or approach the mine area from a different access point. This increased use pressure in other areas could result in wildlife species, particularly big game, being killed or displaced from these other areas. It could also cause wildlife, particularly big game, to be attracted to the mine vicinity from other areas if the mine site vicinity serves as a defacto refuge during hunting seasons.

3) Wildlife Mortality

As vehicle traffic along State Route 14 to the mine/Elk City area increases in response to development of the mine, wildlife losses caused by vehicle/wildlife accidents may increase.

Additional wildlife losses, primarily big game species, may occur from hunting or other recreation related to the increase in human population associated with operation of the mining project.

A transportation-related accidental spill of project-related chemicals and petroleum products could result in terrestrial wildlife mortality, depending upon the chemical or petroleum product involved. Enforcement of IGC's compliance with the provisions of the Off-Site Transportation and Spill Contingency Plan (Appendix M, Plan of Operations) will significantly reduce this risk.

4.4.3 Cumulative Impacts

Additional insignificant short-term indirect cumulative wildlife impacts may result from additional hunter and recreational use pressure, vehicle traffic, and habitat loss associated with IGC's operation of the Ericson Reef Mine Project, about four miles north of the Buffalo Gulch Mine Project, on U.S. Forest Service lands (see Section 4.1.1. of this EA). The short-term life of this mine (approximately 1.5 years) and small work force (most of which will be shared with the Buffalo Gulch Mine) will not result in significant wildlife impacts in addition to (cumulative) those resulting from the Buffalo Gulch Mine Project. Site specific wildlife impacts associated with the

Ericson Reef Mine Project will be addressed in an Environmental Assessment (EA) prepared by the Nez Perce National Forest. The Ericson Reef Mine Project, a much smaller operation (600,000 tons of ore - 50 acres of disturbance), is proposed to operate concurrently with the Buffalo Gulch Mine Project during 1990 and 1991.

4.4.4 Mitigation Measures

The Idaho Department of Fish and Game (Jerry Thiessen, Regional Manager, letter to Lanny Wilson, BLM Area Manager, March 29, 1990) has identified several additional measures concerning the implentation of the lower Buffalo Gulch Creek wetland enhancement project (BLM preferred Option 3) that would offer an opportunity to increase the area's benefit to use by wildlife species. These are:

- Waterfowl nesting islands within both ponds should be incorporated into the wetland enhancement plan. Islands reduce predator use and increase nesting success. The peninsula in the large pond should be excavated close to shore to create a large island. In the smaller pond, the dirt should be excavated in the emergent wetland zone to create islands adjacent to the deep water area. Islands should be rip-rapped to reduce shore erosion created by wave action.

- It would be best if the emergent/aquatic zone could be 1 to 2 meters in depth instead of 0 to 1 meter. A 1 to 2 meter depth would be used more readily by waterfowl and would not become completely choked with vegetation. It would be best if these areas contain a 50:50 mix of water and vegetation. Wild rice and sago pondweed tubers are commercially available for planting within this zone for a waterfowl food source.

- The ponds should be fenced with a pole fence to exclude livestock grazing. This would ensure nesting habitat for waterfowl, emergent vegetation along the shorelines, and good water quality.

- Trees should not be planted between the ponds.

- The following changes in revegetation species are suggested to provide a taller grass profile for enhanced bird use:

Proposed	Recommended	Pounds/Acre
Streambank Wheatgrass	Intermediate Wheatgrass	7.0
Red Top, Meadow Foxtail	Tall Wheatgrass	4.0
Kentucky Bluegrass		
Ladino Clover	Ladino Clover	1.0

In addition to the above mitigation measures designed to benefit wildlife in the project area, approval of the Plan of Operations will require that IGC enforce a "no firearms" policy in company vehicles. Employees would not be allowed to hunt at the mine site or use the access road/mine area as an "access advantage" not allowed the general public.

4.5 FISHERIES

For purposes of this analysis, direct impacts are those associated with the on-site mine facilities (including the Buffalo Gulch Road from the junction with State Route 14 to the mine site), while indirect impacts are those associated with the off-site transportation of project-related chemicals and petroleum products, and the increase in the population of the Elk City area in response to the development of the Buffalo Gulch Mine Project. With the exception of a catastrophic project facility failure, and the introduction of significant amounts of project-related chemicals or petroleum products through a transportion accident, operation of the Buffalo Gulch Mine Project in compliance with the provisions of the Plan of Operations, including a comprehensive water resources monitoring plan (Appendix I, Plan of Operations), and a sediment control and monitoring plan (Appendix J - Plan of Operations), as well as other state and federal laws concerning the project activities, will not result in significant direct or indirect impacts to the fisheries of the project area.

The risk for a catastrophic project facility failure is considered very low, and risk for a transportation-related accidental spill of significant amounts of chemical or petroleum products to surface waters has been significantly reduced through the required compliance by IGC with an Off-Site Transportation and Spill Contingency Plan. Although the risk for fisheries impact associated with a spill of project-related chemical or petroleum products is present along the entire transportation route for such materials, the scope of this EA focuses on potential impacts to local fisheries (American River and the South Fork of the Clearwater River).

4.5.1 Direct Impacts

Concerns regarding the potential fisheries-related direct impacts of the Buffalo Gulch Mine Project primarily include the potential for the accidental degradation of water quality, and potential increase in sediment in Buffalo Gulch Creek, and Maurice Creek, and the resulting impacts on the anadromous fisheries of these streams and the American River and South Fork Clearwater River downstream. Potential impacts to surface water quality from the operation of the Buffalo Gulch Mine Project, including on-site transportation-related chemical and petroleum spills are discussed in Section 4.3.1 of this EA. The potential for impacts to the area's fishery is directly related to the potential for degradation of surface water quality.

1) Fish Mortality

The potential for fish mortality in the event of an accidental discharge of contaminated process waters from the Buffalo Gulch Mine Project would depend upon several factors, including whether the contaminated waters entered a stream, and the magnitude, location, duration, and time of year of the entry. A worst case discharge of significant amounts of process waters containing cyanide to Maurice Creek or Buffalo Creek would result in a loss of fish (all age classes including eggs and fry). Project design safeguards (regarding process water facilities) required for compliance with state and federal permitting regulations, as well as implementation of a comprehensive water resources monitoring plan, however, result in a low risk for this occurrence (see Section 4.3.1 of this EA).

There is a very low risk for significant amounts of process contaminated waters to reach Buffalo Gulch Creek (approximately 1/2 mile from the mine site) through the overtopping or catastrophic failure of the process water containment system (see Section 4.3.1, Item 3). In the event of catastrophic failure of the surplus/retention pond, however, it is likely that process contaminated waters would reach Maurice Creek. In Maurice Creek (approximately 1/4 mile from the project site), loss of cutthrout trout, rainbow/steelhead trout and sculpins (known to be present in the stream) and brook trout and chinook salmon (may be present) would occur, the extent of which would depend upon the factors identifed above.

Based on a 1986 population analysis by BLM of fish populations in Maurice Creek (120 over-yearling cutthroat trout per kilometer of stream), approximately 180 over-yearling cutthroat trout could be lost (1.5 kilometers of affected stream). As no other species or age class was caught in sufficient numbers to provide a population estimate, these losses could be expected to be small. The effect of these contaminants reaching the South Fork Clearwater River would depend on the amount of contaminants lost, the amount of contaminants reaching Maurice Creek, the flow/volume of Maurice Creek, the flow/volume of the South Fork Clearwater River.

Since only a small portion of the leach pad collection system, and none of the process water collection ponds are located in the Buffalo Gulch Creek drainage, risk to this drainage is slight in the event of facility failure. The BLM did not capture any anadromous species in Buffalo Gulch Creek in 1986 (although habitat is present), and numbers of resident species were too small for population estimates. As a result, no quantitative estimate of fish loss in this stream can be made, should contaminated process waters enter the stream. Based upon the limited extent of process water associated facilities located in the Buffalo Gulch Creek drainage, and the 1986 fisheries survey, it is not anticipated the impact to fisheries in this drainage would be signficant.

The risk for the introduction of project-related chemical or petroleum products to Buffalo Gulch Creek is inherent in the transportion of these materials on the Buffalo Gulch Creek road to the mine site. A discussion of this potential risk and water quality impacts is in Section 4.3.1, Item 1) of this EA. Based upon the fishery survey information discussed above for Buffalo Gulch Creek, the short-term impact to the fisheries in this drainage from a transportation-related spill of chemical products would not constitute a significant loss in terms of the area's fishery. While the same conclusion can be reached for the impacts associated with the spill of petroleum products, such a spill to the stream would provide a longer-term impact.

Inherent in the spill of chemical or petroleum products to Buffalo Gulch Creek is the risk for these materials to enter the American River, and ultimately the South Fork of the Clearwater River. Unless the spill occurred in Buffalo Gulch Creek a short distance from these rivers, there is ample opportunity to either contain and treat or prevent the spill from reaching these streams. The impact to fisheries of these streams from a spill of chemical or petroleum products into Buffalo Gulch Creek immediately upstream from its confluence with these streams would be similar to that discussed below for off-site transportation-related spills.

2) **Fish Habitat Loss or Alteration**

Construction and operation of the Buffalo Gulch Mine Project will result in increased sediment loads into Maurice Creek and Buffalo Gulch Creek, which could further reduce the fishery potential of these streams already adversely affected by previous land uses in these drainages. A discussion of potential increased sediment generation and water quality impacts is in Section 4.3.1., Item 5) of this EA.

Increased sediment/embeddedness as a result of historic disturbances in the drainages of several streams in the project area is a current problem, particularly in Buffalo Gulch Creek. Increased sediment/embeddedness reduces spawning and rearing habitat for both anadromous and resident fish, reduces periphyton/primary productivity, and affects aquatic macroinvertebrates and water temperature. Appendix J of the Plan of Operations details the sediment modeling analyses conducted for the Buffalo Gulch Mine Project.

Currently, Maurice Creek is estimated by the BLM to be 14 percent over base (pristine) for sediment yield. Sediment yield modeling conducted for the proposed Buffalo Gulch Mine Project (Appendix J - Plan of Operations) estimates that construction and operation of the mining operation will result in a peak sediment yield of 49 percent over base. This amount will stabilize at 21 percent over base in 1996 (project closure and reclamation). Based upon the sediment modeling information, the BLM has estimated that the substrate embeddedness (rearing habitat) in Maurice Creek will increase from approximately 44 percent to 48 percent. Percent fines (less than 6.4 mm) in spawning gravels will increase from approximately 35 percent to 40 percent as a result of the mining project. As a result, the BLM has estimated that overall, the fish production potential in Maurice Creek will decrease by approximately 3 to 5 percent. Current fish production potential in Maurice Creek, in reference to optimum condition (pristine) is estimated by the BLM to be 30 to 50 percent, and averages about 40 percent. (Pers. Comm., Craig Johnson, BLM Biologist, April 27, 1990).

Currently, Buffalo Gulch Creek is estimated by the BLM to be 13 percent over base for sediment yield. Based upon the project sediment modeling analysis (assuming a 0.95 mitigation efficiency factor), it is estimated that the mining project will result in a peak sediment yield of 53 percent over base. This amount will stabilize at about 15 percent over base in 1992. The BLM has estimated that percent substrate embeddedness in Buffalo Gulch Creek as a result of the development and operation of the mining project will increase from approximately 34 percent to 39 percent. Percent fines is spawning gravels will increase from approximately 63 percent to 69 percent. Overall, the BLM has estimated that fish production potential in Buffalo Gulch Creek, in reference to optimum condition (pristine) will decrease by about 4 to 6 percent as a result of the proposed project. Current fish production potential, in reference to optimum condition, has been estimated by the BLM to be 30 to 50 percent in Buffalo Gulch Creek, with an average of about 40 percent. (Pers. Comm., Craig Johnson, BLM Biologist, April 27, 1990).

As noted previously, the Maurice Creek and Buffalo Gulch Creek drainages have been adversely affected by past land uses, including road construction, timber harvest, and mining. Consequently, although predicted sediment yields from the proposed mining project are within allowable limits, past land uses continue to prevent BLM fishery objectives from being met in these drainages.

Development of the proposed wetland enhancement project on lower Buffalo Gulch Creek (see Section 2.2.15 of this EA) will not result in a loss or significant alteration of fisheries habitat in Buffalo Gulch Creek.

The Water Resources Monitoring Plan (Appendix I, Plan of Operations) provides for the monitoring of sediment levels in Maurice Creek and Buffalo Gulch Creek by IGC for the life of the Buffalo Gulch Mine Project and beyond (see Section 2.16.2., Item 2) of this EA). The BLM currently monitors sediment loads and embeddedness in the potentially effected streams and will continue to do so during the life of the Buffalo Gulch Mine Project and beyond. Idaho Gold Corporation has committed to cooperate with the appropriate agencies to reduce sediment/embeddedness problems if they increase as a result of the project.

4.5.2 Indirect Impacts

Concerns for indirect impacts to fisheries have focused on the potential degradation of water quality associated with an off-site accidental transportation-related spill of chemical or petroleum products to the South Fork Clearwater River, and the resulting impact to the anadromous fisheries of this river. A discussion of this risk and impact to the water quality of these rivers is in Section 4.3.1., Item 8) of this EA.

2) Fish Mortality

There is an inherent risk for the spill of project-related chemicals or petroleum products into the American River and South Fork Clearwater River during transport along State Route 14 to the mine access road. Idaho Gold Corporation's compliance with the Off-Site Transportation and Spill Contingency Plans (Section 2.2.9 of this EA, and Appendix M, Plan of Operations) will significantly reduce the likelihood of a transportion-related spill to these waters. The impact to the aquatic ecosystem from a spill will depend on the chemical nature of the contaminant, amount and duration of spill, point of entry and flow/volume of the receiving water, water temperature, and time of year (i.e., age class and numbers of anadromous and/or resident fish species present). The South Fork Clearwater River is considered a critical upstream and downstream passage for anadromous fish, including spring chinook salmon and steelhead trout. The American

River provides important spawning and rearing habitat for anadromous fish. In the event of a spill, depending upon the above spill factors, some loss of fisheries may occur, but the extent of the loss is not possible to quantify. A worst case situation involving the accidental spill of cyanide to the South Fork Clearwater River is discussed in Section 4.3.1, item 8) of this EA.

Increased fish harvest in the project area's streams and rivers may result from increased fishing pressure associated with the mining-related increase in human population and recreational use of the Elk City area. This impact would likely have less effect on Buffalo Gulch Creek and Maurice Creek than on other streams and rivers in the region, including the American and South Fork of the Clearwater Rivers. It is not anticipated that this increased fishing pressure will be significant enough to affect local fish limits or other harvest regulations.

4.5.3 Cumulative Impacts

The proposed concurrent operation by IGC of the Ericson Reef Mine Project on U.S. Forest Service lands near Elk City, Idaho (see Section 4.1.1. of this EA) will result in an additional increase in human population, transportation of chemical and petroleum products, and placement of mining and ore leaching facilities in the Elk Creek drainage, which is a tributary to the American River below Elk City. Based upon the much smaller size of the Ericson Reef Project (600,000 tons of ore - 50 acres of disturbance), the short-term duration of the operation (1990 - 1991), and IGC's required compliance with state and federal laws that are the same as those necessary for approval of the Buffalo Gulch Mine Project, the risk for significant cumulative impacts to the area's fisheries from this project is considered low. Impacts to fisheries directly related to the Ericson Reef Project will be addressed in an Environmental Assessment (EA) being prepared by Nez Perce National Forest.

4.5.4 Mitigation Measures

Measures offering an opportunity to further reduce the potential for impacts to the area's fisheries include those measures previously discussed concerning the further reduction of surface water impact potential (see Section 4.3.2). In addition, the Idaho Department of Fish and Game (Jerry Thiessen, Regional Supervisor, letter to Lanny Wilson, BLM Area Manager, March 29, 1990) has suggested that the post-mining 17.5 acre mine pit pond will have a depth sufficient to be considered for fish stocking following verification that the mine pit pond water quality would allow fish survival.

4.6 ENDANGERED, THREATENED, OR SENSITIVE WILDLIFE AND FISH SPECIES

In compliance with the provisions of the Endangered Species Act of 1973, as amended, the Section 7 consultation process with the U.S. Fish and Wildlife Service was initiated in 1987 by the BLM for the Buffalo Gulch Project small-scale test heap facility. This consultation process has continued for the proposed Buffalo Gulch Mine Project. Attachment 4 of this EA contains USFWS correspondense regarding Section 7 consultation, biological assessments prepared by the BLM for the gray wolf, northern bald eagle, and wolverine, and the USFWS's concurrence with a no adverse impact determination.

The gray wolf is the only federally designated endangered species identified by the USFWS that may occur in the project area. The wolverine is identified by the USFWS as a candidate species that may occur within the project area. Biological assessments prepared by the BLM for the grey wolf and wolverine in compliance with the Section 7 consultation process show a "no effect" situation for both of these species concerning potential impacts from the proposed mining operations.

Bald eagles do not nest in or near the proposed Buffalo Gulch Mine Project but are present during winter along the South Fork of the Clearwater River, particularly about 20 air miles downstream from the project. The biological assessment prepared by the BLM concerning bald eagles concludes that there is "no effect" concerning impacts to bald eagles from the proposed mining project. Compliance by IGC with the provisions of the Off-Site Transportation and Spill Contingency Plan (see Section 2.2.19 of this EA) will minimize the potential risk of contaminant spill effects on fish, which are potential prey items of wintering bald eagles.

Five BLM "sensitive" species are present in the area: chinook salmon, steelhead trout, bull trout, westslope cutthroat trout, and fisher. The potential effects of the proposed Buffalo Gulch Mine Project on the fish species have been discussed previously. Although fisher have been recorded in the region surrounding the proposed Buffalo Gulch Mine Project, the past disturbance of the project site by selective logging, grazing and mining-related activities ensures that it does not provide attractive, unique or critical habitat for the fisher. Therefore, no impact from mine development is expected on this species.

4.7 VEGETATION

Impacts to vegetation associated with the proposed mining project include the ultimate removal of approximately 180 acres of existing vegetation (including harvestable timber, and wetland vegetation), and potential erosion and sediment effects. Removal of vegetation, however, will be staged, and some areas will be revegetated while other areas are being cleared. Implementation by IGC of the reclamation and revegetation plan, and sediment control plan in the Plan of Operations in compliance with state and federal reclamation requirements will significantly reduce these impacts and avoid long-term significant impacts to vegetation.

4.7.1 Direct Impacts to Vegetation

The major direct impact on vegetation associated with development and operation of the proposed mining project will be the removal of existing vegetation, including wetland areas and some merchantable timber, which currently occupy the sites of project components. Existing vegetation would be removed from approximately 180 acres of the project site during project construction and mining activities, and would be replaced during and following completion of the mining project in compliance with a comprehensive reclamation plan (see Sections 2.2.17, 2.2.17 of this EA, and Section 7.0 of the Plan of Operations). The reclamation plan has been designed to meet requirements of the State of Idaho Surface Mining Reclamation Plan (Title 47, Chapter 15, Idaho Surface Mining Act), as well as the reclamation requirements of the BLM. Select areas of the mining operation will be reclaimed concurrent with the operations, beginning in year two (see WELSH Drawings 11602/7 through 11602/12, Revision B, Appendix L, Plan of Operations). Although considered a long-term impact, the successful reestablishment of post-mining vegetation in accordance with the provisions of the reclamation plan will not represent a significant impact.

Reclamation of the north waste dump, and that portion of the ultimate leach pad fill located in the Buffalo Creek drainage will begin in year two of the project operation. Reclamation of a portion of the mine pit will begin in year four of the operations. Final reclamation following project closure will reestablish a vegetative cover on all areas disturbed by the project (with the exception of existing rock outcrops and possibly mine pit benches that may be inaccessible) that is ecologically comparable to pre-mine conditions. Final reclamation will restore watershed, wildlife, recreational and aesthetic values to meet post-operational land use objectives. A detailed description of revegetation activities and plant species is in Section 7.5 of the Plan of Operations, and addresses species selection, seed mixtures and rates, seedbed preparation, seeding and planting methods, cultural treatments and intermim revegetation. A summary of the revegetation plan is in Section 2.2.18 of this EA.

Based upon laboratory tests shown in Table 4.7-1, the reclamation potential for both the agglomerated ore and waste rock material is favorable, and does not limit the use of these materials as suitable subsoil for reclamation activities. Additional information concerning the analysis of waste rock is in Tables 4.3-1, 4.3-2, land 4.3-3 of this EA.

The long-term loss of disturbed project lands from the area's timber base during the life of the mine and until merchantable timber stands are again available on the site is not considered significant.

Approximately 200 acres of forested grazing land will be removed from the current on-site grazing allotments for the life of the project and as long thereafter as is required to replace suitable forage vegetation (approximately 2 years). The surface area of the mine pit will be permanently removed from the timber and grazing resource. These impacts are not considered significant.

TABLE 4.7-1 The Physical and Chemical Characteristics of Buffalo Gulch Mine Project Agglomerated Spent Ore and Waste Rock Material

	Buffalo Gulch Spent Ore	Buffalo Gulch Waste Rock
pH	9.0	5.4
Cond.,mmhos/cm	2.0	0.94
Sand, %	59	72
Silt, %	29	21
Clay, %	12	7
Texture	SL	SL
Coarse Fragments, %	<2	<2
Lime, %	1.1	<0.1
Neut. Pot., ppt.(1)	11	<1
Acid Pot., meq/100g	<1	8
Acid-base Pot., (1)	11	-4

(1) T. CaCO3/100 T.

Analysis by Energy Laboratories, Billings, Montana 1/18/90 and 1/26/90
Lab No: 90-1310 and 89-13835-37.

Development of the Buffalo Gulch Mine Project will consume approximately 5.8 acres of wetlands and associated wetland vegetation (see Section 4.3.1., Item 4) of this EA). In response to this long-term unavoidable impact, and in compliance with Section 404(b)(1) of the Clean Water Act administered by the U.S. Corps of Engineers, a wetlands mitigation and enhancement plan has been developed by IGC which addresses reestablishment of wetland vegetation at the mine site and enhancement of a site historically disturbed by placer mining on lower Buffalo Gulch (see Section 2.2.15 of this EA). Wetlands mitigation is addressed in detail in Chapter 7, Section 7.9 and Appendix T of the Plan of Operations. The BLM, in consultation with the Idaho Department of Fish and Game, has selected Option 3 of the wetland enhanced plan as the preferred option, with implementation of several suggested additional measures to benefit wildlife (see Section 4.4.4 of this EA).

The loss of existing vegetation caused by the development of the wetlands enhancement site on lower Buffalo Gulch will be short-term is not considered significant. The short-term loss will be more than offset by successful long-term enhanced wetland revegetation associated with the project.

4.7.2 Indirect Impacts to Vegetation

Indirect impacts to vegetation caused by the Buffalo Gulch Mine Project will include the potential for soil compaction and soil loss associated with soil handling activities during removal for stockpiling, and again during redistribution for reclamation, potential soil contamination caused by on-site spills of chemical or petroleum products, increased erosion caused by disturbance of erosive soils, and off-site wetlands vegetation impacts caused by the project's alteration of the existing hydrologic regime of the project area.

Compaction of soils during construction and operation activities can have a detrimental effect on revegetation success, especially in moist or wet areas. Removal or loss of topsoil during removal/fill and recontouring operations can also decrease revegetation success. In recognition of these potential impacts, the provisions of the reclamation and revegetation plan contained in the Plan of Operations give sufficient consideration to these concerns to assure successful revegetation and prevent significant vegetation impacts associated with reclamation failure. In addition, the IGC is required to submit a reclamation bond to the BLM and the State of Idaho prior to project commencement that is sufficient to assure long-term revegetation success for the lands disturbed by the mining project.

The potential for soil contamination by on-site spills of chemical and petroleum products is discussed in Section 4.9.1 of this EA.

The disturbance of erosive soils associated with project construction activities, may increase erosion and reduce revegetation potential. If interim revegetation is not successful, erosion may become a long-term concern, accompanied by concomitant loss of fertility and further reduction of revegetation potential. The implementation by IGC of soil handling and erosion control measures to reduce the potential for these impacts to revegetation success are discussed in Section 4.9 of this EA, and detailed in Chapter 7 of the Plan of Operations, while a sediment control and monitoring plan is discussed in Section 4.3.1., Item 5), and detailed in Appendix K of the Plan of Operations. Compliance by IGC with these provisions for soil handling and erosion control measures will significantly reduce the potential for erosion-related impacts to vegetation.

The proposed project is expected to alter the on-site hydrologic regime, which may modify on-site and adjacent wetland and riparian communities. Project development would result in the direct loss of about 5.8 acres of springs, seeps and related wetlands in small headwater drainages in the project area (see Section 4.3.1., Item 4) of this EA). Changes in drainage patterns, groundwater discharge/recharge, surface flow, or water table levels may result in dewatering and subsequent loss or reduction in the seasonal extent of some wetlands below and adjacent the project site in subdrainages in the Maurice Creek and the Buffalo Gulch watersheds. These hydrologic modifications also may affect streamflows downstream from the study area, although it is not anticipated this effect would be significant given the relatively small percentage of the Maurice Creek and Buffalo Creek drainages occupied by the project facilities.

4.7.3 Cumulative Impacts to Vegetation

Mining has a long history in the Elk City area. Dredge mining in particular has adversely affected portions of Buffalo Gulch Creek and its associated riparian wetlands in the past. Impacts to wetlands and riparian areas during development of the Buffalo Gulch Project will add to the cumulative effects of mining on these plant communities. Rapid revegetation of the project site will be encouraged, however, by the significant precipitation received by the area. Other cumulative impacts may include increased soil erosion and unintentional introduction of exotic plant species on disturbed sites. Idaho Gold Coroporation's proposed wetlands enchancement site on lower Buffalo Gulch Creek, as well as on-site wetlands reestablishment following project closure, however, will significantly reduce the project's cumulative impact to the area's vegetation communities, and not result in a signficant impact. The project's reclamation and revegetation plan has been developed to recognize and prevent the introduction of exotic plant species on disturbed sites.

4.7.4 Threatened, Endangered, or Sensitive Plant Species

As discussed in Section 3.5.5 of this EA, four populations of the Idaho barren strawberry are known to occur in the vicinity of the project area (Figure 3.2-4), although outside of the lands proposed for disturbance. Once listed as a federal candidate species, this species is now listed as a former candidate species, and is also on the Idaho State Monitor list. The project will not disturb these populations, and no impact is anticipated.

4.7.5 Mitigation Measures

Effective mitigation for vegetation-related impacts will be achieved through IGC compliance with state and federal reclamation standards, as well as implementation of the wetlands mitigation plan contained in the Plan of Operations. Section 4.4.4 of this EA identifies additional mitigation measures associated with the wetlands enhancement project (BLM preferred Option 3) on lower Buffalo Gulch Creek that have been suggested by the Idaho Department of Fish and Game (pertaining to increasing wildlife benefits).

4.8 GEOLOGY AND TOPOGRAPHY

Implementation of the proposed mining activities will constitute a consumptive use of a geologic resource. The proposed project activities will affect the geology of the area by mining, processing, and using a geologic resource. The construction and operation of the proposed project would remove the precious metal orebody and other surficial geologic materials. No unique resources such as unusual fossils or geologic formations or other geologic resources are known to exist in the area. The mining activities will permanently remove about 5 million tons of mineral resource from the project site.

The removal of the precious metal orebody geological resource cannot be mitigated. Similarily, the use of geologic materials for roads and borrow cannot be avoided if the project is approved. The stability of surficial deposits would be protected through routine engineering practices such as slope reduction and drainage channels, thereby minimizing long-term adverse impacts following project reclamation.

Topographic impacts that would occur as a result of this project include excavation of the open-pit mine, the construction of a 5 million ton heap leach facility, the disposal of approximately 7.5 million tons of overburden in two waste dumps, the construction of process water collection ponds, and the construction of limited on-site haul roads. Some of the topographic alterations caused by mining and processing activities such as the open pit mine (approximately 48 acres, 200 feet deep), overburden dumps (approximately 50 acres - average 100 feet in height), and ultimate leach heap (approximately 46 acres - average 90 feet in height) constitute long-term impacts to the pre-mining topography. These facilities will become permanent features of the landscape. The overall impact of these features, however, would be reduced by recontouring associated with reclamation, which would blend the features into the existing topography. Reclaimed topographic cross-sections of these features are presented in WELSH Drawing 11602/13, of Appendix L of the Plan of Operations. A post-mining topographic and drainage map is shown in Exhibit 4 of the Plan of Operations.

4.9 SOILS

Disturbance of surface and subsurface soils will be an unavoidable consequence of this project. Salvage and reclamation operations will mean the effects are generally reversible, but the soils in some areas (such as the mine pit) will be permanently altered. Although pre-existing soil types can never be restored to their exact pre-mine condition, implementation of reclamation techniques, along with erosion control and other management practices as required by state and federal law, and as proposed in the Plan of Operations, will result in a signficant reduction of soils-related impact potential. Soil handling, salvage, protection and redistribution as proposed in the Plan of Operations will result in the re-establishment of an on-site soils environment capable of sustaining productive vegetation and of supporting the proposed post-mining land use.

4.9.1 Project Construction and Operation

Construction of project facilities will require the removal and salavage of approximately 324,969 cubic yards of topsoil for use in reclamation and revegetation activities (see Table 7.4-2, Plan of Operations). From 13 to 18 inches of surface soil with about one percent or more organic matter will be salvaged. Subsoils (those soils between the organic rich surface soil and soft bedrock) will not be salvaged to avoid mixing subsoil (weathered parent material) with surface soil. Soil mixing would dilute beneficial physical and chemical characteristics of the surface soil. Existing disturbances and rock outcrops are precluded from soil salvage because there is no cover soil available. Salvaged soil will be direct-hauled for immediate use in concurrent reclamation or stockpiled and protected in storage areas. During soil handling operations, care will be taken by IGC to minimize compaction. Soil will be handled only when it exhibits good tilth and is moderately dry, and will not be disturbed again until it is redistributed. Soil handling will cease during wet weather.

Potential impacts to the soil following topsoil removal include erosion, a decrease in soil productivity because of vegetation loss, and compaction from heavy equipment operation. Long-term stockpiling of topsoil could also adversely affect soils if there is a decrease in soil microbial activity or alteration of the soil structure by mixing of soil horizons during soil handling. There is a potential for soil contamination caused by spills of chemical or petroleum products at the project site during the life of the mine. Contamination of topsoil is less likely to occur once it has been salavaged and stockpiled. Appendix G - On-Site Spill Prevention and Contingency Plan (Plan of Operations) addresses clean-up procedures for the removal and proper disposal of chemical or petroleum spill contaminated soils. All soils contamined by chemical or petroleum spills will be promptly removed and acceptably disposed.

Loss of soil structure, and decreased pore space, organic matter, and fertility can result from soil handling by heavy equipment. Although soil structure is not particularly strong in the project area soils, most of the profiles examined exhibited fairly high organic matter content and favorable soil textures in the A horizon.

Soils in the project area may be compacted and rutted by heavy equipment during construction and operation. Compaction can make germination and growth difficult because it creates resistance to root penetration. Moisture and air supply to plant roots can also be restricted in highly compacted soils. Because of the presence of some volcanic ash in the surface soil and the physical nature of the ash particles, compaction problems can be more severe. Construction activities will occur during the summer dry season to minimize the adverse effects of compaction. Suitable topsoil will then be salvaged and placed in protected stockpiles. Stockpiles will be seeded and mulched to establish a protective cover and to minimize erosion.

The average redistribution depth of cover soil will be approximately 19 inches. Topsoil will be respread with an earthmover to reduce compaction where physically possible. The cover soil will be redistributed directly over the waste rock and neutralized spent ore. Prior to soil redistribution or revegetation, compacted areas (especially roads, soil storage areas, and the facilities area) will be ripped to reduce compaction. This will also eliminate potential slippage at layer contacts and promote root penetration. Soil materials will be applied in lifts as thick as possible to decrease compaction. Select organic debris (stumps, root wads, brush, etc.) that has been previously salvaged will be distributed on areas of respread soil. This will create microsites (thereby enhancing seedling success) and reduce soil movement by creating a rough seedbed surface.

Most disturbed lands are susceptible to erosive forces unless reclamation management is well planned and implemented. Soils with high percentages of silt and very fine sand particles are most susceptible to water erosion. Although soils in the project area are generally coarse-textured, they contain moderate amounts of silt and very fine sand which are conducive to erosion. The extent and severity of soil loss from wind and water erosion will depend largely on reclamation success, reclamation techniques employed, and the amount of time it takes to reestablish a permanent, stable vegetative cover. Some erosion can be expected to occur in areas of steep slopes, heavy precipitation, and high winds, regardless of soil characteristics and the specific reclamation measures utilized. Erosion potential will increase from slight (less than 0.1 tons of soils per acre per year) prior to project construction to severe (up to 20 tons per acre per year) during construction until erosion control measures such as straw mulch or erosion fabric is applied or vegetation reestablished. For a short period of time, barren substrate material will remain exposed until facilities are constructed. In recognition of this impact potential, comprehensive erosion and sedimentation control measures will be implemented by IGC (Appendix K, Plan of Operations) and sediment control structures will be in place before construction begins.

Loss of macronutrients from stockpiled soils can occur over a period of time and adversely affect revegetation success in the reclamation phase. However, because soils will only be stockpiled for a few years at the Buffalo Gulch mine project, significant loss of nutrients is not expected.

The sandy subsoil that is exposed and not removed during mine operation will be highly erodible. The topsoil respread during reclamation will have a high volcanic ash content. The angularity of the ash shards will reduce the erodibility of this material unless it is subjected to flowing water of sufficient volume to float away these light particles.

At the end of mining operations, disturbed areas will be recontoured, overspread with stockpiled topsoil and revegetated. Prior to topsoil redistribution, mechanical ripping or other similar physical soil treatments can be implemented if necessary to loosen the soil and provide a better environment for root growth and development. Care will be taken during grading and topsoil application to avoid unncessary compaction of soil layers in the root zone. Reseeded areas will be protected from grazing and monitored to ensure successful vegetation establishment. Effective erosion control measures (see Appendix K, Plan of Operations) will be implemented to control and prevent significant erosion-related impacts.

4.9.2 Land Application Disposal (LAD) Area Soils

Land application disposal (LAD) will be utilized to dispose of periodic excess water from the project activities. A suitable LAD area has been identified in the northwest portion of the project area (Figure 2.2-1). Soil suitability for LAD was determined by IGC using guidelines established by the U.S. Environmental Protection Agency (U.S. EPA, 1981) and the State of Idaho (1988). Table 4.9-1 shows laboratory data for key parameters used to verify suitability for land application.

Physical parameters examined included saturation percentage, particle size including sand, silt, clay, and coarse fragment content over 2mm, and organic carbon content. A comparison of values for saturation percentage, organic matter content, and particle size analysis between site soils and State of Idaho guidelines (Table 4.9-2) shows these soil are better than the guideline, and are suitable for use in LAD without significant impact to the soil resource of the LAD area.

Values recorded for cation exchange capacity (CEC), electrical conductivity (EC), calcium (Ca), magnesium (Mg), sodium (Na), and sodium adsorption ration (SAR) are considered favorable by State of Idaho standards. Values recorded for chloride are also favorable (Chapman 1973).

In general, the available soil macronutrients nitrate (N) and phosphorus (P) are low. Nutrient values for potassium (K), overall, are suitable. Even though overall values for N and P are low, there is an increase in P and K, as well as ammonia (an available form of N), total N, and organic N in the horizons where organic matter content is high. Moreover, disposal solutions

TABLE 4.9-1 Buffalo Gulch Mine Project - Land Application Disposal Soil Analysis

Sample Number	1	2	3	4	5	6
Location	LAD-1	LAD-1	LAD-1	LAD-1	LAD-2	LAD-2
Depth (inches)	0-4	4-10	10-20	20-34	0-4	4-10
pH	6.1	5.6	4.5	4.5	5.6	5.2
Saturation %	73.4	53.5	40.6	37.0	89.1	55.1
Cond., mmhos/cm	0.27	0.18	0.34	0.11	0.28	0.17
Calcium, meq/l	1.73	1.23	2.17	0.43	1.57	0.71
Magnesium, meq/l	0.51	0.40	0.76	0.25	0.40	0.28
Sodium, meq/l	0.11	0.03	0.39	0.11	0.08	0.16
SAR	0.10	0.03	0.32	0.19	0.08	0.23
CEC, meq/100g	35.6	40.1	25.7	19.3	70.2	43.0
Chloride, ppm	6.8	5.9	7.8	7.8	8.8	6.8
Sand, %	51	51	53	66	44	42
Silt, %	42	40	39	28	46	47
Clay, %	7	9	8	6	10	11
Texture	L	L	SL	SL	L	L
Coarse Fragments, %	<2	<2	<2	<2	<2	<2
Organic Carbon, %	3.2	1.4	0.9	0.3	6.2	1.5
Nitrate as N, ppm	<1	<1	<1	<1	<1	<1
Potassium, ppm	338	305	139	271	404	252
Phosphorus, ppm	8.3	2.4	1.7	2.9	1.8	1.3
Ammonia, ppm	19.9	11.0	8.1	7.5	24.9	11.9
Total Nitrogen, ppm	1800	700	400	200	200	100
Organic Nitrogen, ppm	1780	689	392	193	175	88
Total Cyanide, ppm	0.2	0.1	<0.1	<0.1	0.4	0.1
WAD Cyanide, ppm	0.2	<0.1			0.2	<0.1

E.P. Toxicity Analysis

Extraction and analysis performed according to SW-846. Test Methods for Evaluating Solid Waste.

Constituent	Sample Extract mg/l					
Arsenic	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Barium	<10	<10	<10	<10	<10	<10
Cadmium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Lead	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Mercury	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Silver	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Copper	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Iron	0.1	<0.1	<0.1	0.1	0.3	<0.1
Manganese	2.5	0.9	0.4	0.1	1.8	1.0
Nickel	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Zinc	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

TABLE 4.9-1 Continued

Sample Number	7	8	9	10	11	12
Location	LAD-2	LAD-2	LAD-3	LAD-3	LAD-3	LAD-3
Depth (inches)	10-20	20-54	0-4	4-10	10-20	20-54
pH	5.0	4.2	5.2	5.2	5.1	4.6
Saturation %	31.1	43.6	78.0	62.5	40.1	42.2
Cond., mmhos/cm	0.17	0.14	0.22	0.11	0.14	0.12
Calcium, meq/1	0.78	0.42	1.15	0.67	0.51	0.36
Magnesium, meq/1	0.35	0.26	0.33	0.13	0.29	0.36
Sodium, meq/1	0.07	0.18	0.09	0.07	0.03	0.22
SAR	0.09	0.31	0.10	0.11	0.05	0.37
CEC, meq/100g	21.8	24.0	59.2	43.5	17.8	14.1
Chloride, ppm	11.8	7.0	5.9	14.7	11.8	7.8
Sand, %	46	59	49	43	58	61
Silt, %	46	32	43	46	36	34
Clay, %	8	9	8	11	6	5
Texture	L	SL	L	L	SL	SL
Coarse Fragments, %	<2	<2	<2	<2	<2	<2
Organic Carbon, %	0.7	0.3	2.6	1.4	0.4	0.2
Nitrate as N, ppm	<1	<1	<1	<1	<1	<1
Potassium, ppm	111	72	399	209	92	101
Phosphorus, ppm	1.2	4.3	1.7	1.6	1.9	8.9
Ammonia, ppm	7.8	10.8	18.2	9.7	6.7	6.7
Total Nitrogen, ppm	200	100	17000	10000	200	100
Organic Nitrogen, ppm	192	89	16982	9990	193	93
Total Cyanide, ppm	<0.1	<0.1	0.2	0.2	<0.1	<0.1
WAD Cyanide, ppm			0.1	0.1		

E.P. Toxicity Analysis

Extraction and analysis performed according to SW-846, <u>Test Methods for Evaluating Solid Waste</u>.

Constituent	Sample Extract mg/l					
Arsenic	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Barium	<10	<10	<10	<10	<10	<10
Cadmium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Lead	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Mercury	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Silver	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Copper	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Iron	0.1	<0.1	<0.1	0.1	<0.1	<0.1
Manganese	0.3	<0.1	2.2	1.2	0.2	<0.1
Nickel	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Zinc	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

TABLE 4.9-1 Continued

Sample Number	13	14	15	16
Location	LAD-4	LAD-4	LAD-4	LAD-4
Depth (inches)	0-4	4-10	10-20	20-60
pH	4.7	4.3	4.2	4.0
Saturation %	78.7	45.2	44.1	43.8
Cond., mmhos/cm	0.52	0.14	0.16	0.17
Calcium, meq/1	3.12	0.36	0.40	0.36
Magnesium, meq/1	1.01	0.31	0.35	0.49
Sodium, meq/1	0.42	0.17	0.28	0.24
SAR	0.29	0.29	0.46	0.37
CEC, meq/100g	68.8	31.4	22.4	22.2
Chloride, ppm	7.8	6.8	7.8	7.8
Sand, %	42	39	50	56
Silt, %	45	49	41	37
Clay, %	13	12	9	7
Texture	L	L	L	SL
Coarse Fragments, %	<2	<2	<2	<2
Organic Carbon, %	6.5	1.0	1.6	0.3
Nitrate as N, ppm	<1	<1	<1	<1
Potassium, ppm	345	222	140	74
Phosphorus, ppm	1.9	1.5	1.5	9.9
Ammonia, ppm	31.4	12.4	9.7	7.9
Total Nitrogen, ppm	2300	800	400	200
Organic Nitrogen, ppm	2269	788	390	192
Total Cyanide, ppm	0.3	0.1	<0.1	<0.1
WAD Cyanide, ppm	0.1	<0.1		

E.P. Toxicity Analysis

Extraction and analysis performed according to SW-846, <u>Test Methods for Evaluating Solid Waste</u>.

Constituent	Sample Extract mg/1			
Arsenic	<0.5	<0.5	<0.5	<0.5
Barium	<10	<10	<10	<10
Cadmium	<0.1	<0.1	<0.1	<0.1
Chromium	<0.5	<0.5	<0.5	<0.5
Lead	<0.5	<0.5	<0.5	<0.5
Mercury	<0.02	<0.02	<0.02	<0.02
Selenium	<0.1	<0.1	<0.1	<0.1
Silver	<0.5	<0.5	<0.5	<0.5
Copper	<0.1	<0.1	<0.1	<0.1
Iron	0.4	0.2	0.1	<0.1
Manganese	2.8	0.7	0.4	<0.1
Nickel	<0.3	<0.3	<0.3	<0.3
Zinc	<0.1	<0.1	<0.1	<0.1

TABLE 4.9-2 Site Limitations Rating Criteria for Land-Applied Wastewater

		Very Severe	Severe	Moderate	Slight
1.	Organic Matter (0-10" depth)	<.5%	.5-1%	1-3%	>3%
2.	Soil Texture Surface	Clays >50% Extremely Gravelly Textures Stony Soils Very & Extremely Cobbly	Clays Silty Clays Cobbly Soils Very Gravelly Textures	Silty Clay Loams Clay Loams Gravelly Textures Sandy Clay Loam Sands	Sandy Loams Silt Loams Loams Sandy Loams
3.	Permeability (Slowest layer within 5' depth)	>20" per/hr <0.06" per/hr	10-20" per/hr 0.06-0.2" per/hr	6-10" per/hr 0.2 - 0.6" per/hr	0.6-6" per/hr
4.	Surface Structure 0-10" depth cultivated 0-3" depth native		Cloddy Massive Platy	Weak Granular Weak Blocky	Mod & Strong Granular Mod & Strong Blocky
5.	Subsurface Structure 3-24" depth		Massive Platy Columnar	Weak Blocky Weak Prismatic	Mod & Strong Blocky Mod & Strong Prismatic
6.	pH 0-40" depth	<4 >9	4.0 - 4.5 8.5 - 9.0	4.5 - 5.6 7.9 - 8.5	5.6 - 7.9
7.	Cation Exchange Capacity (Surface 10")	<5 meq/100 gr	5-10 meq/100 gr	10-20 meq/100 gr	>20 meq/100 gr
8.	AWC in/60 in. (Available Water Capacity)	<1"	1-3"	3-6"	>6"
9.	Coarse Fragment (>3") (0-40" depth)	>60%	35-60%	15-35%	<15%
10.	Drainage Class	Very Poorly	Poorly Somewhat Poorly	Moderately Well Excessive	Well Somewhat Excessive

TABLE 4.9-2 Continued

		Very Severe	Severe	Moderate	Slight
11.	Water Table depth	<2'	2-3'	3-5'	>5'
12.	Limiting Layer Depth (duripan) (fragipan)	<3"	3-4'	4-5'	>5'
13.	Depth of Bedrock	<2'	2-3'	3-5'	>5'
14.	Bedrock Characteristics if >5' depth		Highly Fractured Columnar	Fractures 1-2' apart	Fractures >2' apart
15.	Soil Temperature Regime			Cryic	Frigid or warmer
16.	Soil Moisture Regime		Aquic	Aquic Intergrade	Xeric Udic Aridic
17.	Salinity 0-40" depth	Salt on Surface	>8MMHos/cm	4-8 MMHos/cm	<4MMHos/cm
18.	SAR (Sodium Adsorption Ratio)	>12	8-12	4-8	<4
19.	Flooding Potential	More than 1x per year	1-2 years	2-5 years	>5 years (none)
20.	Slopes %[1]	>12	6-12	2-6	<2
21.	Erodibility (Water) K Factor X slope	>6	4-6	2-4	<2
22.	Wind Erodibility Group (SCS)		6,7,8	1,2	3,4,4<,5
23.	Frost Free season[2] (32°F)	<60 days	60-90 days	90-120 days	>120 days
24.	Oxides Sesquioxides Carbonates		All uncoated sand grains no Ca accumulation or Fe exchange sets	Partially coated sand grains (Ca or Fe)	Sand grain coated with Fe or Carbonates, allophone layers, Ca horizons present

[1] Land that is established in forests can be acceptable in the very severe range.
[2] Summer application can be considered if classified very severe.

will supply additional nitrogen in the form of nitrate, nitrite, and ammonia to LAD soils.

Trace element concentrations in the LAD soil samples are generally below laboratory detection limits as measured using E.P. toxicity analytical methods. A few iron and manganese values are above detection limits, but are not significantly elevated to pose any danger to public health or plant establishment (Chapman 1973; Soil Conservation Society of America 1987).

Soil pH values are low enough to be considered severe by State of Idaho standards in several soil samples. Even though the pH values of these samples range from 4.0 to 4.3, they are equal to or are above 4.0 and occur at depth in 25 percent of the samples. In addition, disposal solutions are alkaline and will raise the soil pH. Overall soil pH values are favorable.

Total and weak acid dissociable (WAD) cyanide values are generally less than detection limits for the analytical methods used by Energy Laboratories Inc. Low levels of cyanide were detected in some soils because many plants release cyanide as they decay. These low levels of cyanide are believed to be byproducts of natural plant growth and decay (Ecological Analysts, Inc., 1979).

There was no indication of accumulations of oxides, sesquioxides, or carbonates in the soil or on sand grains. The LAD soil lacks the exchange sites provided by iron oxides and/or carbonates.

Infiltration rates were determined at two sites in the LAD area by double ring infiltration tests in accordance with ASTM D-3385-75. Locations of test sites are shown on Figure 3.7-5. Infiltration rates of the LAD area were 1.7 and 2.1 inches/hour for sites LAD-103 and LAD 104, respectively. These rates are suitable according to State of Idaho guidelines (Table 4.9-2).

Soil surface structure to 10 inches and subsurface structure to 16 inches are favorable for land application. Subsurface structure below 16 inches is massive, which is unfavorable, but, regardless of structure, permeabilities remain favorable.

The drainage class (well-drained), depth to water table (>60 inches), limiting layer depth (>60 inches), depth to bedrock (>60 inches), bedrock characteristics (unfractured), soil temperature regine (cryic), soil moisture regime, flooding potential (none), slopes (generally less than 6 percent), wind and water erodibility factors (<3) and frost-free season (90-120 days), are all suitable for LAD according the State of Idaho guidelines.

Except for a small fraction of unfavorable pH values, the proposed LAD site is well suited for land application disposal. At an average infiltration rate of 1.9 inches/hour, the soils will readily accept the proposed flow rate.

Cumulative mass loading rates for trace elements on the LAD site are presented and compared with State of Idaho guidelines in Table 4.3-5, Section 4.3.3 of this EA. Trace element cumulative loadings to the LAD site are several orders of magnitude below the recommended maximum applications.

4.9.3 Soil Impact Mitigation Measures

Reduction and control of impacts to soil resources will include preconstruction and operational erosion control measures and the comprehensive reclamation activities required by state and federal law. Impacts to soils will be mitigated by topsoil salvaging during site construction, the construction of appropriate erosion control features (Appendix K, Plan of Operations), a soil amendment program during reclamation to enhance soil productivity as needed, and immediate revegetation of all retopsoiled areas to minimize erosion losses. To maximize revegetation success, topsoil will be salvaged and stored separately from waste rock and redistributed with a minimum of handling.

Erosion of soil surfaces will be controlled in part by the design of the facilities and also by the contruction of appropriate erosion control features. Interim reclamation consisting of seeding and mulching will be implemented in areas no longer required for ongoing operations.

No soil impact mitigation measures in addition to those proposed as a part of the Plan of Operations are necessary.

4.10 LAND USE, VISUAL RESOURCE AND NOISE

4.10.1 Land Use

The proposed project and Plan of Operations is consistent with the provisions of the Chief Joseph Management Framework Plan (MFP) prepared by the BLM for lands including the project area.

During the life of the operations and reclamation period (approximately 7 years), the 200 acre project site will be devoted to mining and ore processing activities. The project site will be removed from the existing grazing allotments for this period of time. In addition, the merchantable timber on the project site will be harvested during project development activities, and other vegetation removed for the life of the operations. It is estimated that reestablishment of harvestable timber on the project site will require about 50 years from the completion of revegetation activities. These impacts are not considered signficant.

Public access to the project area is currently restricted by the BLM with a locked gate 0.8 miles from the junction of the Buffalo Gulch Creek road with State Route 14. Public access to the project area will continue to be restricted during the life of the mining project. Future public access to the project area following completion of the project is uncertain at this time, and will be determined by the BLM following project closure.

The long-term objective of the reclamation plan for the Buffalo Gulch Mine Project is to establish a post-operational environment that is compatible with existing land uses of the area and adjacent areas. Of particular importance is returning disturbed areas to land uses consistent with long-term direction in the current management plan of the BLM. Specific post-operational land use objectives include:

- o permanent protection for air, surface water and groundwater resources;
- o removal of potential hazards to protect public health and safety.

- o restoration of a land configuration compatible in the watershed;
- o reestablishment of an aesthetic environment allowing for visual quality and recreational opportunity;
- o reestablishment of post-operational biological potential suitable for supporting vegetation cover and wildlife habitat appropriate to the area; and
- o reestablishment of wetlands aquatic site functional values consistent with those disturbed by the operation.

No additional land use mitigation measures are considered necessary to meet these goals.

4.10.2 Visual Resources

A visual impact evaluation was conducted by Hydrometrics, Inc. and is in Appendix P of the Plan of Operations. The impact evaluation contains detailed information concerning evaluation techniques and conclusions, as well as topographic cross-sections of the mine project as viewed from several Key Observation Points (KOPS), and visual simlulations of the project as seen from these KOPs.

The visual impact evaluation concludes that the mining project will be visible from Elk City and the surrounding area during operations (day and night) and following project closure. Although the mining project is likely to attract viewer attention during the life of the operations, most visual impacts will be significantly reduced following project closure and implementation of the proposed reclamation activities which include recontouring, topsoiling, and reestablishment of a vegetation cover suitable to the surrounding area, including shrubs and trees.

Reclamation of the mine pit will significantly lessen its visual impact and soften its post-mining contrast with the adjacent landforms and vegetation. A relatively new technique known as "landshaping" may be selectively used to reclaim the pit walls and benches. Slope molding, a landshaping technique, would involve additional blasting and/or the use of heavy equipment to mold selective bench edges and the crest of the pit to create a slope of gently increasing steepness. Selective revegetation with tree and shrub species will complement the landshaping techniques. Pit wall raveling and landshaping is expected to partially fill the benches and break up the visual contrast of the post-mining pit bench contours.

The project will exceed the goals of the BLM's Visual Resource Management (VRM) Class III designation for the area during the operational life of the project, although not significantly. Implementation of the proposed reclamation plan for the facilities following completion of the six year life of the mine is expected to restore the area to compliance with the VRM Class III designation.

4.10.3 Noise

The project operations will result in a significant increase in the day and night noise levels of areas adjacent the project site. Noise will result primarily from the use of heavy mining equipment and ore/waste rock haul trucks, although some blasting noise will occur on a periodic basis. Under favorable weather conditions, noise from the mining operation will likely be heard in Elk City and surrounding areas of residence, although not at a nuisance level. Noise from the operations will be most noticeable at those residences closest the mining operation, although partially screening of the noise by existing topographic relief (ridges and valleys) and dense timber between most of these locations and the mine site will occur. The most common noticeable noise at these locations will likely result from the backup alarm horns on equipment used for mining and loading ore and waste rock. Night operations at the project site will provide the greatest potential for significant noise impacts to residents closest to the operations.

Limited opportunities are available to reduce the potential for noise impacts related to operation of the proposed mine:

- Permit operation of the project only during those hours least likely to provide a significant noise impact.

- Require heavy equipment to install external noise-reducing features (with the exception of backup horn alarms which are required by law).

4.11 TRANSPORTATION AND ENERGY

The movement of mine vehicles on public roads and increases in travel caused population growth associated with the mining project would cause minor increases in traffic and wear on county roads in the Elk City area. Mine vehicle use of public roads would be greatest during mine construction, when construction equipment and mine machinery would be transported to the mine site, and when the mine work force would be the largest. The Elk City Road Department of Idaho County would experience some increase in both road maintenance and snow clearing requirements.

Traffic between Elk City and Grangeville-Kooskia on State Route 14 would increase as a result of mine activities and additional population in Elk City. Although some delays and inconvenience would be experienced, the overall level of service would not be meaningfully reduced (Elmer Kassen, Idaho Department of Transportation, pers. comm., November 1989). State Route 14 currently experiences frequent use by logging trucks, and the transport of heavy equipment and other supply materials to the mine site would not create unusual loads for the roadway.

The proposed mining operation would annually consume approximately 750,000 gallons of diesel fuel, 30,000 gallons of gasoline, and 2,000 gallons of propane for the life of the mine (six years).

4.12 SOCIAL AND ECONOMIC ENVIRONMENT

The social and economic effects of the Buffalo Gulch Mine would be relatively short-term. Mine site development is predicted to begin in the summer of 1990. The mine closure and reclamation would be accomplished by the fall of 1997.

The following social and economic impact projections were developed prior to the most recent Buffalo Gulch Mine Project development schedule. The current proposed development schedule delays implementation of the early project phases by approximately 4 to 6 weeks. This will delay impacts discussed below by a similar period, resulting in a similar extension of some impacts (primarily cumulative) beyond the identified end dates. Although the following text is based upon the previous project schedules, the quantification of impacts remains appropriate.

The discussion of cumulative impacts (Buffalo Gulch Mine Project and Ericson Reef Mine Project) is based upon anticipated project approval timeframes for each project and may vary depending upon time required for agency approval of each project.

4.12.1 Employment

<u>Mine Employment</u>

During its six-year production period, from July 1990 until the summer of 1996, the Buffalo Gulch Mine would employ an estimated 47 persons. The peak work force at the mine site would be 73 persons from late July to early September of 1990, when final construction activities overlap with the beginning of actual mining. The mine is predicted to employ about 13 workers in reclamation and decommissioning operations in the second half of 1996 and the first half of 1997 (see Table 4.12-1).

Site clearing and mine construction activities would be completed by contractors. The contractors are expected to come from outside of the Elk City area. Their work forces are expected be composed primarily of non-local workers (Pers. Comm., Paul Schumacher, Project Supervisor, Idaho Gold Corporation, October 1989).

TABLE 4.12-1. MINE EMPLOYMENT SCHEDULE, BUFFALO GULCH MINE 1990-1997

Activity	Start Date*	End Date*	Total Employees
Site Clearing	June 15, 1990	Sept. 10, 1990	15
Construction	July 2, 1990	Sept. 17, 1990	20
Mining and Agglomeration	July 23, 1990	June 30, 1996	33
Leaching	Oct. 1, 1990	August 31, 1996	9
Staff	May 1, 1990	August 31, 1997	5
Reclamation	July 1, 1996	Sept. 30, 1997	8

* See revised project schedule, Table 2.2-8.

Source: Pat Doherty, Project Manager, Idaho Gold Corporation, 1990.

Mine and plant workers, project management staff and reclamation workers would be employees of the Idaho Gold Corporation. The available labor pool in Elk City is somewhat diminished by recent hirings by the local lumber mill (Lee Wilsey, Plant Manager, Shear Lumber Mill, pers. comm., October 1989). The mining company still feels that it would be able to hire about one-third of its work force from persons living in the Elk City area (Pers. Comm., Paul Schumacher, Project Supervisor, Idaho Gold Corporation, October 1989). Twenty-five of the 29 active job applications on file at the Idaho Gold Corporation office are from Elk City, demonstrating local interest in employment at the mine.

The 1989 unemployment rate in Idaho County was 6.5 percent, suggesting surplus labor would also be available within the county-wide work force. With advance notice, the local job service office predicts it would have little difficulty in filling a roster of 50 to 75 local people interested in employment at the mine (John Purdy, Idaho Department of Employment, pers. comm., October 1989).

Secondary Employment

The expenditures and taxes paid by the mine and its employees are projected to create about 21 jobs in private business and the public sector in Idaho County (See Table 4.12-2). The secondary employment effects would be divided between Elk City and Grangeville. Many of the new jobs are likely to be low-paying, part-time jobs. New secondary jobs are not likely to cause a notable population increase in Elk City. There currently is a shortage of retail and service jobs for Elk City residents (Pers. Comm., John Purdy, October 1989). Additional jobs would likely be filled by local residents or the spouses of the mine workers moving to the area. If new teachers are hired, these people could come from outside of the Elk City area. In Grangeville, the local labor pool should easily be able to fill any new jobs in its commercial businesses (Pers. Comm., John Purdy, October 1989).

TABLE 4.12-2. ESTIMATED AVERAGE ANNUAL EMPLOYMENT RESULTING FROM OPERATION OF THE BUFFALO GULCH MINE IDAHO COUNTY, IDAHO - 1990-1997

Year	Mine 1/ Employment	Secondary 2/ Jobs	Total Employment
1990	32	14	46
1991	47	21	68
1992	47	21	68
1993	47	21	68
1994	47	21	68
1995	47	21	68
1996	32	14	46
1997	7	3	10

1/ Pat Doherty, Project Manager, Idaho Gold Corporation, 1989.

2/ Secondary employment is estimated using an economic base model of Idaho County, Idaho.

Total Employment

During most of its operating life, the direct and secondary effects of the Buffalo Gulch mining project would be expected to support about 68 jobs in Idaho County. Based on estimates of 1989 employment and unemployment levels, the mine's operation would increase county-wide employment by about 1.1 percent and reduce the county-wide unemployment rate by about 0.4 percent.

4.12.2 Income

Mine Payroll

Earnings for mine employees would be considerably above average earnings for Idaho County residents (See Table 4.12-3). Average annual earnings, including benefits, are predicted to be $29,500 for mine, agglomeration, and reclamation workers and $30,700 for leaching workers. Average annual earnings for the management staff is expected to be $34,300. The total payroll for the life of the mine is estimated to be about $7.6 million (in 1989 dollars). During the years of full mine operation, from 1991 to 1995, annual payrolls are anticipated to be about $1.2 million (Pers. Comm., Paul Schumacher, Project Supervisor, Idaho Gold Corporation, October 1989) (see Table 4.12-3).

TABLE 4.12-3. ESTIMATED ANNUAL INCOME EFFECTS, BUFFALO GULCH MINE - 1990-1997 (in 1989 dollars)

Year	Mine 1/ Payroll	Secondary 2/ Income	Total Income
1990	$ 668,431	$ 160,423	$ 828,854
1991	1,183,832	284,120	1,467,952
1992	1,183,832	284,120	1,467,952
1993	1,183,832	284,120	1,467,952
1994	1,183,832	284,120	1,467,952
1995	1,183,832	284,120	1,467.952
1996	799,983	191,946	991,979
1997	193,430	46,431	239,841
Total:	$ 7,580.994	$1,819,440	$9,400,434

1/ Paul Schumacher, Project Supervisor, Idaho Gold Corporation 1989.

2/ Secondary income estimated using an economic base model of Idaho County, Idaho.

Secondary Income

Expenditures made by employees of the Buffalo Gulch Mine would create additional income for Idaho County residents. An economic base model was used to project the secondary effects of the expenditures of mine workers. The derivative effects of worker expenditures are projected to create an additional $1.8 million in local income. From 1991 through 1995, yearly secondary income effects are estimated to be $284,000.

The secondary income effects would be felt both in Elk City and in Grangeville. As a small and isolated community, Elk City can provide only a limited array of goods and services. Local business would experience a noticeable increase in their business volumes. However, the relatively short duration of the mine's operation should serve to discourage significant business expansions or development of major new businesses.

Mine workers and their families would likely make regular trips to Grangeville to shop at supermarkets, hardware and clothing stores. Some major purchases such as automobiles and appliances also would be made in Grangeville.

Total Income

During its operational life, the Buffalo Gulch Mine is projected to generate $9.4 million in combined direct and secondary income for Idaho County residents. From 1991 through 1995, operation of the mine would provide $1.5 million a year in income for county residents. This would increase county-wide personal income about 0.9 percent and occupational earnings by about 1.5 percent per year. Most income benefits would accrue to residents of the Elk City area. Income growth resulting from mine operation could to reduce the incidence of poverty for area residents.

Other Economic Impacts

By adding greater diversity to the economic bases of the Elk City area and Idaho County, the mining operation would make the economies less vulnerable to fluctuations in earnings and employment levels in the wood products industry.

Local shortages of housing could affect persons who visit Elk City for hunting and other recreation. Recreationists could have difficulty in finding acceptable lodging or lodging at a price they would be willing to pay. Should recreationists choose to go elsewhere, this could adversely affect local residents whose businesses or employment cater to recreational visitors.

The wages paid at the mine would be higher than wages paid by most other businesses in the Elk City area. The higher wages could allow the mine to hire workers away from existing employers. Local inflation due to competition for labor and locally available goods and services might also increase other costs for local businesses and individuals.

4.12.3 Population

Development of the Buffalo Gulch mining project would increase the population of the Elk City area. The mine's population effects would vary with levels of employment during the different phases of the project's life. Workers and their families would begin arriving in May 1990 with the commencement of mine management staffing and site clearing activities. Mine activities would increase the Elk City area population by 10 to 20 people in May and June of 1990.

The major population increase would occur in the summer of 1990. In August, an estimated 100 mine-related workers and family members would increase the Elk City area's population to about 700. From October 1990, through June 1996, the population increase would be relatively stable at 98 residents, and the Elk City area population would remain close to 700 persons. For the last year of the operation, September of 1996 through August 1997, total mine-related population would decrease to 26 persons (See Table 4.12-4).

When the Buffalo Gulch operation is closed down in late 1997, total Elk City township population could be slightly higher than the present 600 residents. Some of the people who came for mining employment may decide to stay in the area.

TABLE 4.12-4. PROJECTED POPULATION EFFECTS OF THE BUFFALO GULCH MINE
ELK CITY, IDAHO - 1990-1997

Time Frame *	Projected Population Increase	Total Elk City Population
May 1990	10	610
June 1990	20	620
July 1990	33	633
August 1990	102	702
Early Sept. 1990	92	692
Late Sept. 1990	79	679
Oct. 1990 - June 1996	98	698
July 1996 - Aug. 1996	45	645
Sept. 1996 - Aug. 1997	26	626
Sept. 1997	16	616

* See revised project schedule, Table 2.2-8.

4.12.4 Public and Private Services

Mine activities and mine-related population increases would create demand for additional public and private services in the Elk City area. The Elk City townsite is not incorporated, and many of the public services provided to local residents are provided by Idaho County or by local special improvement districts. The assessment of potential impacts on services is based on discussions with service providers. Elk City water supply, sewage treatment, fire protection, and medical services have capacity to serve additional residents. The local service providers indicated that meeting the needs of mine-related population growth would not adversely affect the quality of these services. Idaho County officials indicated the projected increase in population would not adversely affect law enforcement, refuse collection, or social services.

Telephone and electrical services to Elk City are provided by private utilities. Telephone and electrical lines feeding into Elk City have capacity to meet the needs of the predicted population increase. The mining operations would not create additional demands for electricity sufficient to warrant upgrading of the area's electrical transmission lines.

The movement of mine vehicles on public roads and increases in travel due to population growth would cause minor increases in traffic and wear on county roads in the Elk City area. Mine vehicle use of public roads would be greatest during mine construction, when construction equipment and mine machinery would be transported to the mine site, and when the mine work force would be the largest. The Elk City Road Department of Idaho County would experience some increase in both road maintenance and snow clearing requirements.

Traffic between Elk City and Grangeville-Kooskia on State Highway 14 would increase as a result of mine activities and more people living in Elk City. Although some delays and inconvenience would be experienced, the overall level of service would not be meaningfully reduced (Pers. Comm., Elmer Kassen, Idaho Department of Transportation, November 1989). Highway 14 currently experiences frequent use by logging trucks, and the transport of heavy equipment to the mine site would not create unusual loads for the roadway.

The Elk City School is currently overcrowded. Lower grades are combined and have reached maximum class size standards. Any additional students would cause the combined grades to be split into separate classrooms. (Pers. Comm., Trent Woods, District 241 School Board, October 1989). Increases in population would lead to additional enrollment at the school. It is predicted there would be 31 additional school-aged children in the fall term of 1990 due to the mining development. This increase would last through the 1995 school year. In the 1996 term, the mine-related enrollment would decrease to eight students (see Table 4.12-5).

4.12.5 Social Effects

Since it was first settled in the late 1800s, the Elk City area has experienced alternating periods of population growth and decline due to natural resource development activities. The Buffalo Gulch mining project would continue this pattern. Some persons moving to Elk City for mine-related jobs might have different social backgrounds than local residents. The arrival of nearly 100 persons would have some disordering effects on the lifestyles of Elk City residents. During the life of the mine, most new residents would be assimilated into the community.

TABLE 4.12-5. PROJECTED INCREASES IN ELK CITY SCHOOL ENROLLMENT, BUFFALO GULCH MINE, 1990-1996

School Year	Additional Students
Sept. 1990 - June 1991	31
Sept. 1991 - June 1992	31
Sept. 1992 - June 1993	31
Sept. 1993 - June 1994	31
Sept. 1994 - June 1995	31
Sept. 1995 - June 1996	8

The mining operation would directly and indirectly create jobs and improve the income of some Elk City residents. To the extent that jobs and income generated by the mine would reduce unemployment, poverty and poverty-related social problems, it would have a beneficial social impact.

Public Concerns About Quality of Life and the Environment

Informal interviews were conducted with several Elk City residents to determine public concerns about the proposed development. Most of the issues raised pertained to potential population impacts on services and mine-related impacts on the environment. Residents indicated that fluctuations in Elk City's population had occurred in the past and would likely occur again at some point in the future. Recent hirings at the local lumber mill had already led to an influx of new residents. Economic impacts of the mine were cited as desirable benefits of the mining project. Increased employment could lead to beneficial changes in the local economy.

Increasing the over-crowding problem at the Elk City School was identified as an important service delivery issue. Any increase in enrollment could create need for additional classrooms and teachers. Increased traffic was cited as another public service issue.

Several environmental issues were raised. Comments were made about the possible impacts of mine-related pollutants on surface water quality and on groundwater quality. Concerns were raised about noise resulting from mining operations.

Residents expressed an awareness that economic and environmental trade-offs would be involved in the decision to develop the mine, and that community feelings about the trade-offs were mixed.

Public comments about the proposed mine were also gathered at an informal public meeting held in Elk City in October of 1989. About 50 persons participated in the meeting. A summary of the issues raised by the public is included in Table 1.4-1 of this EA.

4.12.6 Housing

Two types of housing demand would be created by the employees of the Buffalo Gulch mining operation. There would be a demand for short-term housing units by the non-local site clearing and mine construction workers. These workers would only be in the Elk City area for a few months, and many would not be accompanied by family members. Their housing preferences would likely be motel rooms, recreational vehicle hookups, apartments and mobile homes. If the temporary workers use all the available recreational vehicle hookups, the summer tourism industry could be impaired. With a shortage in hookups, recreationists would look elsewhere for recreational opportunities, or they could park their vehicles on rural roads where utilities and sanitary services are not available.

Ten units of short-term housing would be needed for site clearance workers, beginning in June, 1990. Short-term housing unit demand would peak at 24 housing units during the summer of 1990. Demand for longer-term housing would be created by mine management and operation workers, who would be living in the area for more than one year. Most long-term workers would be accompanied by family members. Their preference for housing would be for year-round housing units such as mobile homes, conventional housing units and larger apartments. (See Table 4.12-6).

Mining activities would generate demand for three long-term housing units in May of 1990, when the initial management staff is hired. By October of 1990, mine activities would create demand for an estimated 32 units of year-round housing. All of these housing units would be needed through June of 1996.

TABLE 4.12-6. PROJECTED HOUSING DEMAND CREATED BY THE BUFFALO GULCH MINE, ELK CITY, IDAHO 1990-1997

Time Span *	Projected Short-Term Demand	Projected Long-Term Demand	Total Units
May 1990	-	3	3
June 1990	10	3	13
July 1990	24	3	27
August 1990	23	26	49
Early Sept. 1990	14	25	39
Late Sept.	-	26	26
Oct. 1990 - June 1996	-	32	32
July 1996	-	14	14
Aug. 1996 - Aug. 1997	-	8	8

* See revised project schedule, Table 2.2-8.

Eight units of long-range housing would be needed for the last year of the mining operation. Five housing units would be needed for the final month of the mining operation. New residents demand for housing would intensify the housing shortages which already exist in the Elk City area. If additional housing units are not supplied, competition for housing would drive up rental and housing resale prices. Families with lower incomes could be displaced by persons able to pay more for housing.

4.12.7 Tax Revenue

Taxes paid by the Idaho Gold Corporation and its employees would benefit the state of Idaho, Idaho County and the local school system. The state of Idaho would experience increased revenue from corporate income tax (to be paid by the Idaho Gold Corporation) and individual income tax (to be paid by mine employees and others benefiting from secondary economic effects) as a result of the Buffalo Gulch mining operation. A state Mine License Tax, which is two percent of the value of ores mined or extracted, is also collected. The state of Idaho would receive an estimated $2.7 million in total tax revenues from the mine during the life of the project (see Table 4.12-7).

TABLE 4.12-7. STATE TAX REVENUES, BUFFALO GULCH MINE - 1990-1997

Source	Amount
Corporate Income Tax	$1,226,400
Individual Income Tax	353,456
Mine License Tax	1,128,000
Total Estimated Revenue	$2,707,856

Individual and corporate tax revenue estimates were based on 1988 tax rates. Corporate profits and salaries were furnished by Idaho Gold Corporation (Pat Doherty, Project Manager, and Paul Schumacher, Project Superintendent, Idaho Gold Corporation, pers. comm., October 1989). All estimates are in 1989 dollars.

The Net Profits of Mines Tax would be the major mining tax available to Idaho County. The Net Profits Tax is expected to generate about $1.1 million in county tax revenues during the life of the mining project. Real estate and personal property taxes on mine land, improvements and equipment would also provide substantial revenue to the county. The total county revenue from the mining project would be about $1.3 million (See Table 4.12-8).

The large portion of the mine-related property taxes collected by the county would benefit the local school district. The 1989 Elk City School District tax was set at 0.005627. (Jim Beckman, Idaho County Assessor, pers. comm., October 1989). Assuming that this levy would remain constant, an estimated $746,000 in revenue would accrue to the district over the operating life of the Buffalo Gulch mine.

Mine-related tax revenue estimates were based on the best available information. Revenue generation can be variable and difficult to predict. Forecasts are subject to fluctuations in gold market conditions and mineral reserve estimates. Legal and financial considerations in corporate accounting policies could also affect total revenue forecasts.

TABLE 4.12-8. IDAHO COUNTY TAX REVENUES, BUFFALO GULCH MINE - 1990-1997

Source	Amount
Net Profits of Mine Taxes	$1,062,820
Real and Personal Property Taxes	258,800
Mineral Rights to Grantor	360
Total Revenue	$1,321,980

County property tax estimates were based on 1989 Idaho mill levies (0.0099956) (Jim Beckman 1989). Net profits and estimates of future real and personal property values were furnished by the Idaho Gold Corporation (Pat Doherty, Project Manager, Idaho Gold Corporation, memo, September 1989, and Wendy Conboy, Accountant, Idaho Gold Corporation, pers. comm., October 1989). Estimates are in 1989 dollars.

4.12.8 Effects of Mine Closure

Mining operations at the Buffalo Gulch Mine are expected to end in the summer of 1996. Reclamation is predicted to be completed in the summer of 1997. The loss of mining jobs would adversely affect the incomes of persons employed by the mine, as well as other Elk City and Idaho County residents who benefited from the secondary economic effects of the mine's operation. During full operation the mine would generate 68 jobs and $1.4 million in annual income. Most of this would occur in the Elk City area.

During its life, the mine would reduce the unemployment problem which exists in Elk City and Idaho County (Pers. Comm., John Purdy, Idaho Department of Employment, October 1989). When the mine shuts down in 1996 and 1997, employment in the county and Elk City would revert to conditions that existed prior to mine development. The transition from full operation to closure of the mine would occur in about a year. Unless residents account for the short duration of the mine's operation in their personal and business decisions, they could also experience some financial hardships. Businesses in small towns such as Elk City could be highly vulnerable to "bust" effects resulting from an abrupt decrease in local purchases of goods and services. A rapid reduction in the demand for housing could deflate rental rates and resale values of housing and businesses, affecting persons who have invested in residential and commercial property.

Most of the mine-related population would move from Elk City when the Buffalo Gulch mining operation is completed. The area's population would decrease to near the original 600 residents. Tax revenues generated by the operation would cease. The State, Idaho County, and the Elk City School District would be affected. There would be a surplus of housing in the area. An oversupply of housing would tend to soften the market and to deflate resale values and rental prices.

4.12.9 Cumulative Impacts

The Idaho Gold Corporation proposes to develop two separate mining projects in the vicinity of Elk City. The social and economic effects of the Buffalo Gulch and Ericson Reef Mining Projects would occur during 1990 and 1991.

Economy

Mine Employment

The simultaneous operation of the two mining projects would increase mining employment in the vicinity of Elk City. Peak employment would occur in August of 1990, when about 110 workers would be employed at the mining sites. The mining work force would be 74 from October through December of that year.

Total man-years worked (total months worked divided by 12) would be greatest in 1991. For most of the first half of 1991, an estimated 59 people would be employed in mining. Peak employment would occur in the year's summer months, when 78 persons are predicted to be employed (see Tables 4.12-9, and 4.12-10). Employment at the Ericson Reef Mine Project would cease in October of 1991, ending the period of coincidental employment effects.

TABLE 4.12-9. ESTIMATED PEAK EMPLOYMENT, ERICSON REEF AND BUFFALO GULCH MINING PROJECTS BY QUARTER - 1990-1992

	1st Quarter Employees	2nd Quarter Employees	3rd Quarter Employees	4th Quarter Employees	Total Man-years Worked
1990	5	20	110	74	47
1991	59	78	78	47 1/	59
1992	47	47	47	47	47

1/ Only the Buffalo Gulch Mine would be operating after September of 1991.

Source: Pat Doherty, Project Manager, Idaho Gold Corporation 1989.

TABLE 4.12-10. TOTAL JOBS BY ACTIVITY - ERICSON REEF AND BUFFALO GULCH MINES (1990, 1991 and 1992)

	Jobs
Site Clearing	30
Construction	30
Mining and Agglomeration	48
Leaching	17
Staff	9
Reclamation	12

Site clearing and construction for both projects would be completed by non-local contractors using primarily non-local workers. Simultaneous operation of the two mining projects should not limit the abilities of Elk City residents to fill at least a third of mine operation jobs. This would mean about 20 to 25 Elk City area residents would be working for the mining company in the second half of 1990. An estimated 18 to 23 Elk City residents are expected to work at the mines during 1991. It is likely persons from other areas of Idaho County would be able to fill some of the other jobs at the two mines (Pers. Comm., John Purdy, Idaho Department of Employment, October 1989) (see Table 4.12-11).

TABLE 4.12-11. TOTAL EMPLOYMENT EFFECTS - ERICSON REEF AND BUFFALO GULCH MINES - 1990, 1991 and 1992 (man years worked)

Year	Direct /1 Employment at Mine	Secondary /2 Employment	Total Employment
1990	47	18	65
1991	59	28	87
1992 /3	47	21	68

1/ Pat Doherty, Project Manager, Idaho Gold Corporation, 1989.

2/ Secondary employment estimated using an economic base model of Idaho County, Idaho.

3/ Only the Buffalo Gulch mine would be operating in 1992.

The initial mining phase at the Ericson Reef Mine would be completed at the end of 1990. In 1991, most employment at this mine would be limited to leaching, reclamation and management personnel and the cumulative impacts of the two operations would be reduced. There would be a 2-month period of renewed mining at the site during the summer of 1991.

Secondary Employment

Parallel operation of the mines would increase the secondary employment in both Elk City and Grangeville. Particularly in the summer of 1990, the existing staff of Elk City businesses would have difficulty accommodating a sudden and substantial increase in demand for goods and services. The derivative income effects of the county's economy are projected to be sufficient to support as many as 18 additional jobs in 1990, and 28 in 1991. Most secondary jobs would be filled by local residents.

Total Employment

The two mines are estimated to generate the equivalent of 65 year-round jobs in 1990, and 93 year-round jobs in 1991. In 1990, the mines would increase county-wide employment by about 1.1 percent and reduce the unemployment rate by about 0.5 percent. In 1991, county-wide employment would grow by 1.4 percent and employment would decrease by 0.07 percent.

Income

Mine Payrolls

The combined payrolls for the mining operations would be about $994,000 in 1990 and $1.53 million in 1991 (see Table 4.12-12). The Buffalo Gulch mine would account for most of employee earnings.

Secondary Income

The combined derivative income effects of the two mining projects are estimated to be $238,000 in 1990 and $366,000 in 1991 (see Table 4.12-12).

Total Income

In 1990 and 1991, the two mines would create an estimated $3.1 million in earnings for Idaho County residents (See Table 4.12-12). In 1990, the mines would increase the total personal income of county residents by an estimated 0.7 percent and occupational earnings by about 1.2 percent. In 1991, total personal earnings would increase by 1.1 percent and occupational earnings would grow by 2.0 percent.

TABLE 4.12-12. TOTAL INCOME EFFECTS - ERICSON REEF AND BUFFALO GULCH MINES 1990 and 1991 (in 1989 dollars)

Year	Mine 1/ Payroll	Secondary 2/ Income	Total Income
1990	$ 994,021	$ 238,656	$1,232,586
1991	1,529,955	365,990	1,895,945

1/ Pat Doherty, Project Manager, Idaho Gold Corporation, 1989.

2/ Secondary employment estimated using an economic base model of Idaho County, Idaho.

Other Economic Impacts

Particularly in the summer of 1990, the simultaneous development of the two mines would increase disruptive effects on business patterns in the Elk City area. Housing shortages and shortages of other goods and services would contribute to localized inflation. This would increase the operating costs for local businesses and the costs of living for local residents. Effects would be most adverse on residents with low incomes.

The operation of both mines would worsen shortages of motel and camper spaces and further discourage recreational visitors to the Elk City area. This could affect the livelihoods of persons providing services to this clientele.

Population

Simultaneous development of the two mining projects would increase the rapidity and amount of population increases occurring in the Elk City area. The population changes would begin in early July 1990, with the hiring of mine management and site clearing personnel for both projects. The joint population effects are predicted to peak in August of 1990, when the arrival of miners and their families would increase the population of the Elk City area to about 745. Population would decrease to 734 and remain at this level for most of the balance of 1990 (See Table 4.12-13).

By January of 1991, the Elk City population is forecast to decrease to 724 residents. Then in June 1991, a slight increase to 737 persons would occur. Population would decrease by ten in July and August. In September, 711 residents are estimated to live in the Elk City area.

Public and Private Services

The cumulative population effects of the two mines would create additional demands for public and private services. In most instances, the added demand would not adversely affect the availability or quality of local, county, or private services in Elk City. Most area facilities have excess capacity to accommodate the projected population growth. In most instances, service providers would not have to hire additional personnel to adequately serve the new population.

TABLE 4.12-13. PROJECTED CUMULATIVE POPULATION EFFECTS - BUFFALO GULCH AND ERICSON REEF MINING PROJECTS, ELK CITY, IDAHO 1990-1991

Date *	Projected Population Changes**	Total Elk City Population
Early July 1990	53	653
Late July 1990	122	722
Early Aug. 1990	129	729
Lat Aug. 1990	145	745
Sept. 1990	128	728
Oct. 1990 - Dec. 1990	134	734
Jan. 1991 - May 1991	124	724
Jun. 1991	137	737
Jul. 1991	127	727
Sept. 1991	111	711

* See revised schedule, Table 2.2-8.

** Above the present 600 residents.

Impacts to local roads would be increased by the mining operations. Increased road maintenance would be needed to support additional levels of personal and mine-related traffic.

Increased levels of traffic on State Highway 14 would be another impact of simultaneous mine operation and additional population growth in Elk City. Delays and inconveniences would be experienced, although the overall level of service should not decline substantially.

The most notable service impact of the mining operations would be on the Elk City School. Simultaneous mine operation is projected to add 39 students in the 1990-1991 school year.

Representatives from the Elk City school have indicated that two additional classrooms would be needed to accommodate the increased enrollment. The school currently is overcrowded. Current student per classroom ratios would exceed the state of Idaho classroom standards.

Simultaneous operation of the two mines would increase the socially disordering effects of rapid population growth in a small community. The Elk City area has considerable experience with the population increases and decreases associated with natural resource development. The increases in local job opportunities would enhance the potential for the area's unemployed and low income residents to find work and improve their incomes.

Housing

Combined operation of the mines would intensify projected housing shortages. The peak of the cumulative housing demand would be in the late summer of 1990, when 75 housing units would be needed. Approximately 41 housing units would be needed to meet short-term need. Another 34 units would be needed for long-term residents. (See Table 4.12-14).

TABLE 4.12-14. CUMULATIVE HOUSING DEMAND - BUFFALO GULCH AND ERICSON REEF MINES 1990-1991

Date *	Short-Term Demand	Long-Term Demand	Total Demand
Early July 1990	34	6	40
Late July 1990	34	28	62
Early Aug. 1990	41	29	70
Late Aug. 1990	41	34	75
Sept. 1990	24	34	58
Oct. 1990 - Dec. 1990	10	40	50
Jan. 1991 - May 1991	-	40	40
June 1991	14	40	54
July 1991 - Aug. 1991	3	40	43
Sept. 1991	3	35	38

* See revised schedule, Table 2.2-8.

The existing stock of short-term housing would be sufficient to meet the needs of the temporary workers. However, a shortage of recreational vehicle hookups could develop if most temporary workers use the hookups, instead of motel rooms and apartments. Detrimental effects of a shortage of hookups could occur if vehicles park on public lands where services are not available. The summer tourism industry also could be diminished if recreationists are displaced.

By October of 1990, nearly 40 long-term housing units would be needed. A shortage of long-term housing units could lead to higher rents and housing prices. The cumulative demand for housing would increase the probability that low income persons would be displaced by persons able to pay more for housing.

Revenue

During 1991 and 1992, the state would receive nearly $562,000, when the mines are being operated concurrently (See Table 4.12-15). Revenues would be collected through 1992 since some taxes would be paid for the previous year.

TABLE 4.12-15. ESTIMATED CUMULATIVE STATE TAX REVENUE - BUFFALO GULCH AND ERICSON REEF MINES (1990-1992)

Source	Amount
Corporate Income Tax	$ 96,000
Individual Income Tax	118,000
Mine License Tax	348,000
Total Estimated Revenue	$562,000

Idaho County would receive more than $330,000 in 1990 and 1991, as a result of the two mining operations (See Table 4.12-16). Of that total, an estimated $186,300 would accrue to the school district.

TABLE 4.12-16. ESTIMATED CUMULATIVE COUNTY TAX REVENUE - BUFFALO GULCH AND ERICSON REEF MINES (1990-1991)

Source	Amount
Net Profits of Mines Tax	$217,170
Real & Personal Property	113,525
Mineral Rights	110
Total Estimated Revenue	$330,805

The total tax revenue accruing to the state of Idaho for the full lives of both mines is estimated to be about $3.0 million. Total revenue to Idaho County is estimated to be $1.4 million, of which about $800,000 would go to the school system.

4.12.10 Mitigation

Housing

The mine-related demand for new housing in the Elk City area will create business opportunities for Elk City entrepreneurs. The Idaho Gold Corporation can assist in solving the local housing shortage by providing private housing developers with accurate information about mine development plans. The most valuable information would be details about the scheduling and number of mining jobs during the different phases of the project.

Development of additional mobile spaces would be the most practical way of solving the projected shortage of long-term housing. Elk City has sufficient land and public service delivery capacity to accommodate the needed increase in mobile homes. Mobile homes parks can be quickly and economically developed. At the conclusion of the mining, mobile homes could be moved out of the community, thus reducing the deflation effects on housing values and rents. Idaho County should work with the developers of mobile home spaces to encourage efficient land use practices. Ideally, units should be clustered to minimize the costs of public and private services.

Education

Overcrowding is an existing problem at the Elk City School. Mining-related population growth would contribute an additional increment of students and enlarge the need for additional classroom space. The Elk City School District's solution to the classroom problem should include a consideration of the impermanence of both the wood products and mining employment activities which will be responsible for most of the increases in school enrollment. The district's most serviceable approach may be the purchase or lease of additional temporary classrooms.

The district's financial resources can be expected to improve significantly as a result of new and expanded natural resource development and new residential development in its taxing jurisdiction. In the 1990s, taxes paid by the mine, the lumber mill, and residential property, and increases in the district's federal PILT revenues (Payments in Lieu of Taxes on federal lands) should greatly improve the district's financial position, even with significant increases in enrollment.

The district's immediate problem is how to finance new classroom space before it experiences an increase in tax revenues. One potential solution may be prepayment of a portion of the property taxes to be owed by the mining company and the lumber mill. The school could negotiate prepayment schedules based on the enrollment increases attributable to each activity. The mill and the mine would receive tax credits for prepayments, which could be applied to their future tax liabilities to the district.

Another option for the school district would be the use of traditional school financing mechanisms; i.e. school bonding. If the wood products and mining industry development levels sustain themselves in the 1990s, the district's tax base should be sufficient to repay the bonds without creating an onerous tax burden for residential and small business property owners.

Additional classroom space could also be achieved if ninth and tenth graders were sent to high school in Grangeville or Kooskia. Currently students have the option of attending school in Elk City or commuting, on a weekly basis, to the larger schools. Currently, all of these students attend the local school. The elimination of ninth and tenth grade education in Elk City would create inconvenience and hardship for the students and their families. Elk City eleventh and twelfth graders already commute to the schools in the larger communities.

Irrespective of how the classroom problem is resolved, the mining company can assist the school district by providing it with timely information about mine development plans. Of particular value to the district would be information on the ages of the school children of families associated with the Idaho Gold Corporation development.

Social, Public and Private Services, and the Local Economy

By hiring as many local residents as possible, Idaho Gold Corporation can reduce the extent of inmigration into the Elk City community. Present services and facilities are adequate for local residents. They would not require additional housing, add new students to the school system or require extensions or improvements to other local public and private service delivery systems. By reducing the influx of new people, local hiring would also lessen the socially disruptive effects of rapid population growth.

As with housing developers and the school system, local businessmen, public service providers and individuals would benefit from timely and accurate information about Idaho Gold Corporation's mine development plans.

4.13 RECREATION

No significant impacts to recreation would occur as a result of the Buffalo Gulch Mine Project operations, or the concurrent operation of the Ericson Reef Mine Project.

The existing recreational resources of the Elk City area would likely receive additional use by the employees of the mining project, as well as their families. The majority of this additional recreational use is expected to be dispersed, however, and should not significantly effect the amount or quality of recreational opportunities available in the area. Additional information concerning potential recreational impacts related to hunting and fishing is in Sections 4.4 and 4.5 of this EA.

As described in Social and Economic Environment, Section 3.2.9, trailer hookups in Elk City for recreational vehicles could be in short supply if mine workers rent those trailer hookups. Recreationists could possibly elect to go elsewhere, but trailer hookups are relatively inexpensive and local entrepreneurs could expand the available service.

4.14 WILDERNESS

No direct impacts to nearby wilderness or primative areas would occur as a result of the Buffalo Gulch Mine Project Operations or the concurrent operation of the Ericson Reef Mine Project.

Nearby wilderness and primative areas (11 to 18 air miles) may receive additional use by employees of the mining project(s) and their families. The amount of use resulting from these additional visitations will not significantly affect the quality of the wilderness resource.

4.15 CULTURAL RESOURCES

All cultural resource surveys conducted concluded that no known significant cultural resources will be affected by the proposed Buffalo Gulch Mine Project.

5.0 CONSULTATION AND COORDINATION

5.1 PERSONS AND AGENCIES CONSULTED

Persons and Agencies consulted in preparation of this Environmental Assessment are listed below by category.

<u>Air Quality</u>:

- Idaho Department of Health and Welfare, Division of Environmental Quality, Air Quality Bureau - Boise, Idaho

  Ms. Susan Richards
  Air Quality Bureau

  Mr. Dean C. Delorey
  Air Quality Engineer
  Planning and Permits Section
  Air Quality Bureau

  Mr. Orville Green
  Air Quality Bureau

<u>Water Resources</u>:

- Idaho Department of Health and Welfare, Division of Environmental Quality, Water Quality Bureau - Region II - Lewiston, Idaho

  Mr. Mark Von Lindern
  Environmental Supervisor - Region II

  Mr. Gregg Teasdale, P.E., Water Quality Engineer
  Region II

- Bureau of Land Management, Coeur d'Alene District Office - Coeur d'Alene, Idaho

  Mr. David Fortier
  Hydrologist

- Bureau of Land Management, Cottonwood Resource Area Office - Cottonwood, Idaho

  Mr. Craig Johnson
  Biologist

- U.S. Forest Service, Nez Perce National Forest - Grangeville, Idaho

  Mr. Nick Gerhardt
  Hydrologist

__Wildlife__:

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  Mr. Craig Johnson
  Biologist

- U.S. Forest Service, Nez Perce National Forest - Grangeville, Idaho

  Mr. Klaus Liedenfrost
  Biologist

- U.S. Forest Service, Nez Perce National Forest - Elk City Ranger District, Elk City, Idaho

  Ms. Kimberly Mitchell
  Resource Assistant

- Idaho Department of Fish and Game - Region II - Lewiston, Idaho

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  Supervisor

- Idaho Natural Heritage Program - Boise, Idaho

  Mr. George Stephens
  Data Manager

__Fisheries__:

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  Mr. Craig Johnson
  Biologist

- Idaho Department of Fish and Game - Region II - Lewiston, Idaho

  Mr. Jerry Thiessen
  Supervisor

Vegetation:

- Bureau of Land Management, Cottonwood Resource Area Office - Cottonwood, Idaho

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  Silviculturalist

  Mr. Craig Johnson
  Biologist

  Mr. Gary Wright
  Range Conservationist

- Idaho Natural Heritage Program - Boise, Idaho

  Ms. Pam Peterson
  Data Manager

- Idaho Department of State Lands - Boise, Idaho

  Mr. Scott Nichols
  Mined Land Reclamation Specialist

- U.S. Army Corps of Engineers, Field Office - Coeur d'Alene, Idaho

  Mr. Michael Doherty
  Biologist/Regulatory Specialist

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Land Use:

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- Bureau of Land Management, Cottonwood Area Resource Office - Cottonwood, Idaho

  Mr. LuVerne Grussing
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Noise:

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  Natural Resource Specialist

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  Project Manager

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- Idaho County Road Department - Elk City, Idaho

  Mr. Monty Jones
  Road Supervisor

Social and Economic Environment:

- Center for Business Research and Services, Idaho State University - Pocatello, Idaho

  Mr. Paul Zelus, Ph.D.

- Idaho Department of Revenue and Taxation - Boise, Idaho

  Ms. Kathryn Roberts
  Industrial Appraiser

  Mr. Robert Chatterton
  Corporate Auditor

  Mr. Earl Lusk
  Assistant Bureau Chief

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  Mr. Douglas Tweedy
  Labor Market Analyst

- Idaho Department of Employment - Grangeville, Idaho

  Mr. John Purdy
  Manager, Grangeville Job Service

- Idaho Department of Commerce - Boise, Idaho

  Mr. Alan Porter
  Data Specialist

- Idaho Department of Health and Welfare, Water Quality Bureau - Boise, Idaho

  Mr. Robert Braun
  Manager, Engineering and Facilities Construction

- Idaho County Road Department - Grangeville, Idaho

  Mr. Monty Jones
  Road Supervisor

- Idaho County Assessor - Grangeville, Idaho

  Mr. Jim Beckman

- Idaho County Clerk - Grangeville, Idaho

  Ms. Rose Gehrig

- Idaho County Commissioners -

  Mr. Harry Owens

  Mr. Doug Higgins

  Mr. George Ennebering

- Idaho County Sheriff's Office - Grangeville, Idaho

  Lt. Dick Ziegler

- Idaho County Health Department - Grangeville, Idaho

  Mr. Don Sokolowski
  Environmental Health Specialist

- Idaho County Welfare Director - Grangeville, Idaho

  Ms. Margie Kase

- Idaho Social Services, Grangeville Health and Welfare - Grangeville, Idaho

  Ms. Patti Pratt
  Office Coordinator

- U.S. Forest Service, Payette National Forest - McCall, Idaho

  Mr. Stephen Ryberg
  Assistant District Ranger

- Bureau of Land Management - Boise, Idaho

  Mr. Terrence Costello
  Chief, Planning and Environmental Assistance Staff

- Elk City Water and Sewer - Elk City, Idaho

  Mr. Mike Nelson

- Elk City Fire Department - Elk City, Idaho

  Mr. Trapper Bettencourt

- Elk City Emergency Medical - Elk City, Idaho

  Ms. Betty Nafziger

  Ms. Sue Phillips

  Mr. Bill Baer

- Elk City School District 214 School Board

  Mr. Trent Woods

- Elk City Baptist Church

  Reverend Leo Porter

- Elk City Ranger District

  Mr. Jim Wiebush
  Ranger

- Elk City Hotel

  Dave and Tiffy Newbigging

- Elk City Resident

  Ms. Beverly York

- Elk City Laundromat

  Ms. Linda Young

- Bennett Mill

  Mr. Lee Wilsey

- First Security Bank - Grangeville, Idaho

  Mr. Bart Tabor
  Assistant Vice President

  Mr. Jim Babb
  Manager

- Washington Water and Power - Grangeville, Idaho

  Mr. Ray Peterson
  Customer Service Specialist

- CONTEL Inc. - McCall, Idaho

  Mr. E.J. Hewlett
  OSP Manager

- U.S. Postal Service - Elk City, Idaho

  Ms. Betty Nitz

- Emmett Cleaver Motel - Elk City, Idaho

  Mr. Emmett Cleaver, Owner

- City of Lewiston - Lewiston, Idaho

  Mr. Steve Watson
  City Planner

- Idaho Gold Corporation - Elk City, Idaho

  Mr. Pat Doherty
  Project Manager

  Mr. Wilf Struck
  Ericson Reef Mine Project Superintendent

  Mr. Paul Schumacher
  Buffalo Gulch Mine Project Superintendent

  Ms. Wendy Conboy
  Payroll Clerk

<u>Cultural Resources</u>:

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  Mr. David Sisson
  Archaeologist

- Idaho Historical Society

  Mr. Thomas Green
  State Historic Preservation Officer

5.2 LIST OF PREPARERS

This EA was prepared by Hydrometric Inc., Helena, Montana, an environmental consulting firm, under the provisions of a third-party agreement between the BLM and IGC, as described in a Memorandum of Understanding (MOU) dated June 24, 1988 and included as Attachment 1 to this EA.

The following is a list of preparers of this EA.

<u>Overall EA Preparation and Content</u>:

Mr. Ralph Driear, Project Coordinator/Resource Specialist, Hydrometrics, Inc., - Helena, Montana

Experience - Coordination and management of multidisciplinary environmental baseline and impact studies for major natural resource development projects; natural resource and land use policy analyses; environmental assessment (EA) and environmental impact statement (EIS) management and preparation in compliance with the National Environmental Policy Act (NEPA); interagency coordination.

<u>Air Quality</u>:

Mr. James Gelhaus, Meteorologist Consultant - Townsend, Montana

Experience - Consultant specializing in air pollution meteorology, air quality compliance monitoring and permitting, diffusion modeling, and air quality data analysis.

<u>Water Resources</u>:

Mr. Maxwell K. Botz, President and Technical Director, Hydrometrics, Inc. - Helena, Montana

Experience - Registered Professional Engineer; surface and groundwater resource investigations and impact analyses for major mining, agricultural, and municipal projects.

Mr. Scott Mason, Geochemist, Hydrometrics Inc. - Helena, Montana

Experience - Geochemical modeling; data quality assurance; contaminant fate pathway analyses; land application disposal treatment for mining-related process waters.

Mr. Chris Martin, Hydrologist, Hydrometrics Inc. - Helena, Montana

Experience - Drainage planning; water balance modeling; sedimentology and hydrometeorology.

Wildlife and Fisheries:

Mr. Patrick Farmer, Director of Biology, WESTECH - Helena, Montana

Experience - Wildlife and fisheries baseline surveys and impact analysis for major mining projects.

Vegetation:

Ms. Loverna Wilson, Environmental Consultant - Corvallis, Oregon

Experience - Vegetation habitat analysis and plant community descriptions, vegetation mapping and aerial photointerpretation, wetland and riparian assessments and boundary determinations, endangered species surveys, impact assessment and mitigation design.

Ms. Lisa Larsen, Vegetation Specialist, WESTECH - Helena, Montana

Experience - Vegetation baseline surveys, rangeland analyses, and reclamation planning.

Mr. Dean Culwell, Director of Plant Ecology and Reclamation, WESTECH - Helena, Montana

Experience - Coordination and management of multidisciplinary baseline inventories; design, management and performance of qualitative and quantitative vegetation inventories; evaluation of forest and range resources; development of reclamation plans.

Soils:

Mr. Duane Noel, Soil Scientist, Grassland - Helena, Montana

Experience - Baseline soil surveys and impact analyses; land application disposal analyses; soil salvage and reclamation planning.

Ms. Carole Schmidt, Soil Scientist, Grassland - Helena, Montana

Experience - Baseline soil surveys and impact analyses; soil salvage and reclamation planning.

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Mr. Ralph Driear, Project Coordinator/Resource Specialist, Hydrometrics Inc. - Helena, Montana

Experience - Coordination and management of multidisciplinary environmental baseline and impact studies for major natural resource development projects; natural resource and land use policy analyses; environmental assessment (EA) and environmental impact statement (EIS) management and preparation in compliance with the National Environmental Policy Act (NEPA); interagency coordination.

Social and Economic Environment:

Mr. Dale Rosebrock, Urban and Regional Planner, Principal, Intermountain Demographics - Boise, Idaho

Experience - Population estimates and forecasts; Fiscal analyses and impact projection for major development projects; land use planning.

Mr. Jim Boyer, Socioeconomist, Environmental Consultant - Helena, Montana

Experience - Economic and social baseline and impact analyses for major natural resource development and planning projects.

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3.9 AND 4.11 TRANSPORTATION AND ENERGY

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3.10 AND 4.12 SOCIAL AND ECONOMIC ENVIRONMENT

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4.3 WATER RESOURCES AND WATER QUALITY

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4.4 AND 4.5 WILDLIFE AND FISHERIES

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Thiessen, Jerry. BLM Regional Manager. Letter to Lanny Wilson, BLM Area Manager, 29 March 1990.

ENVIRONMENTAL ASSESSMENT

IDAHO GOLD CORPORATION
BUFFALO GULCH MINE PROJECT

LIST OF ATTACHMENTS

ATTACHMENT 1:	MEMORANDUM OF UNDERSTANDING BETWEEN THE BUREAU OF LAND MANAGEMENT AND IDAHO GOLD CORPORATION CONCERNING PREPARATION OF AN ENVIRONMENTAL ASSESSMENT - BUFFALO GULCH MINE PROJECT
ATTACHMENT 2:	BUFFALO GULCH AND ERICSON REEF MINING PROJECT INTERAGENCY TASK FORCE MEMBERSHIP AND ISSUES
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ATTACHMENT 1

MEMORANDUM OF UNDERSTANDING

BUREAU OF LAND MANAGEMENT - IDAHO GOLD CORPORATION
PREPARATION OF AN ENVIRONMENTAL ASSESSMENT
BUFFALO GULCH MINE PROJECT

MEMORANDUM OF UNDERSTANDING
BETWEEN
BUREAU OF LAND MANAGEMENT
AND
IDAHO GOLD CORPORATION

I. INTRODUCTION AND PURPOSE

IDAHO GOLD CORPORATION (hereinafter referred to as "Idaho Gold"), will engage a consultant acceptable to the Bureau of Land Management (hereinafter "BLM") for the accumulation and analysis of environmental data, information and reports (hereinafter sometimes collectively referred to as "environmental data and analyses") and for the preparation of an environmental assessment (hereinafter "EA") and other related documents, reports or evaluations. The BLM retains ultimate responsibility for the preparation of the EA and for directing the consultant on all phases of the EA process. The EA is to be prepared for the BLM, as the lead agency, by the consultant under a third party agreement for Idaho Gold's proposed mining project (hereinafter referred to as "the project") located in Idaho County, Idaho near the community of Elk City. Selection of the contractor must be approved by BLM. The selected contractor must verify in writing that they have no vested interest in the decision resulting from the EA and that there would be no conflict of interest with this project.

The EA must comply with all provisions of the National Environmental Policy Act of 1969 (NEPA), the regulations for implementing the procedural provisions of NEPA (40 CFR Parts 1500-1508), Department of the Interior Departmental Manual 516 DM, and BLM Manual Section 1790 with NEPA Handbook H-1790-1 (draft August, 1987). The EA is intended to fulfill the requirements of NEPA, local, state, and other laws and regulations which may require preparation of an EA.

It is the purpose of this Memorandum of Understanding (hereinafter "MOU") to set forth the understanding between Idaho Gold and BLM regarding the responsibilities of the parties and the conditions and procedures to be followed in the development and preparation of the EA.

II. GENERAL PROVISIONS

A. The BLM shall be responsible for assuring compliance with all of the requirements of NEPA and with any and all regulations and guidelines related to NEPA promulgated by the President's Council on Environmental Quality, the Department of the Interior, and BLM. The BLM shall ensure that all environmental issues and impacts, and reasonable alternatives and their impacts are treated in the EA, and shall be responsible for the scope and content of the EA.

B. Idaho Gold shall select and retain, at its cost, an independent consultant acceptable to BLM, for the preparation of the EA. The consultant, with the approval of BLM and Idaho Gold, may employ such other consultants and experts (hereinafter collectively referred to as "subcontractors") as are required for the adequate development and preparation of the EA.

Attachment - 1

C. The principals of the Idaho Gold consultant and all subcontractors to be involved in preparing the EA will be evaluated for expertise, and must be accepted and approved by the BLM prior to their use on the EA. Approval of the consultant and subcontractors shall be based on, but not limited to, the following criteria:

1. Expertise in the areas of environmental concern (water quality, groundwater resources, biology, geology, land use, archeology, engineering, etc.);

2. Demonstrated ability to perform environmental analysis through experience and/or expertise;

3. Ability to produce thorough, readable, and informative documents; and

4. Evidence of a good working knowledge of NEPA, corresponding federal and state regulations and applicable local ordinances, and other statutory requirements.

To document their expertise and experience, the consultant shall provide BLM with a Statement of Qualifications (hereinafter "SOQ"). The SOQ shall contain a summary of the consultant's experience on similar projects; the qualifications of the proposed project team and resource specialists; and resumes of team members.

D. The consultant shall provide, through its staff or by subcontract, the expertise, labor, and technical capabilities required for the preparation of the EA. The BLM shall determine the scope of the EA and shall evaluate all information, environmental data and analyses submitted by the consultant, Idaho Gold, or others, and revise or cause additional study and analysis to be performed in accordance with the plan of study.

E. Idaho Gold shall facilitate the coordination of effort and the exchange of information related to the planning, design, and construction of the project, as they relate to the preparation of the environmental data and analyses and EA among and between Idaho Gold's staff and contractors, the consultant and its subcontractors and BLM. Idaho Gold shall make all reasonable efforts to assure the satisfactory and timely performance of the duties of the consultant as specified in this MOU. In addition, the consulting contracts between Idaho Gold and the consultant, and any subcontractors shall be consistent with the provisions of this MOU.

F. Idaho Gold and BLM shall:

1. Within 20 days of the execution of this MOU, appoint, in writing, a representative who will serve as the single point contact on all matters concerning the project and EA. Written notice to the named representative shall constitute notice to that organization.

2. Review all substantive phases of the preparation of the EA.

3. Have their respective representatives, and others deemed appropriate, attend meetings as necessary with federal, state, regional and local agencies for the purpose of providing information and/or receiving comments as the same may be necessary, desirable, or required by law, and insofar as such meetings are relevant to the development and preparation of the EA.

4. Ensure a continuing coordination of effort and exchange of data and information.

5. Attend, at their option, all meetings between the various federal, state, and local agencies and the consultant, except where BLM exercises its rights under Section III. D., hereof.

G. All costs incurred in connection with the employment of the consultant and any and all subcontractors shall be the sole responsibility of Idaho Gold.

III. PROCEDURES

A. The BLM, Idaho Gold, and the consultant shall jointly determine the scope of the EA to guide the collection of environmental, social and economic data necessary for the preparation of the EA document and supporting documents which may be required by other agencies of the U.S. Government, State of Idaho, or Idaho County.

B. The BLM reserves the right to monitor the work of the consultant and subcontractors to assure that BLM requirements under NEPA are satisfied. The consultant will formally report to BLM and Idaho Gold on the progress of the work, problems encountered, recommendations for modifications and suggested changes in personnel, methodology or schedules.

C. The consultant will, upon request, provide the BLM access to and review of all procedures and underlying data used in developing submitted sections of the EA including, but not limited to, field reports, subcontractor reports, and interviews with concerned private and public parties, whether or not such information may be contained in the working papers or the EA. The BLM will direct the release of all data to concerned governmental agencies and other interested parties.

D. To facilitate the development of environmental data and the preparation of the EA, joint meetings between BLM and the consultant will be held. However, BLM reserves the right to work directly with the consultant for purpose of assuring objectivity in preparaing reports and/or for assuring expeditious communications. However, should such action indicate the need for a change in cost to Idaho Gold, then prior to the initiation of such actions, the BLM shall inform Idaho Gold and seek approval of Idaho Gold for such additional costs. The BLM will notify Idaho Gold and the consultant of any pertinent meetings that are scheduled by the BLM. BLM further reserves the right to consult directly with other federal, state, and local officials during the preparation of the EA to assure compliance with NEPA and objectivity.

E. Idaho Gold shall require the full cooperation of the consultant and its subcontractors with respect to participating in public meetings required by BLM to foster public familiarity and participation with respect to the NEPA process.

F. With respect to all analyses, including review and final copies of the EA prepared by the consultant, Idaho Gold shall be responsible for stenographic, clerical, graphics, layout, printing and like costs.

G. In all instances involving questions as to the content or relevance of the environmental data and analyses, evaluations and wording, the BLM will make the final determination on the inclusion, deletion or modification of the same in the EA.

H. Confidentiality of information, documents and materials used in the development of the EA will be handled by the BLM in accordance with the Freedom of Information and Privacy Acts, BLM policies and legal decisions pertinent thereto. Should Idaho Gold determine that certain information or data is of a proprietary or confidential nature, they will clearly note the information or data as such.

IV. TERMINATION

A. Any party to this MOU may terminate the same upon 30 days written notice to the other party. During this period, the parties will actively attempt to resolve any disagreement.

B. In the event of a termination of this MOU and if the preparation of an EA by BLM is still required, it is agreed as follows:

1. BLM and Idaho Gold shall have access to all documentation, reports, analyses, and data developed by the consultant.

2. Idaho Gold shall assure that the consultant will submit to BLM a written report on the environmental work and analysis performed by the consultant prior to termination of the MOU.

3. BLM will assume the responsibility for preparing the EA consistent with BLM's Surface Management Regulations (43 CFR 3809), personnel availability and budget limitations.

V. MODIFICATION

This Memorandum of Understanding may be modified by the parties hereby by mutually agreed upon written amendment.

FOR IDAHO GOLD CORPORATION

Signature ______________________ Date ____________

Title President

Attachment - 1

FOR THE BUREAU OF LAND MANAGEMENT

Fritz U. Rennebaum 6-24-88

Fritz U. Rennebaum Date
District Manager, Coeur d'Alene District

ATTACHMENT 2

BUFFALO GULCH AND ERICSON REEF MINING PROJECTS
INTERAGENCY TASK FORCE MEMBERSHIPS
AND ISSUES

BUFFALO GULCH AND ERIKSON REEF CYANIDE TASK FORCE MEMBERS AND ISSUES

1. NEPA ANALYSIS

Issues

-Documents must be similar
-Besides BLM and Forest Service, what other federal agencies need to be involved
-Coordinate NEPA mailing list and distribution
-Circulate all documents to same groups

Task Force Members

Lanny Wilson BLM (962-3245)
Ted Graf BLM (962-3245)
Jim Wiebush FS (842-2245)
Joe Bednorz FS (983-1950)
Pat Doherty Id. Gold (842-
Max Botz Id. Gold 2241)

Meeting set for February 28 at 10:00 AM.

2. TRANSPORTATION AND SPILL ANALYSIS

Issues

-Review existing plan

-Dates of hauling and no hauling

-Review transportation plan for Thunder Mt. Mine on the Payette

-Transportation of all materials

-EMT and other training

-Comprise list of all agencies and cities, counties to be notified during convoys

Tom Schmidt, Coordinator 842-2245
George Dekan - Div. of Env. 799-3430
Craig Johnson- BLM 962-3245
Wilf Struck- ID Gold 842-2241
Ray Latham/Loren Kronemann Nez Perce Tribe 843-2253
Paul Blubaum 983-2212
Jerry Thieson- IDF&G 743-6502
Terry Beeler- Idaho County Sheriff Dept. 842-2484
Jim Clayton- Id. Trans. Dept. 746-1345
Local Representative Trans Dpt
State Police, Captain Moore Lewiston 743-9546
Monte Jones - Id. Cnty. Road Dept. 842-2280
Mary Ann High - EMT, 842-2245
Ollie Goldhammer - Emergency Coordinator 983-1950
George LeDuc - Hazardous Materials Coord. 983-1950
Charles Ray, Id. Cons. League

3. TIME FRAMES AND OVERALL COORDINATION

Issues	
-Documents	Lanny Wilson- BLM
-Construction	J.C. Harkson- BLM
-Key periods during year when specific operations must be handled.	Jim Wiebush- FS Marci Gerhardt- FS Greg Teasdale- D of E Scott Nichols- IDL

4. STANDARDS OF CONSTRUCTION

Issues	
-Key Periods of Construction to Notify Division of the Environment	Greg Teasdale-Coordinator Division of Environment
-Methods of Construction Performance by BLM and Forest Service	J.C.Harkson-BLM 962-3245 Marci Gerhardt-FS 842-2245
-Time Frames of Construction Performance	Jim Robbins-BLM 765-1511
-How will noncompliance and lines of authority be handled?	Linda Brandvold-FS 983-1950 Paul Schumaker-ID Go 842-2245
-Who keeps project records?	Dirk Van Zyl-Welsh Eng
-What documents will be requested by the agencies?	303-290-9111 Scott Nichols- IDL

5. BONDING

Issues	
-Chemical	Liz Mathews- Coordinator
-Rehabilitation	FS 983-1950
-Spills	Jim Robbins-BLM 765-1511 Greg Teasdale-DOE 799-3430 Scott Nichols-IDL Paul Schumacher-Id Go 842-2241

6. TIMBER HARVEST

Issues	
-Same Company	Roy Majeski- BLM Coordinator
-Standard Rates	962-3245
-Coordinated Contract	George Regas- 842-2245
-Scaled or Volume Measurement	Jim Borowicz- Bennett Lumber
-Payment Methods	Wilf Struck- Id Gold 842-2241

7. SAMPLING AND MONITORING

Issues

-Review Buffalo Gulch -Add and delete accordingly- -Water Balance -Sedimentation	Greg Teasdale- Coordinator Craig Johnson- BLM 962-3450 Nick Gerhardt- FS 983-1950 Wilf Struck- Id Go 842-2241 Ray Latham- Nez Perce Tribe Jerry Theison- IDF & G Pat Doherty- Elk City Water BD 842-2241 Marilyn Woods, Elk City Water BD 842-2275

8. VEGETATION STANDARDS

Issues

-Species of Plants -Seeding Rates and Seed Sources -Fertilization -Guidelines for reclamation approval -This includes total reclamation	Scott Nichols-Coordinator Marci Gerhardt- FS 842-2245 Ken Woodman-FS 842-2255 Dee Thomas- IDE Grangeville J.C.Harkson-BLM 962-3245 Craig Johnson-BLM 962-3245 Wilf Struck-ID Go 842-2241 Mary Ann High-FS 842-2243

9. FENCING STANDARDS

Issues

-Project Area Fence -Pregnant Pond-Ditch Fence High Wall Fence or Barricade	Mary Ann High-Coordinator FS 842-2245 Craig Johnson-BLM 962-3245 Bill London- IDF & Game Paul Schumacher- 842-2241

ATTACHMENT 3

BUFFALO GULCH AND ERICSON REEF MINE PROJECTS
INTERAGENCY TRANSPORTATION TASK FORCE REPORT

INTERAGENCY TRANSPORTATION TASK FORCE
RECOMMENDATIONS TO REDUCE RISK OF CHEMICAL OR PETROLEUM PRODUCT SPILL

IDAHO GOLD CORPORATION - BUFFALO GULCH MINE PROJECT

In addressing the need to consider recommendations to reduce the risk and potential impact significance of a transportation-related spill of chemical or petroleum products associated with Idaho Gold Corporation's Buffalo Gulch Mine Project near Elk City, Idaho, the Interagency Transportation Task Force considered the following items at a February 28, 1990 meeting in Grangeville, Idaho, and an April 19, 1990 meeting in Lewiston, Idaho. They are:

RECOMMENDATIONS FOR A SPILL CONTINGENCY PLAN:

Recommendations for supplementing Idaho Gold Corporation's Off-Site Transportation and Spill Contingency Plan (Appendix M, Plan of Operations) developed by the task force are attached as "Supplement to Appendix M".

WORST CASE SPILL DEFINITION:

The task force recommended that a worst case spill scenario should involve a single cyanide transport vehicle spilling a single ruptured "Flo-Bin" container to the South Fork of the Clearwater River.

RECOMMENDATIONS:

1. <u>Transportation Route Selection</u>:

   a. The task force recommended the primary use of the following highway route to reduce the risk and potential impact of the transportation of chemical and petroleum products associated with the proposed Buffalo Gulch Mine Project near Elk City, Idaho:

      - Use of Highway 95 (Grangeville) for shipments coming from the north.

   b. The task force recognized the potential need for use of a highway route from the south (Highway 95 - Wieser), but expressed concern for use of this route because of potential impact sensitive areas between New Meadows and Whitebird.

c. The task force recommended against the use of the following highway routes for the transportation of project-related chemical and petroleum products:

- Avoid use of Highway 12 (Orofino, or Montana-Lolo Pass) for shipments coming from the north.

- Avoid use of Highway 55 (McCall) for shipments coming from the south.

d. The task force recommended against the consideration of "second choice" acceptable alternative routes.

2. Transportation Vehicles with Escort (Pilot):

a. The task force agreed with Idaho Gold Corporation's commitment to provide an escort for transport vehicles (excluding cement, petroleum products, and ammonium nitrate) from Mount Idaho to Elk City.

b. The Idaho Department of Fish and Game, and Charles Ray, requested that the task force recommend a statewide convoy (Idaho) for all transport vehicles involving the hauling of chemicals (excluding petroleum, cement, and ammonium nitrate).

c. The representative from the Nez Perce Tribe generally supported the escort of all transport vehicles hauling chemicals (excluding petroleum, cement, and ammonium nitrate) while on the Nez Perce Reservation. Potential Nez Perce Tribal Council support of this recommendation, however, was unknown, and the recommendation was not offered to the task force for formal consideration.

3. Timing of Chemical and Petroleum Shipments:

a. The task force recommended that shipments of chemicals (excluding petroleum, cement, and Ammonium Nitrate) be limited to the periods of each year offering a low risk for impacts to adjacent water resources. It was recommended that the return transportation of empty cyanide flo-bins be exempted from transportation limitations.

b. The Idaho Department of Fish and Game recommended that the periods of lowest potential impact include:

- The period of early Spring (generally April), after the migration of juvenile Chinook Salmon has left the South Fork of the Clearwater River and before the adult Chinook Salmon arrive (generally mid to late May). Early May was recommended as the period offering the least risk because 1) the risk of spill-related impact would be restricted to only one year-class of Chinook Salmon, and 2) this period generally offers a significant dilution factor during increased spring flows to reduce the potential effect of a chemical-related spill.

- An alternative period in late September when the majority of the juvenile Chinook Salmon have left the South Fork of the Clearwater River.

b. The task force recommended that the periods of high and low risk be determined at coordination meetings between IGC and state and federal agencies prior to shipments. It was recommended that factors determining risk should include road conditions, fisheries, logging traffic, weather, water flow volume, and recreational traffic. It was recommended that IGC and the transportation company(ies) contact State Police to check on road conditions, weather conditions, and other factors affecting transport.

c. The task force recommended that IGC maintain sufficient chemical inventory on-site to continue operations without transporting hazardous chemicals during adverse conditions.

d. The task force recommended that if for any reason IGC was unable to comply with the recommended preferred period of transport during any period of the mining operation, members of the task force would be notified prior to the chemical shipment(s).

4. <u>Other</u>:

a. The task force recommended that at least one week prior to the transport of chemicals (excluding petroleum, cement, and ammonium nitrate), IGC provide written notification to D.J. Richardson ITD/POE, Jim Wiebush - Elk City District Ranger (who will notify log hauling contractors, etc.), Terry Beeler - Idaho County Deputy Sheriff. It was noted that verbal communication one week prior to shipments would be sufficient for Lanny Wilson - BLM Area Manager, and Gregg Teasdale - Idaho DEQ.

b. The task force recommended that the Nez Perce National Forest officials, upon receipt of the transportation notice from IGC, notify local timber hauling contractors of the transportation times.

c. The task force recommended that IGC consider providing temporary informational signs during the chemical transportation period (excluding petroleum, cement, and ammonium nitrate), at the beginning and ending of the transportation route on State Route 14, warning the general public and others of the transportation convoys traversing the route. All such signs, if used, must meet ITD specifications.

d. The task force recommended that all escort vehicle pilots receive training equivalent to ITD standard training for pilots. It was also recommended that IGC personnel and local emergency response personnel receive training equivalent to MSHA/OSHA standards for those chemicals to be transported.

e. The task force recommended that all cyanide transport containers (Flo-Bins) be properly secured on transport vehicles.

f. The task force recommended that the speed of transport vehicles be controlled by the pilot vehicles and be determined by road conditions.

g. The task force recommended that IGC increase the petroleum product (diesel fuel, and gasoline) on-site storage capacity (4 to 6 weeks) to reduce the frequency of transport of petroleum products during adverse weather conditions and spring road breakup.

h. The task force recommended that petroleum products be transported in DOT approved compartmentalized fuel trucks.

i. The task force noted that ITD requirements must be met for all transport vehicles (75 foot overall maximum length on State Route 14).

j. The task force recommended that all escort vehicle pilots be well familiarized with State Route 14 along the South Fork of the Clearwater River prior to duty.

k. The task force recommended that IGC provide an emergency response trailer, with personnel trained in hazardous material emergency spill response, to accompany all chemical transport vehicles (excluding cement, petroleum products, and ammonium nitrate) from Mount Idaho to Elk City.

STATE AND FEDERAL AGENCY AUTHORITY TO IMPLEMENT RECOMMENDATIONS:

Transportation and handling of all chemical and petroleum products associated with the Buffalo Gulch Mine Project by Idaho Gold Corporation will occur in compliance with all state and federal laws regulating the safe transportation of such materials on public roads and public lands.

Enforcement of the task force recommendations (beyond the explicit authority existing in state and federal law concerning the transportation of chemical and petroleum products on state and federal highways) along the South Fork of the Clearwater River by the BLM as a required portion of the Buffalo Gulch Mine Project Plan of Operations review and approval is considered to be a legal uncertainty.

In recognition of the need to reduce the potential for transportation-related chemical and petroleum spills along the South Fork of the Clearwater River, however, IGC has included compliance with the task force recommendations as a portion of the Buffalo Gulch Mine Project Plan of Operations, Appendix M - Off-Site Transportation and Spill Contingency Plan, Revised). The following discussion clarifies IGC's compliance with several of the task force recommendations:

- 1. Transportation Route Selection, a., b., and c.

Idaho Gold Corporation has agreed to request chemical and petroleum distributors to limit their deliveries to the preferred route identified by the task force to reduce the risk and potential significance of a transportation-related spill. Highway 95 through Grangeville will be IGC's preferred route for project deliveries.

- 2. Transportation Vehicle with Escort, c.

If in the future the Nez Perce Tribe should consider a recommendation that convoys include an escort vehicle for travel across reservation lands, IGC will consult with tribal officials and consider the potential need to amend the Off-Site Transportation and Spill Contingency Plan.

SUPPLEMENT TO APPENDIX M: OFF-SITE MATERIALS TRANSPORTATION AND SPILL CONTINGENCY PLAN - BUFFALO GULCH MINE PROJECT

EMERGENCY PREPAREDNESS FOR HAZARDOUS MATERIAL/OIL SPILL AND INITIATION OF THE INCIDENT COMMAND SYSTEM

This supplement defines and specifically addresses a reportable hazardous material and oil spill and the reporting process. It also defines the incident level and appropriate response.

1. **Definitions** (from Idaho Hazardous Materials - Incident Command and Response Plan, Final, January 1990)

INCIDENT:

An event that results in the release or potential release of a hazardous material to the environment. This may include either transportation or fixed location spills, leaks, or accidents involving hazardous materials.

MAJOR INCIDENT:

A natural or man-made situation that requires the Governor to declare an emergency and set the State Emergency Operations Plan in motion. The Idaho Hazardous Materials Incident Command and Response Support Plan is as appendix to that plan, but may be activated independently.

SIGNIFICANT INCIDENT:

Any incident involving amounts or types of materials which are capable of environmental damage or are (or have the potential to be) an immediate hazard to public health and/or the environment. Significant incidents normally require implementation of the Idaho Hazardous Materials Incident Command and Response Support Plan.

MINOR INCIDENT:

An accident involving hazardous materials which may cause limited environmental damage but is not an immediate hazard to public health and/or the environment because of low toxicity or minor amounts.

INSIGNIFICANT INCIDENT:

An accident involving hazardous materials which has little or no potential to cause harm to public health or the environment because of low toxicity or minor amounts of hazardous materials.

INCIDENT COMMAND SYSTEM

The Incident Command System was designed so that agencies can work together effectively during an emergency response. The system provides a structure for controlling personnel, facilities, equipment and communications. The Incident Command System can be established and expanded depending upon the changing conditions of an incident.

INCIDENT COMMANDER:

The Incident Commander is the designated emergency response officer or official responding to an incident. This person must be fully trained and knowledgeable in the Incident Command System. Normally the Incident Commander will be the local fire chief or law enforcement officer. A local jurisdiction, based upon its local plan and resource assessment, may request that Idaho State Police assume incident command, particularly for incidents on interstate, U.S., and state numbered routes, including rights-of-way. The Incident Commander shall be in overall charge of all efforts at the scene.

2. Reporting Process

The Port of Entry will be notified to ensure that Federal Motor Carrier safety requirements are met. Port of Entry personnel will contact the Idaho State Police who will ensure that local county dispatchers are aware of the presence of the convoys of hazardous materials so they can alert county HazMat coordinators. Any hazardous material/or spill occurring outside Idaho County will be reported to the Idaho State Communications Center (1-800-632-8000). This center will contact appropriate personnel and agencies.

Pat Doherty, Idaho Gold Corporation, agreed that the hazardous material response trailer with trained HazMat personnel will accompany the convoys from Grangeville to Elk City. The Idaho Gold trained HazMat person will be the Incident Commander until relieved by a person of higher qualifications. A higher qualified person is a person trained in hazardous materials and the incident command system.

The Idaho County Sheriff's Dispatcher is the primary contact for any reportable incident in Idaho County. This person will use the Hazardous Materials Releases and Oil Spills Checklist to determine whether it is a minor or major incident. All hazardous materials/oil spill incidents will be reported to the Idaho State Communications Center (1-800-632-8000). In addition to the standard operating procedures the dispatcher follows, the following persons will be contacted:

PERSON	AGENCY	BUS. PHONE	HOME PHONE
George Regas	Elk City Ranger Dist.	842-2245	842-2395
Tom Schmidt	Elk City Ranger Dist.	842-2245	842-2425
Gregg Teasdale	Dept. of Envir. Qual.	799-3420	
Ollie Goldhammer	Nez Perce Nat. For.	983-1950	983-2445

ATTACHMENT 4

BUREAU OF LAND MANAGEMENT - U.S. FISH AND WILDLIFE SERVICE CONSULTATION
THREATENED AND ENDANGERED SPECIES

BIOLOGICAL ASSESSMENTS FOR MAJOR CONSTRUCTION ACTIVITIES

FINDING OF NO ADVERSE IMPACTS

United States Department of the Interior

FISH AND WILDLIFE SERVICE
BOISE FIELD OFFICE
4696 Overland Road, Room 576
Boise, Idaho 83705

AM for ARC ✓ AT AC ADP / LND MNT MIN RA1 RA2 REC WLD Cog SUF SIL CRU FMO SAD File

February 7, 1990

TO: Area Manager, Cottonwood Resource Area Office, Bureau of Land Management, Cottonwood

FROM: Field Supervisor, Fish and Wildlife Service, Boise

SUBJECT: Idaho Gold Corporation - Buffalo Gulch Mine (FWS 1-4-90-SP-100) (ES File: 1019.3093) (SE File: 6003.0220)

As requested by your letter dated January 22, and received by this office on January 24, we have attached a list (Attachment A) of endangered and threatened, proposed, and/or candidate species that may be present in the proposed project area in Idaho County, Idaho. The list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under Section 7(c) of the Endangered Species Act of 1973, as amended (the Act). The requirements for Federal agency compliance under the Act are outlined in Attachment B. Please reference the species list number on Attachment A in all subsequent correspondence, reports, environmental assessments, environmental impact statements, biological assessments (evaluations), Coordination Act reports, etc. If a construction project is not commenced within 180 days of this response, a subsequent species list request is required by regulations. This letter updates the Service's species list response of April 17, 1987 (#1-4-87-SP-118).

If a listed species appears on Attachment A, a biological assessment (evaluation) is required. Should your biological assessment (evaluation) determine that a listed species is likely to be affected (adversely) by the project, the Bureau of Land Management should request formal Section 7 consultation through this office. If a proposed species is likely to be jeopardized by a Federal action, regulations require a conference between the Federal agency and the Service.

Candidate species that may appear on Attachment A have no protection under the Act, but are included for early planning consideration. Proposed species could be formally listed and candidate species could be formally proposed and listed during project planning, thereby falling within the scope of Section 7 of the Endangered Species Act. Therefore, if they appear on Attachment A, we recommend that additional surveys be made for proposed and/or candidate species that are likely to be in your project area. If the project is likely to impact candidate species, informal consultation with this office is recommended.

RECEIVED
FEB 12 1990

Attachment - 4

The Service is concerned that toxic cyanide ponds and tailings impoundments associated with heap leach mining operations may be toxic to wildlife, especially migratory birds. Compliance with state permits may not be adequate to ensure protection of migratory birds and compliance with provisions of Federal statutes to protect wildlife. Open water sources attract migratory waterfowl and other avian species. High mortality rates of birds have been documented due to toxic ponds at heap leach operations. Under the Federal Migratory Bird Treaty Act, 16 U.S.C. 701-718h, it is unlawful to kill migratory birds, and no permits are issued to take migratory birds using toxic wastewater ponds. The Federal list of migratory birds (50CFR10, April 15, 1985) includes nearly every bird species found in the State of Idaho.

The Service is aware of two approaches that are available to prevent migratory bird mortality: (1) physical isolation of toxic water bodies through barriers such as netting, and (2) chemical detoxification. The netting of open ponds may be facilitated by reducing the surface area of ponds, thereby minimizing the extent of open toxic water. The applicant may contact the U.S. Fish and Wildlife Service at the address above.

If you have any questions regarding Federal consultation responsibilities under the Act, please contact Jeri Williams of this office at FTS 554-1931 or 208-334-1931.

Thank you for your continued interest in the Endangered Species Program.

Charles H. Lobdell

Attachments

cc: IDFG, Hdqtrs., Boise
IDFG, Region 2, Lewiston
IDHW, Boise
IDHW, Lewiston

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, AND CANDIDATE SPECIES, THAT MAY OCCUR WITHIN THE AREA OF THE BUFFALO GULCH MINE IN IDAHO COUNTY, IDAHO
FWS-1-4-90-SP-100

<u>LISTED SPECIES</u>	<u>COMMENTS</u>
Gray Wolf (<u>Canis lupus</u>)	

<u>PROPOSED SPECIES</u>

None

<u>CANDIDATE SPECIES</u>

Wolverine (<u>Gulo gulo luscus</u>)

FEDERAL AGENCIES' RESPONSIBILITY UNDER SECTIONS 7(a) and (c) OF THE ENDANGERED SPECIES ACT

SECTION 7(a) - Consultation/Conference

Requires: 1) Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species;

2) Consultation with FWS when a Federal action may affect a listed endangered or threatened species to insure that any action authorized, funded or carried out by a Federal agency is not likely to jeopardize the continued existence of listed species; or result in destruction or adverse modification of critical habitat; and

3) Conference with FWS when a Federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed critical habitat.

SECTION 7(c) - Biological Assessment for Major Construction Activities [1/]

Requires Federal agencies or their designees to prepare Biological Assessment (BA) for major construction activities. The BA analyzes the effects of the action on listed and proposed species. The process begins with a Federal agency in requesting from FWS a list of proposed and listed threatened and endangered species (list attached). The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the species list, the accuracy of the list species should be informally verified with our Service. No irreversible commitment of resources is to be made during the BA process which would foreclose reasonable and prudent alternatives to protect endangered species. Planning, design, and administrative actions may be taken; however, no construction may begin.

We recommend the following for inclusion in the BA; an onsite inspection of the area to be affected by the proposal which may include a detailed survey of the area to determine if the species are present; a review of literature and scientific data to determine species' distribution, habitat needs, and other biological requirements; interviews with experts, including those within FWS, State conservation departments, universities and others who may have data not yet published in scientific literature; an analysis of the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; an analysis of alternative actions considered. The BA should document the results, including a discussion of study methods used, any problems encountered, and other relevant information. The BA should conclude whether or not a listed or proposed species will be affected. Upon completion, the BA should be forwarded to our office.

1/ A major construction activity is a construction project (or other undertaking having similar physical impacts) which is a major action significantly affecting the quality of human environment as referred to in the NEPA (42 U.S.C. 4332 (2)(c).

6514,6840(580)

March 5, 1990

Mr. Charles H. Lobdell, Field Supervisor
U.S. Fish and Wildlife Service
4696 Overland Road, Room 576
Boise, ID 83705

RE: Biological Assessments: Gray Wolf (Canis Lupus)
Bald Eagle (Haliaeetus leucocephalus)
Wolverine (Gulo gulo luscus)

Buffalo Gulch Mine, Idaho County, Idaho
USFWS-1-4-90-SP-100
(Update of USFWS Response April 17, 1987, No. 1-4-87-SP-118)

Dear Mr. Lobdell:

This letter is in response to your letter of February 7, 1990, and the initiation of a biological assessment for the federally listed gray wolf. Biological assessments were also initiated for the federally listed bald eagle and the candidate species wolverine. The assessments have shown a "no effect" situation for the gray wolf, bald eagle, and the wolverine. Enclosed are copies of the assessments for your records. The proposed action that was assessed is summarized in the Ore Processing by Cyanidation Permit Application which was sent to your office. The complete plan of operation is on file at the Bureau of Land Management Cottonwood Resource Area Headquarters.

If you need additional information or have any questions, please contact Craig Johnson (962-3245) at this office.

Sincerely,

Larry D. Wilson

Larry D. Wilson
Area Manager

3 Enclosures

Johnson:mt/cms/3-5-90
CRAIG1: 6

Biological Assessment
Gray Wolf (Canis lupus)
Buffalo Gulch Mine

The U.S. Fish and Wildlife Service (USFWS) in reference to a request for a list of endangered, threatened, and candidate species which may occur in the Buffalo Gulch Mine assessment area have indicated that the listed endangered species, gray wolf (Canis lupus), should be evaluated.

The Buffalo Gulch Mine Project is located approximately three miles northwest of Elk City in Sections 17, 20, and 21, Township 29 North, Range 8 East, Idaho County, Idaho. The mine area is approximately 200 acres in size and is located on the ridge area between Buffalo Gulch Creek and Maurice Creek. The mine operating time proposed is six years (1990 through 1995) and final completion of reclamation will be two years (1996-1997). See plan of operation on file at the BLM Cottonwood Resource Area Headquarters.

Currently, the area is being mined in accordance with the plan of operation for the Buffalo Gulch Mine Test Heap Project. The general area is roaded and portions have been logged. The area primarily provides spring, summer, fall, and early winter habitat for whitetail deer, moose, and elk. Winter big game use occurs to a lesser extent and is dependent on snow depth.

It is known that the wolf may be impacted in one or more of the following three ways:

1. Impacts on the welfare of the prey base.

2. Direct loss of key habitat components.

3. Direct man-caused mortality (potential).

In response to the above listed concerns, the potential impacts are evaluated in reference to the proposed action and mitigation measures.

1. The prey base can be expected to maintain current numbers in the long term. Whitetail deer, moose, and elk are the most abundant big game species occurring the area. The proposed logging activity occurs in a winter use area. Elk and moose winter use has been documented, but such use is low in the immediate mine area. Whitetail deer, may use the area in early winter, and such use is dependent on snow depth. Mining activity will result in localized short term high disturbance (six years) and displacement. Elk are less tolerant of disturbance than whitetail deer and moose. Elk will probably use adjacent areas which have less activity.

2. No known denning or rendezvous sites occur in or adjacent to areas of planned activities. No wolf sightings have been documented for this area.

3. A heavy increase in human activity will occur in the short term (six years), and will decline to low levels after reclamation is completed. Overall, increased human use (mining) is not anticipated to result in human caused mortality to the gray wolf. Idaho Gold Corporation has a policy that mine employees will not carry firearms while on duty and working at

the Buffalo Gulch Mine. The general area is within a BLM road closure area, public use of the area is only authorized by foot or horse. The only vehicle use of the area will be by mine employees and a resident who lives in the area.

It is anticipated that the proposed action will not jeopardize or encourage the continued existence of the gray wolf. Impacts are predicted to be not significant for prey base, key habitats, and man caused mortality. Therefore a "no effect" situation is concluded.

Craig A. Johnson — Feb. 12, 1990

Craig A. Johnson
BLM Area Biologist

Date

Biological Assessment
Northern Bald Eagle (Haliaeetus leucocephalis)
Buffalo Gulch Mine

The Northern Bald Eagle (Haliaeetus leucocephalis), a federally listed endangered species is being assessed in reference to the proposed Buffalo Gulch Mine project.

The Buffalo Gulch Mine Project is located approximately three miles northwest of Elk City in Sections 17, 20, and 21, Township 29 North, Range 8 East, Idaho County, Idaho. The mine area is approximately 200 acres in size and is located on the ridge area between Buffalo Gulch Creek and Maurice Creek. The mine operating time proposed is six years (1990 through 1995) and final completion of reclamation will be two years (1996-1997). See plan of operation on file at the BLM Cottonwood Resource Area Headquarters.

No bald eagle use has been documented at the proposed Buffalo Gulch Mine Project Area. However, bald eagles are found along the South Fork of the Clearwater River during the winter. A key component of the plan of operations is the transport of chemicals, fuels, and toxic material along routes that parallel the South Fork of the Clearwater River, American River, and Buffalo Gulch Creek. It should be noted that transport of materials will be fromBoise or Spokane, consequently other areas will be involved. Buthy, this assessment will only address the localarea.

Bald eagles have been documented to use the areas adjacent to the South Fork of the Clearwater River from late fall through early winter (primarily winter). From Farrens Creek (Mount Idaho Grade) to American River, Highway 14 parallels the South Fork of the Clearwater River for approximately 37 miles. Winter bald eagle use is low; an estimated 1 to 4 bald eagles use the area. No nesting activity has been documented. No known day or night roost areas occur along the South Fork of the Clearwater River, or tributary drainages. This segment of river is not a high concentration area, but does provide fair habitat. The primary limiting factor for wintering bald eagles may be lack of food. However, bald eagle food found in the area includes carrion, waterfowl, and fish. Portions of the river often freeze over during cold winter months.

It is known that the bald eagle may be impacted in one or more of the following three ways:

1. Impacts on the welfare of the food base.

2. Direct loss of key habitat components.

3. Direct man-caused mortality.

In response to the above listed concerns, the potential impacts are evaluated in reference to the proposed action and mitigation measures.

1. A major spill along the South Fork of the Clearwater River (or other live waters) during the winter could conceivably kill fish and other aquatic life. However, the plan of operation (transportation plan and emergency spill plan) specifically addresses actions to prevent such from occurring and identifies emergency actions to take to minimize adverse impacts from

such. The transportation of chemicals, fuels, and toxic materials currently takes place along the South Fork of the Clearwater River. However, a calculated risk is always assumed with the above actions. The proposed mining operations between Buffalo Gulch Creek and Maurice Creek will not impact the food base. The project time period is six years. It should be noted that a catastrophic event such as a major spill (not predicted) could adversely affect fish and aquatic life.

2. No known important day or night roost areas occur in the area. No nesting occurs in the area. Road use by transport trucks will occur, such will result in minimal to no disturbance.

3. Increased human activity at the project area will occur (mining associated). However, no bald eagle use has been documented at the project area. No human caused mortality is anticipated.

It is anticipated that the proposed action will not jeopardize or encourage the continued existence of the bald eagle. Impacts are predicted to be not significant for food base, key habitats and man caused mortality. Therefore a "no affect" situation is concluded.

Craig A. Johnson — Feb. 12, 1990

Craig A. Johnson — Date
BLM Area Biologist

Biological Assessment
Wolverine (_Gulo gulo luscus_)
Buffalo Gulch Mine

The U.S. Fish and Wildlife Service (USFWS) in reference to a request for a list of endangered, threatened, and candidate species which may occur in the Buffalo Gulch Mine area has listed the candidate species, wolverine (_Gulo gulo luscus_).

The Buffalo Gulch Mine Project is located approximately three miles northwest of Elk City in Sections 17, 20, and 21, Township 29 North, Range 8 East, Idaho County, Idaho. The mine area is approximately 200 acres in size and is located on the ridge area between Buffalo Gulch Creek and Maurice Creek. The mine operating time proposed is six years (1990 through 1995) and final completion of reclamation will be two years (1996-1997). See plan of operation on file at the BLM Cottonwood Resource Area Headquarters.

Currently, the area is being mined in accordance with the plan of operation for the Buffalo Gulch Mine Test Heap Project. The general area is roaded and portions have been logged.

The wolverine is often found in wilderness type settings, and often feeds on anything available in the form of meat, larvae, eggs, and berries.

It is known that the wolverine may be impacted in one of three ways:

1. Impacts on the welfare of the prey and food base.

2. Direct loss of key habitat components.

3. Direct man-caused mortality (potential).

In response to the above listed concerns, the potential impacts are evaluated in reference to the proposed action and mitigation measures.

1. The prey and food base can be expected to maintain current numbers and amounts in the long term. The wolverine is adaptable at utilizing a large variety of food items. The wolverine will travel many miles in search of food.

2. The wolverine is territorial and prefers wilderness settings, or areas that have low human disturbances. The project area has been disturbed by man (mining, logging, and roads), consequently in its present condition the area does not provide ideal preferred habitat for the wolverine. The proposed action will not result in the direct loss of preferred key habitat components. No wolverine sightings have been documented for this area.

3. A heavy increase in human activity will occur in the short term (six years), and will decline to low levels after reclamation is completed. Overall, increased human activity (mining) is not anticipated to result in human caused mortality to the wolverine. Idaho Gold Corporation has a policy that mine employees will not carry firearms while on duty and working at the Buffalo Gulch Mine. The general area is within a BLM road

closure area, public use of the area is only authorized by foot or horse. The only vehicle use of the area will be by mine employees and a resident who lives in the area.

It is anticipated that the proposed action will not jeopardize or encourage the continued existence of the wolverine. Impacts are predicted to be not significant for food base, key habitats and man caused mortality. Therefore a "no effect" situation is concluded.

Craig A. Johnson | Feb. 12, 1990

Craig A. Johnson
BLM Area Biologist

Date

United States Department of the Interior

FISH AND WILDLIFE SERVICE

BOISE FIELD OFFICE
4696 Overland Road, Room 576
Boise, Idaho 83705

March 20, 1990

TO: Area Manager, Cottonwood Resource Area Office, Bureau of Land Management, Cottonwood

FROM: Field Supervisor, Boise Field Office, Boise

SUBJECT: Buffalo Gulch Mine (1-4-90-I-169) (6003.2135)

We are writing in regards to your biological assessment of the Buffalo Gulch Mine project.

We concur with your no adverse impacts to bald eagles and gray wolf, as a direct result of this project.

Charles H. Lobdell

cc: IDFG, Hdqtrs, Boise
IDFG, Region 1, Coeur d'Alene

MAR 26 1987

AM MNT SUF
AT MIN SIL
RA1 CRU
RA2 FMO
REC SAD
File

ATTACHMENT 5

BUFFALO GULCH MINE PROJECT- IDAHO DEPARTMENT OF HEALTH AND WELFARE
AIR QUALITY PERMIT TO CONSTRUCT

State of Idaho
DEPARTMENT OF HEALTH AND WELFARE
Division of Environmental Quality

450 W. State Street
Boise, Idaho 83720

CECIL D. ANDRUS
Governor
RICHARD P. DONOVAN
Director

APR 2 ELK CITY

April 3, 1990

CERTIFIED MAIL# P 037 427 286

Pat Doherty, Project Manager
Idaho Gold Corporation
P.O. Box 136
Elk City, Idaho 83525

RE: Idaho Gold Corporation-Buffalo Gulch (Elk City) 89091 (Open Pit Gold Mine and Heap Leach Facility)

Dear Mr. Doherty:

On January 29, 1990, the Bureau determined that your application to construct/install an open pit gold mine and heap leach facility near Elk City, Idaho was complete. Based on that application, we now find that the proposed project meets the provisions of IDAPA 16.01.1012 of the Rules and Regulations for the Control of Air Pollution in Idaho. Therefore, I am pleased to enclose your Permit to Construct.

Please pay particular attention to the reporting requirements contained on Page 8, Paragraph F, of the General Provisions section of the permit. This information is needed by the Department to properly track the progress of the project.

Please also note that this permit is for air emission only and does not replace, supplant or negate any requirements to obtain other state, local, or federal permits. If you have any questions regarding the terms or conditions of the enclosed permit, please contact Orville D. Green, Manager, Planning and Permits Section, Air Quality Bureau at (208) 334-5898.

Sincerely,

Joe Nagel
Administrator
Division of Environmental Quality

JN/SJR:lh
Enclosure
cc: T. Harmon/T. Christianson, CDA
D. Farrell, EPA-IOO
Engineering Source File
CDS/Source file
File Manual
COF 1.1

STATE OF IDAHO PERMIT TO CONSTRUCT AN AIR POLLUTION EMITTING SOURCE	PERMIT NUMBER 0740-0016 AQCR 063 · CLASS A2 · SIC 1041 ZONE 11 · UTM COORDINATE (km) 617.5, 5085.5

1. PERMITTEE
Idaho Gold Corporation - Buffalo Gulch Mine

2. PROJECT
Open Pit Gold Mine & Heap Leach Facility

3. ADDRESS	COUNTY	NO. OF FULL TIME EMPLOYEES
P.O. Box 136	Idaho	

4. CITY	STATE	ZIP CODE	PROPERTY AREA AT SITE (Acreage)
Elk City	Idaho	83525-0136	200

5. PERSON TO CONTACT	TITLE	TELEPHONE NUMBER
Mr. Pat Doherty	Project Manager	(208) 842-2241

6. EXACT PLANT LOCATION
3 miles northwest of Elk City in Sec. 17, 20, & 21, T29N, R8E

7. GENERAL NATURE OF BUSINESS AND KINDS OF PRODUCTS
Gold Mining

8. GENERAL CONDITIONS

This permit is issued according to the **Rules and Regulations for the Control of Air Pollution in Idaho,** Section 01.1012, and pertains only to emissions of air contaminants which are regulated by the State of Idaho and to the sources specifically allowed to be constructed by this permit.

This permit (a) does not affect the title of the premises upon which the equipment is to be located, (b) does not release the permittee from any liability for any loss due to damage to person or property caused by, resulting from, or arising out of the design, installation, maintenance, or operation of the proposed equipment, (c) does not release the permittee from compliance with other applicable local laws, regulations, or ordinances, (d) in no manner implies or suggests that the Department of Health and Welfare, or its officers, agents, or employees, assumes any liability, directly or indirectly, for any loss due to damage to person or property caused by, resulting from, or arising out of design, installation, maintenance, or operation of the proposed equipment.

This permit is not transferable to another person, place, piece or set of equipment. This permit will expire if construction has not begun within two years of its issue date or if construction is suspended for two years.

THIS PERMIT HAS BEEN GRANTED ON THE BASIS OF DESIGN INFORMATION PRESENTED WITH ITS APPLICATION. CHANGES OF DESIGN OR EQUIPMENT MUST BE APPROVED IN ADVANCE BY THE DEPARTMENT.

ADMINISTRATOR DIVISION OF ENVIRONMENT	Joe Nagel	DATE April 3, 1990

Attachment - 5

HWE 0070

PERMIT TO CONSTRUCT	PERMIT NUMBER
PERMITTEE, PROJECT, AND LOCATION Idaho Gold Corp. - Buffalo Gulch Mine Open Pit Gold Mine & Heap Leach Facility Elk City, Idaho	0740 - 0016
SOURCE	
Gold Mining	

1. SOURCE DESCRIPTION

1.1 Process Description. The proposed operation would include an open pit mine, a heap leach pad, solution containment ponds, an overburden dump, a carbon column gold recovery plant, gold refinery, and ancillary facilities.

Precious metal ore is extracted from an open pit mine. Dozers with rippers will be use to remove the ore and waste rock. Minimal blasting will be required to loosen the rock.

Haul trucks will transport the ore and waste rock. The ore will be agglomerated and directly deposited on the leach pad. There will be a temporary stock pile of coarse ore next to the agglomeration circuit. Crushing of the ore will not occur. Overburden and waste rock will be hauled to the overburden dump.

Metals are extracted from the ore via heap leach. The pregnant solution from the heap leach is filtered through five carbon columns.

The most gold laden carbon from the columns is placed in another column and hot, caustic, concentrated cyanide solution is trickled over it. This concentrated solution carrying gold and any contaminating metals then goes to an electrowinning cell where an electric current causes the gold to plate out onto steel wool.

In another cell reverse polarity is applied to drive the gold off the steel wool and onto a plate. Any other metals (mercury, etc.) become part of the tank sludge.

The gold foil from the second tank is collected and placed in a small (1'x8") propane fired furnace where the gold is melted and formed into ingots.

1.2 Control Description. Emissions associated with haul trucks will be controlled using water spray. Emissions from the topsoil stockpiles will be controlled by revegetation. The rock drill emissions will be controlled with

JN

ADMINISTRATOR
DIVISION OF ENVIRONMENTAL QUALITY

DATE: April 3, 1990

PERMIT TO CONSTRUCT	PERMIT NUMBER
PERMITTEE, PROJECT, AND LOCATION Idaho Gold Corp. - Buffalo Gulch Mine Open Pit Gold Mine & Heap Leach Facility Elk City, Idaho	0740 - 0016
SOURCE	
Gold Mining (continued)	

a cyclone with a 90 percent removal efficiency.

Possible mercury emissions from the refining process will be controlled by controlling the voltage in the electrowinning cells.

All other emissions associated with ore handling and the diesel generator are uncontrolled.

1.3 Equipment Listing. Equipment used in the precious metal processing is as follows:

- 1.3.1 Front-end loaders, haul trucks, dozers, motor grader, rotary blasthole drill, water truck, maintenance vehicles, supervisory vehicles;
- 1.3.2 Generator;
- 1.3.3 Heap leach system with stacking pads, drip NaCN solution system, and solution ponds;
- 1.3.4 Carbon Columns;
- 1.3.5 Electrowinning cells;
- 1.3.6 Furnace.

2. EMISSION LIMITS

2.1 Fugitive Emissions. At all times, fugitive emissions shall be reasonably controlled by the following methods, but not limited to the following methods, and as required in IDAPA 16.01.1251 and 16.01.1252 (Rules and Regulations for the Control of Air Pollution in Idaho).

2.1.1 Idaho Gold Corporation shall apply water to the Ore and Waste haul roads for dust control. The application rate shall be at least five passes per road per shift for a ten-hour shift when operating in the months of July through October, and at least three passes per ten-hour shift in the remaining months. Watering shall not be required when the temperature is below freezing or immediately following rain.

Idaho Gold shall keep a written record of the number of times per shift the Ore and Waste haul roads have been watered and this record will be made

JN ADMINISTRATOR DIVISION OF ENVIRONMENTAL QUALITY	DATE: April 3, 1990

PERMIT TO CONSTRUCT	PERMIT NUMBER
PERMITTEE, PROJECT, AND LOCATION Idaho Gold Corp. - Buffalo Gulch Mine Open Pit Gold Mine & Heap Leach Facility Elk City, Idaho	0740 - 0016
SOURCE	
Gold Mining (continued)	

available for inspection by the Idaho Department of Health & Welfare upon request. Historic records will be kept for a minimum of two years.

2.1.2 Disturbed areas shall be revegetated at the earliest possible season.

2.2 Visible Emissions From Affected Facilities. Fugitive emissions shall not exhibit greater than 10 percent opacity, in accordance with 40 CFR 60.382 (b). Opacity shall be calculated as specified in 40 CFR 60 Appendix A, Method 9, and as specified in the Department's "Evaluation of Visible Emissions Manual."

2.3 Generator Emission Limits. Emissions from the diesel generator, as estimated using the Idaho Air Quality Bureau's calculation methods, shall not exceed the pound per hour (lb/hr) and ton per year (T/y) values listed in Appendix A.

3. MONITORING

3.1 Idaho Gold Corporation shall monitor PM-10 emissions with one high-volume monitor. IAQB shall approve of the monitoring plan prior to monitor installation.

3.2 Idaho Gold Corporation shall estimate airborne cyanide emissions at the leach pads by monitoring leach solution pH. A description of the methods Idaho Gold intends to use in managing the leach system to ensure minimum hydrogen cyanide emissions to the atmosphere shall be submitted to the Department as an Operation and Maintenance Manual for Department approval.

3.3 Idaho Gold shall submit a written plan for the above monitoring requirements to IAQB no later than 60 days after the issuance of this permit. At a minimum, the monitoring plan shall include complete descriptions of the monitoring methods and their sensitivities, frequency of sampling, quality assurance procedures to be followed, and report format.

JN

ADMINISTRATOR
DIVISION OF ENVIRONMENTAL QUALITY

DATE: April 3, 1990

PERMIT TO CONSTRUCT	
PERMITTEE, PROJECT, AND LOCATION Idaho Gold Corp. - Buffalo Gulch Mine Open Pit Gold Mine & Heap Leach Facility Elk City, Idaho	PERMIT NUMBER 0740 - 0016
SOURCE	
Gold Mining (continued)	

3.4 Idaho Gold shall commence monitoring as soon as possible, but no later than 60 days after Department approval of the monitoring plan.

4. OPERATING REQUIREMENTS

4.1 Crushing of the ore shall be prohibited at all times at the facility.

4.2 Haul truck speed shall not exceed 7 miles per hour as per applicant's submittal.

4.3 Vehicle speed on the access road shall not exceed 25 miles per hour as per applicant's submittal.

4.4 The current in the electrowinning cells shall be maintained at 300-400 amps.

5. REPORTING REQUIREMENTS

5.1 No later than 60 days after issuance of this permit, Idaho Gold shall submit a draft Operation and Maintenance Manual to the Department for approval as prescribed in Section 3 of this permit.

5.2 Monitoring results shall be mailed to the Department each calendar quarter within 30 days after the end of the quarter.

JN

ADMINISTRATOR
DIVISION OF ENVIRONMENTAL QUALITY

DATE: April 3, 1990

Appendix A

Idaho Gold Corporation - Buffalo Gulch Project

Emission Limits[a] - Hourly (lb/hr) and Annual[b] (T/yr)

SOURCE DESCRIPTION	TSP		PM-10		CO		NOx		SO_2		VOC	
	Lb/hr	T/yr	Lb/hr	T/yr	Lb/h	T/yr	Lb/hr	T/yr	Lb/hr	T/yr	Lb/hr	T/yr
Diesel Generator	0.30	1.33	0.30	1.33	2.12	9.26	4.89	21.46	0.54	2.34	0.36	1.57

[a] As determined by the Department's emission estimation methods used in this permit analysis

[b] As determined by multiplying the actual or allowable (if actual is not available) pound per hour emission rate by the actual hours per year the incinerator operates.

PERMIT TO CONSTRUCT GENERAL PROVISIONS

A. All emissions authorized herein shall be consistent with the terms and conditions of this permit and the **Rules and Regulations for the Control of Air Pollution in Idaho.** The emission of any pollutant in excess of the limitations specified herein, or noncompliance with any other condition or limitation contained in this permit, shall constitute a violation of this permit and the **Rules and Regulations for the Control of Air Pollution in Idaho,** and the Environmental Protection and Health Act, Idaho Code 39-101, et.seq.

B. The permittee shall at all times (except as provided in the **Rules and Regulations for the Control of Air Pollution in Idaho**) maintain in good working order and operate as efficiently as practicable, all treatment or control facilities or systems installed or used to achieve compliance with the terms and conditions of this permit and other applicable Idaho laws for the control of air pollution.

C. The permittee shall allow the Director, and/or his authorized representative(s), upon the presentation of credentials:

1) To enter at reasonable times upon the premises where an emission source is located, or in which any records are required to be kept under the terms and conditions of this permit; and

2) At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit, to inspect any monitoring methods required in this permit, and to require stack emission testing in conformance with the Department's **Procedures Manual for Air Pollution Control** when deemed appropriate by the Director.

D. Nothing in this permit is intended to relieve or exempt the permittee from compliance with any applicable federal, state, or local law or regulation, except as specifically provided herein.

E. The permittee shall notify the Idaho Air Quality Bureau, in writing, of the required information for the following events within five working days after occurrence:

1) Initiation of Construction - Date
2) Completion/Cessation of Construction - Date
3) Actual Production Startup - Date
4) Initial Date of Achieving Maximum Production Rate - Production Rate and Date

F. If emission testing is specified, the permittee must schedule such testing within sixty (60) days after achieving the maximum production rate, but not later than one-hundred and eighty (180) days after initial startup. Such testing must **strictly** adhere to the procedures outlined in the Department's **Procedures Manual for Air Pollution Control,** and will not be conducted on weekends or state holidays. Testing procedures and specific time limitations may be modified by the Idaho Air Quality Bureau by prior negotiation if conditions warrant adjustment. The Idaho Air Quality Bureau shall be notified at least fifteen (15) working days prior to the scheduled compliance test. Any records or data generated as a result of such compliance test shall be made available to the Department upon request.

The performance tests will be performed at the **maximum** production rate. If this maximum rate is not achieved during testing, the allowable production rate will be limited to the production rate attained during testing.

G. The provisions of this permit are severable, and if any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

ATTACHMENT 6

HISTORIC FLOW RATES - SOUTH FORK CLEARWATER RIVER

MEMO

TO: RALPH DRIEAR

FROM: WILF STRUCK

DATE: MAY 31, 1990

SUBJECT: WORST CASE SPILL SCENARIO SOUTH FORK OF CLEARWATER RIVER

The following information was obtained from Mr. Nick Gerhart of the USFS, Grangeville office. Mr. Gerhart is the district forest hydrologist. The stream flow information was obtained from the USGS and is based on 3 stations in the South Fork of the Clearwater River. The station numbers and locations are as follows in Table 1:

TABLE 1: STATION LOCATION INFORMATION

Station	Location	Dates of Service
13337500	Above the confluence with the Crooked River	1946 to 1974
13338000	Between Mt. Idaho and Harpster Bridges	1913 to 1963
13338500	Stites	1966 to 1988

This information was presented in several tables and graphs for each station. The tables and graphs were labeled as follows:

TABLE 2: LIST OF TABLES AND GRAPHS

Title	Description
U.S. Geological Survey Annual Peak Flow Frequency Analysis Following WRC Guidelines BULL 17-B	Table
U.S. Geological Survey Annual Peak Flow Frequency Analysis Following WRC Guidelines	Graph
Duration Curve Statistical Characteristics For...	Table
Duration Plot of Daily Data for..	Graph

In addition to this information, a graphical Summary Hydrographs for the South Fork Clearwater River near Elk City, Idaho prepared by the U.S. Army Engineer District Walla Walla - Hydrology Branch was also utilized. To estimate and correlate of the mean daily flows for each of the three stations, information related by Mr. Gerhardt May 30th, 1990 during personal communication was used. This information is the average yearly measured flow at each station over each watershed area expressed in inches per year. The USGS Flow Summary table below presents this information.

Table 3: Summary of Information From Mr. Gerhardt

Station	Dates of Collection	Watershed Area (mi^2)	Measured Flow (inch/yr)	Calculated Flow Rate CFS
13337500	1944 to 1974	261	14.20	273
13338000	1910 to 1960	865	13.73	875
13338500	1965 to 1984	1150	13.27	1124

It should be noted that the measured flow is after losses to evaporation, ground water recharge, evapotranspiration etc. The value obtained is an average over the years of record based on USGS records.
Table 4,5,6 is a tabulation of the mean daily flow rates for the 15th of each month of record.

Station # 13337500 South Fork of the Clearwater River (Above Crooked River). Developed drainage area 261 mi^2 by the US Army Engineer District Walla Walla, November 1986. Period of record

1945 - 1974 (29 years) value as recorded on the 15th of each month.

The three values shown are the 95% exceedence, the 50% exceedence and the 5% exceedence. For any given month the % exceedence is the probability that the flow will exceed the given flow rate.
For example: In May the flow rate for 95% exceedence is 510 CFS. In other words there is a 95% chance that the flow rate will exceed 510 CFS on May 15th of any year.

TABLE 4: STATION 13337500 - MEAN DAILY FLOW RATES IN CFS
BASED ON % EXCEEDENCE

% EXCEEDENCE	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	SUM	AVE.
95%	50	40	50	190	510	210	80	30	30	30	40	50	1310	109
50%	80	80	120	680	1120	450	120	60	70	50	80	75	2985	249
5%	230	220	400	1250	2200	1120	220	90	120	200	200	350	6600	550

TABLE 5: STATION 13338000 - MEAN DAILY FLOW RATES IN CFS
BASED ON % EXCEEDENCE

% EXCEEDENCE	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	SUM	AVE.
95%	176	141	176	668	1794	739	281	106	106	106	141	176	4608	384
50%	281	281	422	2392	3940	1583	422	211	246	176	281	264	10500	875
5%	809	774	1407	4397	7739	3940	774	317	422	704	704	1231	23216	1935

NOTE: These values are calculated using the yearly average and are proportional to the flow readings at station 13337500.

TABLE 6: STATION 13338500 - MEAN DAILY FLOW RATES IN CFS
BASED ON % EXCEEDENCE

% EXCEEDENCE	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	SUM	AVE.
95%	226	181	226	859	2304	949	361	136	136	136	181	226	5919	493
50%	361	361	542	3073	5061	2033	542	271	316	226	361	339	13488	1124
5%	1039	994	1807	5648	9941	5061	994	407	542	904	904	1582	29823	2485

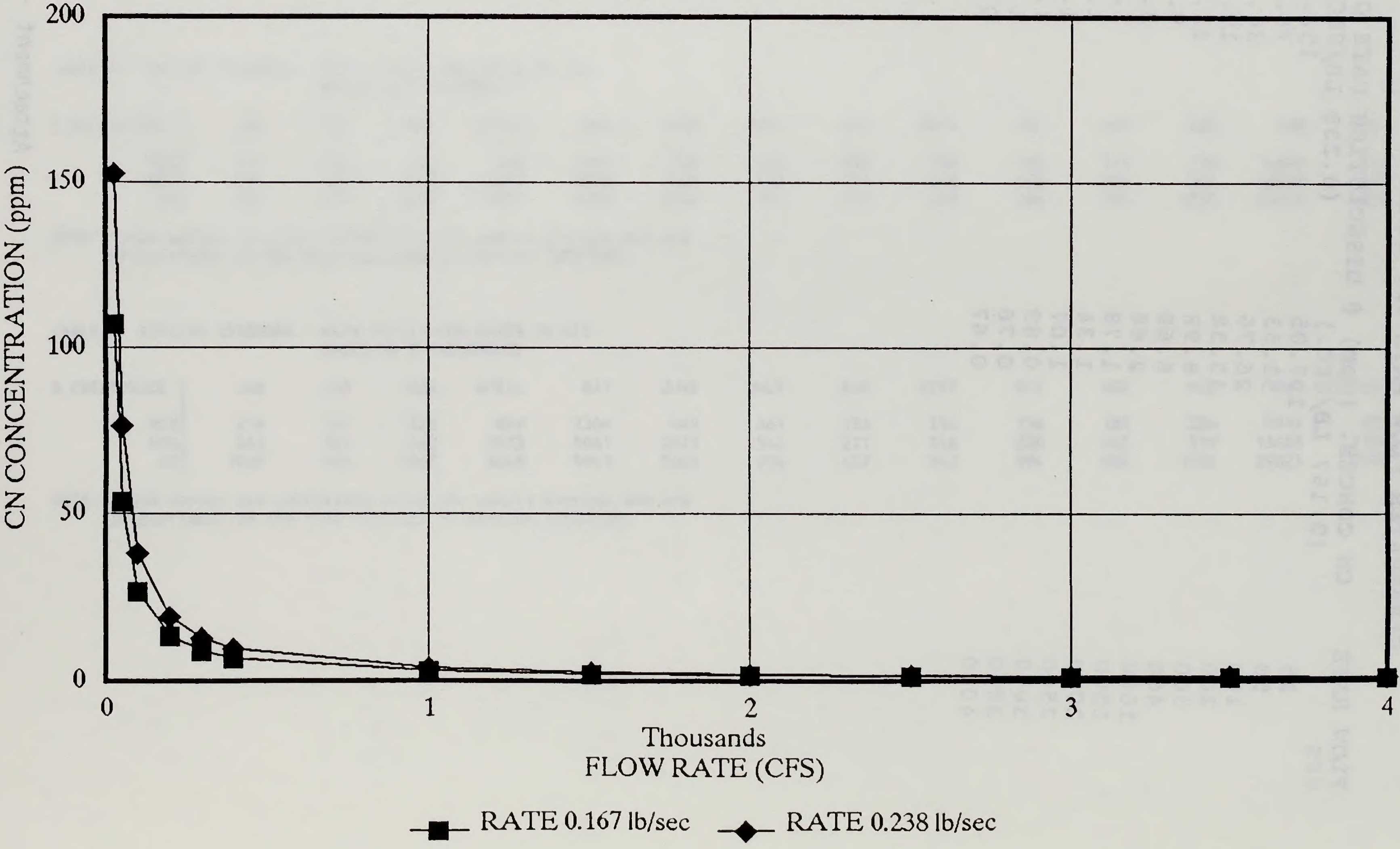
NOTE: These values are calculated using the yearly average and are proportional to the flow readings at station 13337500.

TABLE 7: WORST CASE SCENERIO FOR THE SOUTH FORK OF THE CLEARWATER FLOW RATE VS. CYANIDE CONCENTRATION

FLOW RATE CFS	CN CONCEN. (ppm) @ DISSOLUTION RATE OF: (0.167 LB/SEC.)	(0.238 LB/SEC.)
25	107.05	152.56
50	53.53	76.28
100	26.76	38.14
200	13.38	19.07
300	8.92	12.71
400	6.69	9.54
1000	2.68	3.81
1500	1.78	2.54
2000	1.34	1.91
2500	1.07	1.53
3000	0.89	1.27
3500	0.76	1.09
4000	0.67	0.95

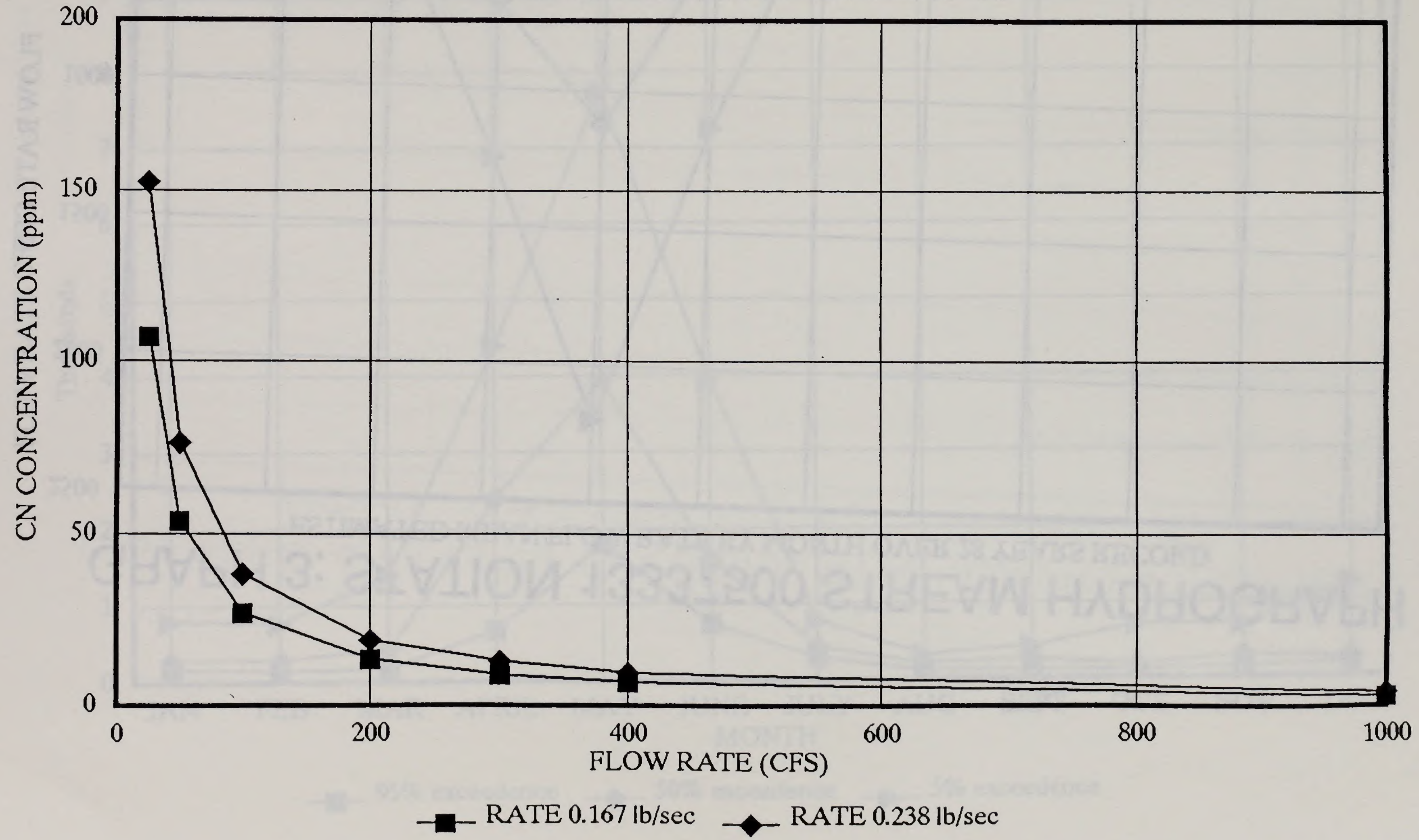
GRAPH 1: WORST CASE: SOUTH FORK CLEARWATER

CN CONCENTRATION VS. FLOW RATE



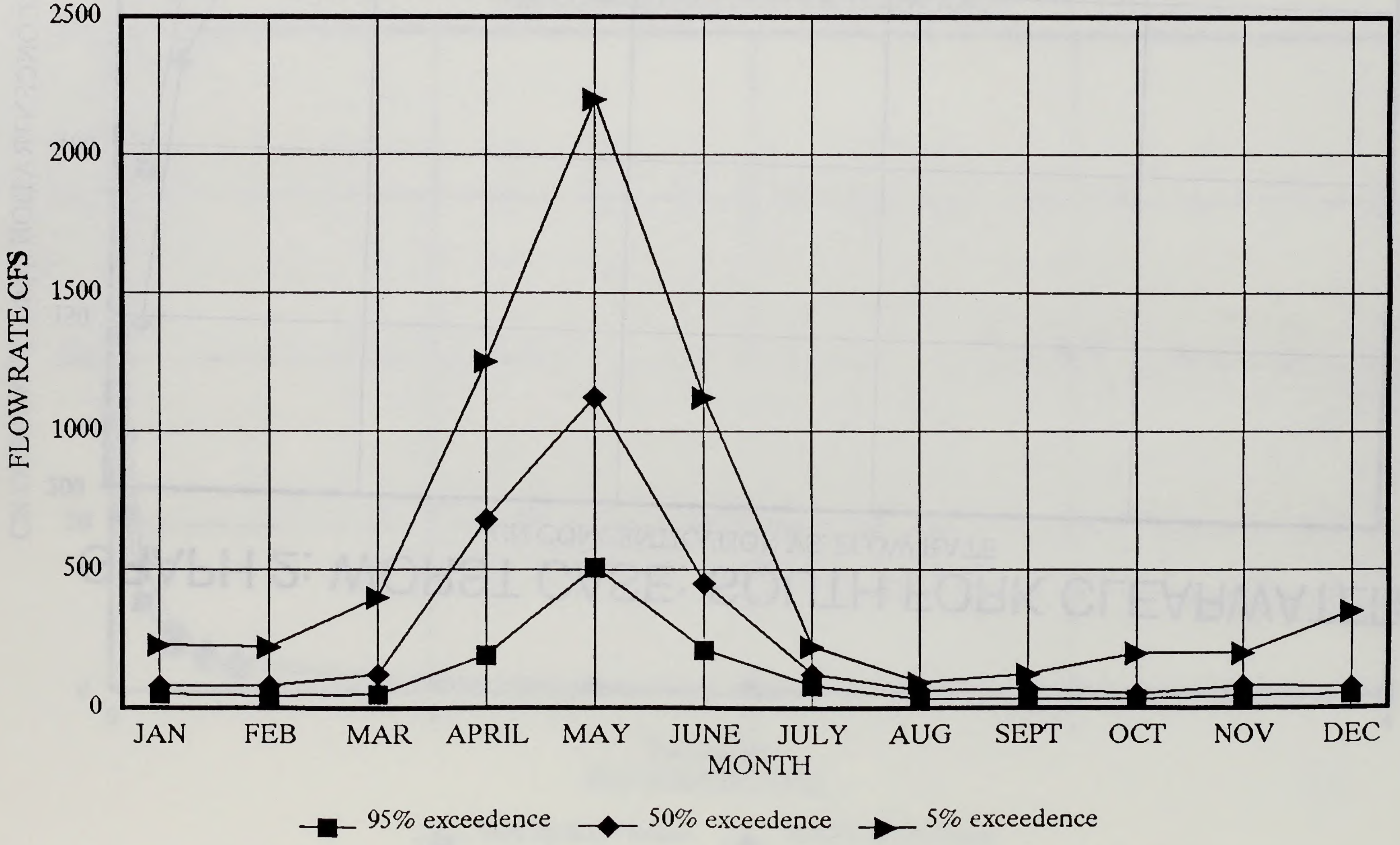
GRAPH 2: WORST CASE: SOUTH FORK CLEARWATER

CN CONCENTRATION VS. FLOW RATE



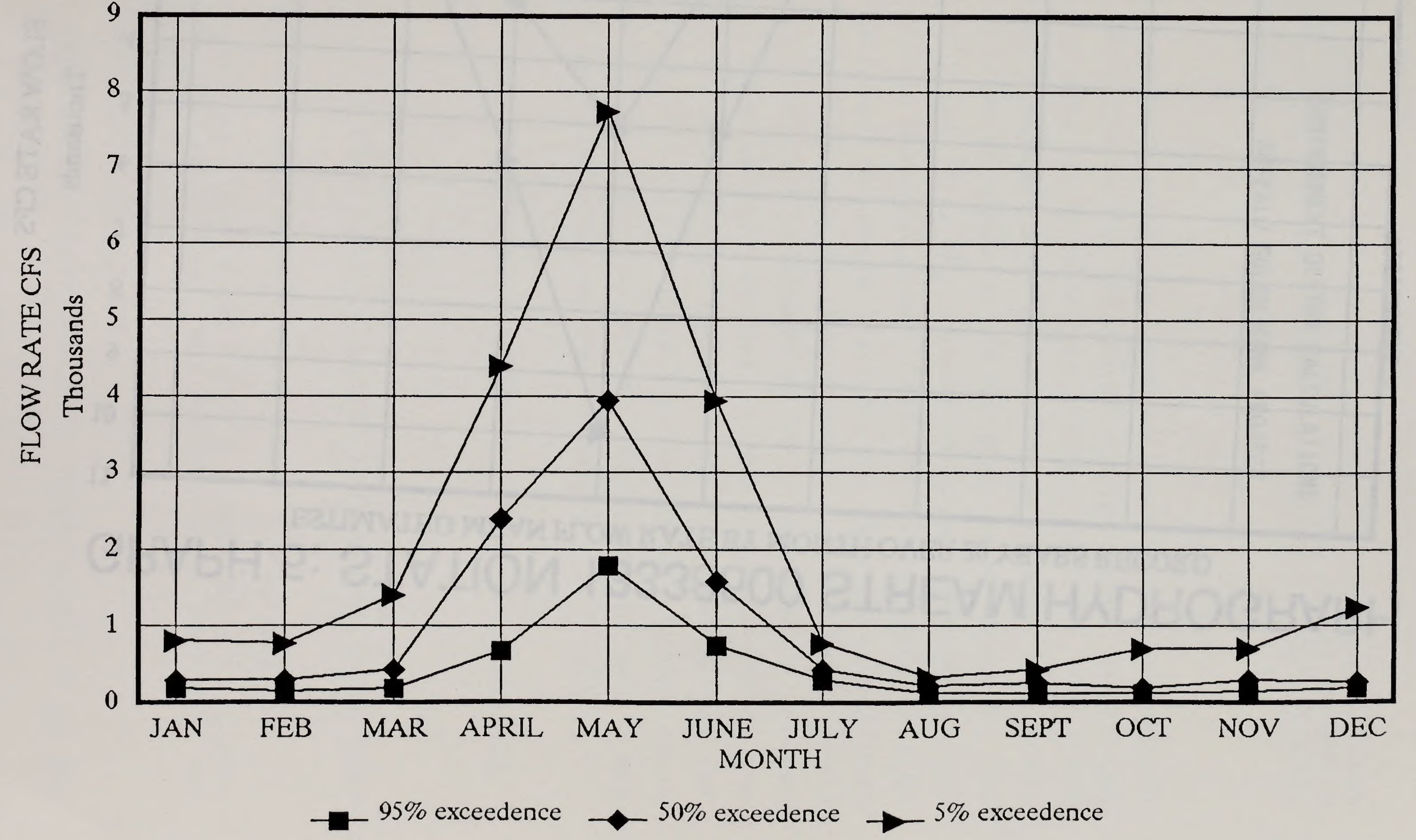
GRAPH 3: STATION 13337500 STREAM HYDROGRAPH

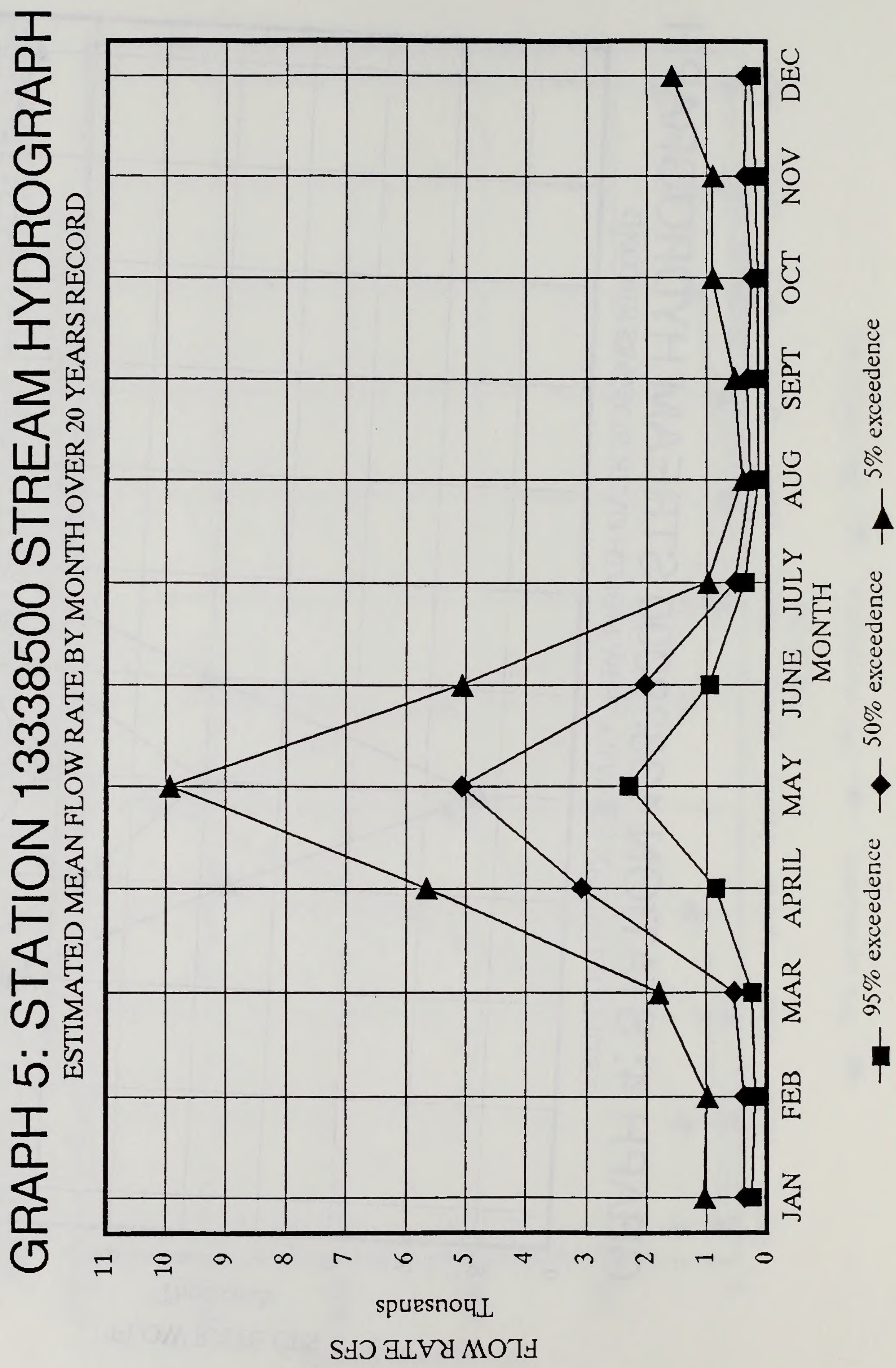
ESTIMATED MEAN FLOW RATE BY MONTH OVER 28 YEARS RECORD



GRAPH 4: STATION 13338000 STREAM HYDROGRAPH

ESTIMATED MEAN FLOW RATE BY MONTH OVER 50 YEARS RECORD




GRAPH 5: STATION 13338500 STREAM HYDROGRAPH
ESTIMATED MEAN FLOW RATE BY MONTH OVER 20 YEARS RECORD
FLOW RATE CFS
Thousands
0
1
2
3
4
5
6
7
8
9
10
11
JAN
FEB
MAR
APRIL
MAY
JUNE
JULY
AUG
SEPT
OCT
NOV
DEC
MONTH
95% exceedence
50% exceedence
5% exceedence

ATTACHMENT 7

CONTAINMENT DESIGN CALCULATIONS -

BUFFALO GULCH MINE PROJECT

ADDENDUM A (JUNE 14, 1990) - REVISED APPENDIX C DESIGN CALCULATIONS TO WELSH ENGINEERING, INC. DESIGN REPORT NO. 199, DATED NOVEMBER 1989 FOR PERMITTING AND CONSTRUCTION OF BUFFALO GULCH GOLD PROJECT HEAP LEACH FACILITIES

The design snowpack event for snowmelt runoff to collection facilities (in addition to 100-yr, 24-hr design storm runoff and normal operation flows) has been revised by Hydrometrics, Inc. from an average 39-inch snowpack at 27 percent water content (SRK 1989) to an average 40-inch snowpack at 34 percent water content. The surplus/retention pond will be sized to store design storm, draindown and average snowpack conditions. Extreme events will be diverted by an emergency drainage ditch to the mine pit. Spillways and ditches will be designed for operational flows, design storm runoff, and a 10-yr 50-inch snowpack at 34 percent water content combined to meet review agency concerns. A peak storm runoff factor of 4 for the 100-yr, 24-hr design storm event was also assumed for the collection facilities to account for the peak precipitation distribution. Revised design calculations are presented herein and are incorporated into the construction drawings.

<u>ULTIMATE LEACH PAD RUNOFF/SOLUTION FLOWS TO COLLECTION PIPE AND CONTAINMENT DITCH:</u>

1A) 100-YR, 24-HR STORM EVENT = 3.6" X 1,800,000 S.F. = <u>2,800 GPM</u> (CONSERVATIVELY ASSUME 100% RUNOFF IN 24 HOUR PERIOD)

1B) DESIGN STORM PEAK FLOW = 2,800 GPM X 4 = <u>11,200 GPM</u>

2) 10-YR SNOWPACK = 50" X 34% WATER X 1,800,000 S.F./2 DAYS = <u>6,620 GPM</u> (CONSERVATIVELY ASSUME 100% SNOWMELT AND RUNOFF IN 48 HOURS)

3) OPERATION FLOW = <u>1,000 GPM</u>

4A) WORST CASE WITHOUT PEAK INFLOW = (1A)+(2)+(3) = <u>10,420 GPM</u>

4B) WORST CASE WITH PEAK INFLOW = (1B)+(2)+(3) = <u>18,820 GPM</u>

Attachment - 7

5) OUTFLOW FOR 12-INCH DIAMETER PVC COLLECTION PIPE ON 1% MINIMUM GRADE FLOWING FULL = 2,000 GPM

6) INFLOW LESS OUTFLOW = (4)-(5) = 8,420 GPM EXCESS FLOW TO SPILLWAY PIPE AND CONTAINMENT DITCH IN 24 HR WITH ESTIMATED PEAK FLOW AT 16,820 GPM

COLLECTION DITCH SPILLWAY PIPE FLOW TO CONTAINMENT DITCH:

The new pad layout for construction shows freeboard in the pad sump area reduced to 2 ft for minimal collection ditch storage capacity against overtopping during design storm events. The recommended spillway design flow (less collection pipe flow) is 16,820 GPM minimum.

Design for construction to incorporate 2 spillway pipes at 18 inches in diameter on a 1.6 percent minimum grade to handle 16,000 GPM flow for pipes flowing full in combination with an emergency open ditch spillway to the containment ditch.

1) WORST CASE WITH PEAK INFLOW = 18,820 GPM
2) COLLECTION PIPE FLOW = 2,000 GPM
3) DESIGN SPILLWAY FLOW = (1)-(2) = 16,820 GPM
4) SPILLWAY PIPE FLOW = 16,000 GPM
5) EMERGENCY SPILLWAY DITCH OPEN FLOW = (3)-(4) = 820 GPM (CONSTRUCTED BY OWNER AS NEEDED)

CONTAINMENT DITCH OPEN CHANNEL FLOW:

Containment ditch design for construction shows collection pipes in double lined ditch on 1 percent minimum grade, 2H:1V side slopes, and 1 ft of open ditch area above potential 1.5 ft of pipe backfill at a later date for pipe protection. Assuming Manning's n = 0.015 and 1.5 ft backfill at 8 ft open bottom width, flow in open ditch = 38,400 GPM flowing full or 11,600 GPM flowing half full. Thus the open ditch design is adequate for containing the revised design flow conditions, even if the collection pipe becomes plugged.

COLLECTION POND SPILLWAY PIPE FLOW TO SURPLUS/RETENTION POND:

1A) 100-YR, 24-HR STORM EVENT ON ULTIMATE 1,800,000 S.F. PAD = 2,800 GPM (SEE PREVIOUS PAD RUNOFF CALCULATIONS)

1B) DESIGN STORM PEAK FLOW = 11,200 GPM (SEE PREVIOUS CALCULATIONS)

2) 10-YEAR SNOWPACK ON ULTIMATE 1,800,000 S.F. PAD = 6,620 GPM (SEE PREVIOUS CALCULATIONS)

3) OPERATION FLOW = 1,000 GPM

4) SPILLWAY PIPE DESIGN WORST CASE INFLOW = (1B)+(2)+(3) = 18,820 GPM (CONSERVATIVELY ASSUME COLLECTION PONDS ARE FULL DURING DESIGN STORM EVENT)

Design for construction to incorporate 4 spillway pipes at 12 inches in diameter on a 5 percent minimum grade to handle 20,000 GPM flow for pipes flowing full, or equivalent.

EMERGENCY DRAINAGE DITCH FLOW

The emergency drainage ditch will be constructed by the owner to divert runoff events associated with extreme event conditions. The surplus/retention pond and storage in the collection pond above the normal operating levels (5.5 million gallons) will contain 100% of design inflows from combined events to the pond to El. 4590 ft.

The combined pond areas are also capable of storing the 10-yr snow pack below El. 4592 ft. Assume a "V" ditch design with 2H:1V side slopes, 1 percent minimum grade, inlet invert El. 4592.0 ft, 1 ft depth, and Manning's n = 0.015. Emergency ditch capacity for the above assumed conditions flowing full is 5,200 GPM.

COLLECTION PONDS (PREGNANT AND HOLDING/BARREN):

1) 100-YR, 24-HR STORM EVENT = 3.6" X 117,090 S.F. POND SURFACE = 262,750 GALLONS OR 131,400 GALLONS PER MAIN POND

2) 48-HR OPERATIONAL STORAGE = 1,000 GPM X 48 HRS = 2,880,000 GALLONS PER MAIN POND

3) TOTAL DESIGN STORAGE = (1)+(2) = 3,011,000 GALLONS PER MAIN POND (PREGNANT POND OR COMBINATION HOLDING AND BARREN PONDS)

Calculate maximum pond heights with 50' bottom widths and 3H:1V side slopes plus 2 ft freeboard:

1A) PRIMARY PREGNANT POND AT 13' DEPTH = 3,045,000 GALLONS > DESIGN (OK)

1B) COMBINED HOLDING AND BARREN PONDS AT 14.5' DEPTHS = 3,020,000 GALLONS > DESIGN (OK)

Use calculated pond depths above for 6,065,000 gallons total storage plus 2' freeboard. Maximum operating level will vary to provide sufficient design storm storage.

SURPLUS/RETENTION POND:

SUMMARY OF DESIGN:

The retention berm crest was raised 3 ft to EL. 4593 ft on construction drawings for 17 ft of freeboard above the surplus pond crest level.

About 25.18 million gallons of storage is available to El. 4590 ft with collection ponds filled to capacity. About 32.4 million gallons of storage + 1 ft of freeboard is available to El. 4592 ft, which will flood the collection pond area with 2 ft of water. An additional 5.5 million gallons of storage is potentially available in the collection ponds for above average snowpack conditions. An emergency ditch to the mine pit area will divert extreme event floods beyond the design storm and draindown events.

DESIGN CALCULATIONS:

A summary of water balance drainage areas and conservative design calculations for storage are presented on Tables 1, 2, and 3 attached. The 100 year storm with average and 10 year snowpack events assume 100% runoff from the pad, ponds and ditches. Draindown assumes maximum pile heights with 800 and 1,000 gpm application rates at 0.005 gpm/sf. Draindown conditions assume 10.5 gallons drainage per ton of ore based on measured laboratory leach column tests. Design calculations and water balance studies (Appendix E) indicate:

1) The surplus pond in combination with 5.5 million gallons of collection pond storage, 800 gpm application rate, and a 60 ft high heap pile is capable of storing 100% design runoff and draindown for all years of operation under average and 10-yr snowpack conditions.

2) The surplus/retention pond with emergency storage in the collection ponds is capable of 100% design runoff and draindown containment for the ultimate pad (1,000 GPM application rate on a 90 ft high heap pile) from Year 2 to the final year under average snowpack conditions.

TABLE 1 - BUFFALO GULCH PROJECT WATER BALANCE PARAMETERS

STRUCTURES	TRIBUTARY AREAS (ACRES)				
	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
ore heap pad	12.46	20.31	20.31	41.32	41.32
process yard	0.19	0.19	0.19	0.19	0.19
containment ditch	0.36	0.36	0.36	0.36	0.36
pregnant pond	1.30	1.30	1.30	1.30	1.30
holding pond	0.69	0.69	0.69	0.69	0.69
barren pond	0.69	0.69	0.69	0.69	0.69
lined surplus pond	1.67	1.67	1.67	1.67	1.67
retention pond	0.00	2.82	2.82	2.82	2.82
TOTAL RUNOFF (ACRES)=	17.36	28.03	28.03	49.04	49.04

TABLE 2 - BUFFALO GULCH PROJECT RUNOFF AND STORAGE PARAMETERS WITH AVERAGE SNOWPACK CONDITIONS

END OF YEAR	PAD, DITCHES AND PLANT (ACRES)	POND AREA (ACRES)	TOTAL RUNOFF AREA (ACRES)	100YR 24HR STORM (M GALLONS)	AVERAGE SNOWPACK (M GALLONS)	DRAINDOWN 90'@1000gpm (M GALLONS)	DRAINDOWN 90'@800gpm (M GALLONS)
1	13.01	4.35	17.36	1.70	6.41	5.10(1)	3.53(1)
2	20.86	7.17	28.03	2.74	10.35	7.65	5.29
3	20.86	7.17	28.03	2.74	10.35	7.65	5.29
4	41.87	7.17	49.04	4.79	18.11	7.65	5.29
5	41.87	7.17	49.04	4.79	18.11	7.65	5.29

END OF YEAR	AVAILABLE STORAGE AT PEAK REMAINING SNOWPACK(4)	TOTAL STORAGE REQUIRED 1000gpm (M GALLONS)	TOTAL STORAGE REQUIRED 800gpm (M GALLONS)	TOTAL STORAGE(2) AVAILABLE (M GALLONS)
1	5.82	13.21	11.64	7.65
2	17.19	20.74	18.38	25.18(3)
3	17.19	20.74	18.38	25.18(3)
4	8.94	30.55	28.19	25.18(3)
5	8.94	30.55	28.19	25.18(3)

NOTES:

1) DRAINDOWN FOR 60'± MAXIMUM PILE HEIGHT AT YEAR 1.
2) TOTAL STORAGE AVAILABLE DOES NOT INCLUDE POTENTIAL COLLECTION POND STORAGE (MAXIMUM 5.5 MILLION GALLONS).
3) FILLING OF SURPLUS/RETENTION POND AND COLLECTION PONDS TO El. 4590 FT + 3 FT OF RETENTION BERM DRY FREEBOARD
4) PER WATER BALANCE EXCLUDING DRAINDOWN

ABLE 3 - BUFFALO GULCH PROJECT RUNOFF AND STORAGE PARAMETERS WITH 10-YR SNOWPACK CONDITIONS

END OF YEAR	PAD, DITCHES AND PLANT (ACRES)	POND AREA (ACRES)	TOTAL RUNOFF AREA (ACRES)	100YR 24HR STORM (M GALLONS)	10 YEAR SNOWPACK (M GALLONS)	DRAINDOWN 90'@1000gpm (M GALLONS)	DRAINDOWN 90'@800gpm (M GALLONS)
1	13.01	4.35	17.36	1.70	8.01	5.10(1)	3.53(1)
2	20.86	7.17	28.03	2.74	12.94	7.65	5.29
3	20.86	7.17	28.03	2.74	12.94	7.65	5.29
4	41.87	7.17	49.04	4.79	22.64	7.65	5.29
5	41.87	7.17	49.04	4.79	22.64	7.65	5.29

END OF YEAR	AVAILABLE STORAGE AT PEAK REMAINING SNOWPACK(4)	TOTAL STORAGE REQUIRED 1000gpm (M GALLONS)	TOTAL STORAGE REQUIRED 800gpm (M GALLONS)	TOTAL STORAGE(2) AVAILABLE (M GALLONS)
1	4.17	14.81	13.24	7.65
2	13.77	23.33	20.97	32.40(3)
3	13.77	23.33	20.97	32.40(3)
4	3.64	35.08	32.72	32.40(3)
5	3.64	35.08	32.72	32.40(3)

Attachment - 7

NOTES:
1) DRAINDOWN FOR 60'± MAXIMUM PILE HEIGHT AT YEAR 1.
2) TOTAL STORAGE AVAILABLE DOES NOT INCLUDE POTENTIAL COLLECTION POND STORAGE (MAXIMUM 5.5 MILLION GALLONS).
3) FILLING OF SURPLUS/RETENTION POND AND COLLECTION PONDS TO El. 4592 FT + 1 FT OF RETENTION BERM DRY FREEBOARD
4) PER WATER BALANCE EXCLUDING DRAINDOWN