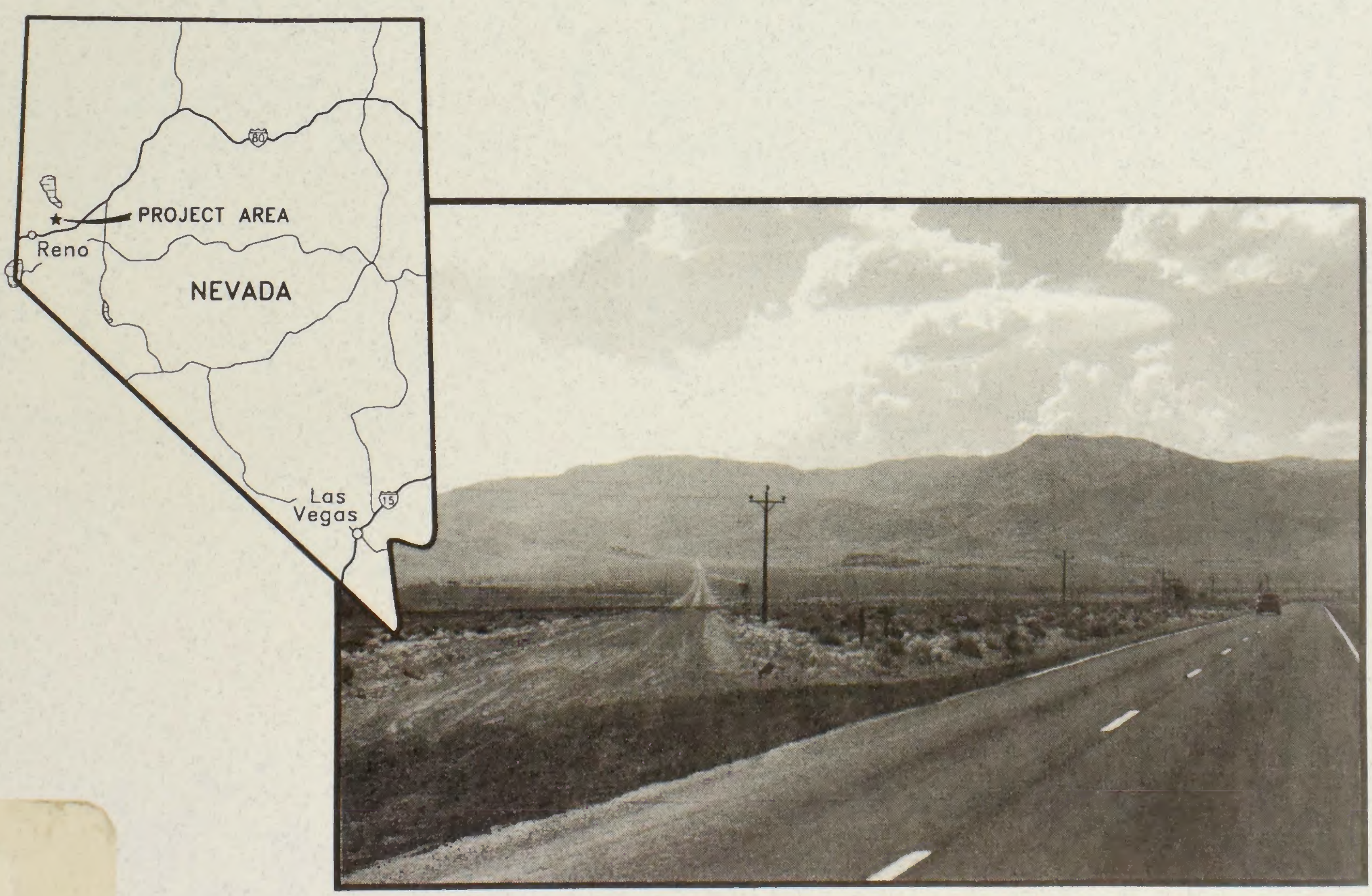
United States Department of the Interior
Bureau of Land Management

Carson City Field Office
Carson City, Nevada

September 1997

DRAFT

Environmental Impact Statement
Olinghouse Mine Project



MISSION STATEMENT

The Bureau of Land Management is responsible for the stewardship of the our public lands. It is committed to manage, protect, and improve these lands in a manner to serve the needs of the American people for all times. Management is based upon the principles of multiple use and sustained yield of our nation's resources within a framework of environmental responsibility and scientific technology. These resources include recreation, rangelands, timber, minerals, watershed, fish and wildlife, wilderness, air and scenic, scientific and cultural values.

BLM/CC/PL-97/022+1791
Case File No. N36-96-001P

United States Department of the Interior
BUREAU OF LAND MANAGEMENT
Carson City Field Office
5665 Morgan Mill Road
Carson City, Nevada 89701
PH:(702) 885-6100

September 12, 1997

3809 (NV030)
N36-96-001P

Dear Reader:

Enclosed for your review and comment is the Draft Environmental Impact Statement (EIS) for Alta Gold Company's Olinghouse Mine Project prepared by the Bureau of Land Management (BLM) Carson City Field Office. Cooperating agencies for this EIS are U.S. Fish & Wildlife Service, U.S. Army Corps of Engineers, U.S. Bureau of Indian Affairs, Washoe County, Pyramid Lake Paiute Tribe, and Lyon County - Town of Fernley.

The Draft EIS is based on the plan of operations submitted to the BLM under 43 Code of Federal Regulations 3809. This Draft EIS analyzes the direct, indirect, and cumulative impacts associated with the proposed development of two open pits, waste dump, haul road, cyanide heap leach pads, and other ancillary facilities at the Olinghouse Mine. The plan of operations and technical reports in support of the plan are available for review at the BLM office in Carson City, Nevada.

The BLM is interested in your review and comment on the adequacy and accuracy of this document. Public comments will be accepted during a 60-day comment period. Written comments on the Draft EIS must be postmarked by November 14, 1997, and should be sent to:

Bureau of Land Management
Carson City Field Office
Attn: Terri Knutson, EIS Project Manager
5665 Morgan Mill Road
Carson City, NV 89701

In addition, two public open house meetings to accept comments are scheduled for October:
1) October 20, 1997, 5 p.m. - 8 p.m., Washoe County Commissioners Chambers, 1001 E. Ninth Street, Reno, Nevada.
2) October 21, 1997, 5 p.m. - 8 p.m., Fernley Town Complex, 595 Silver Lace Boulevard, Fernley, Nevada.

A Final EIS will be prepared that will consider the comments received after the public review and comment period. The Final EIS may be in an abbreviated format; therefore you should retain this Draft EIS as a reference. For more information, please contact Terri Knutson at (702) 885-6156.

Sincerely,

John O. Singlaub
District Manager

DRAFT

ENVIRONMENTAL IMPACT STATEMENT
ALTA GOLD COMPANY
OLINGHOUSE MINE PROJECT

LEAD AGENCY:	U.S. Department of the Interior Bureau of Land Management Carson City Field Office
COOPERATING AGENCIES:	U.S. Fish & Wildlife Service U.S. Army Corps of Engineers U.S. Bureau of Indian Affairs Washoe County Pyramid Lake Paiute Tribe Lyon County - Town of Fernley
PROJECT LOCATION:	Washoe County, Nevada
COMMENTS ON THIS DRAFT (EIS) SHOULD BE DIRECTED TO:	Terri Knutson, EIS Project Manager Bureau of Land Management Carson City Field Office 5665 Morgan Mill Road Carson City, NV 89701 (702) 885-6000
DATE DRAFT EIS FILED WITH EPA:	September 12, 1997
DATE WHEN COMMENTS MUST BE POSTMARKED TO THE BLM:	November 14, 1997

ABSTRACT

The Draft Environmental Impact Statement analyzes impacts associated with the proposed development of the Olinghouse Mine located in Washoe County, Nevada. The Proposed Action includes: construction of two open mine pits, waste rock dump, haul road, cyanide heap leach pad, and other ancillary facilities associated with mining and milling, and reclamation of disturbed areas. Alternatives to the Proposed Action, including the No Action Alternative, are analyzed in the document.

Responsible Official for EIS:

John O. Singlaub
District Manager
Carson City Field Office

SUMMARY

Alta Gold Company (Alta) proposes to develop the Olinghouse Gold Mine in Washoe County approximately 6 miles west of Wadsworth, Nevada, and 33 miles east of Reno, Nevada. Since the proposed mine development involves public lands administered by the Bureau of Land Management (BLM), Alta submitted a Plan of Operations for the proposed development to the BLM Carson City Field Office. BLM reviewed the Plan of Operations and determined that the proposed development has the potential to result in *significant*[1] environmental effects and an Environmental Impact Statement (EIS) should be prepared pursuant to the National Environmental Policy Act (NEPA) to fully inform decision makers and the public about the environmental impacts of the proposed mine.

This EIS describes Alta's Proposed Action, reasonable alternatives to the Proposed Action, and environmental consequences of implementing the Proposed Action or the alternatives. Potential *direct*, *indirect*, and *cumulative impacts* of the Proposed Action and alternatives on the environment have been analyzed and described. Where appropriate, potential *mitigation* measures have been identified to eliminate or reduce the severity of anticipated impacts. Impacts described in this EIS will form the basis for BLM's decision regarding selection of a preferred action among the Proposed Action and alternatives and selection of mitigation measures associated with the preferred action. This EIS is also intended to provide the Washoe County Commission with the analysis necessary to make a decision on the Special Use Permit.

SUMMARY OF PROPOSED ACTION

Alta's Proposed Action consists of two open pits (eventually expanding to become one) in the Green Hill area north of the original Olinghouse townsite; a waste rock dump in Frank Free Canyon east of the mine; an ore crushing, milling, and leaching complex south of the mine between Olinghouse Canyon and Pierson Canyon; and ancillary facilities such as haul and access roads, water pipeline, electric transmission line, equipment maintenance facility, analytical laboratory, fuel and reagent storage facilities, and water and solution control structures. The project is expected to produce approximately 600,000 oz of gold from 9,660,000 tons of ore. Approximately 43,385,000 tons of waste rock would be disposed of in the dump. A small fraction of the ore containing coarse-grained gold particles would be processed through a gravity mill. The mill tailings and the remaining lower grade ore would be leached with a conventional cyanide *heap leach* approach.

The proposed project area consists of 214 unpatented mining claims and 11 patented claims, all controlled or owned by Alta. There are approximately 4,300 acres within Alta's claim boundary and 502 acres within the actual *disturbed area* for the proposed mine and associated facilities. Of this latter area, approximately 165 acres have already been disturbed by historic mining operations or recent exploration activities.

Following mining, approximately 99 acres of pit area would be left unreclaimed. The mine pit is

1 Each term in the Glossary (Section 8.0) is italicized at its first occurrence in the summary and the text for the reader's convenience.

expected to partially fill with inflow of groundwater and surface runoff to an equilibrium depth of approximately 90 ft, with a surface area of approximately 3.4 acres.

The Plan of Operations for the Olinghouse Mine Project covers approximately 7 years, including 5 years of active mining operations followed by an additional 2 years of continued ore leaching, heap detoxification, and reclamation. The mine is projected to employ 114 full-time workers.

PROJECT ALTERNATIVES

Reasonable alternatives identified during *scoping* and evaluated in detail in this EIS include the development of an access road west of Wadsworth and off the Pyramid Lake Paiute Reservation (Alternative A). A No Action Alternative is also evaluated in detail as required by NEPA.

Alternative A - New Mine Access Road That Bypasses Wadsworth

Alternative A would be similar to the Proposed Action, but would include an alternative access road that would follow an existing pipeline right-of-way across a combination of private and public lands. The alternative would involve widening and upgrading the gravel maintenance road alongside the pipeline.

No Action Alternative

Under the No Action Alternative, BLM would not approve Alta's Plan of Operations. Currently approved exploration activities would be allowed to continue, and reclamation of such exploration activities would occur.

SUMMARY OF IMPACTS

Detailed analyses of potential impacts and recommended mitigation measures associated with the Proposed Action and alternatives are presented in Chapter 4, Environmental Consequences. The following summary focuses on the potential impacts to each of the various resources.

Proposed Action

Geology and Minerals. The Proposed Action would result in the excavation and relocation of approximately 43,385,000 tons of waste rock and the excavation and processing of 9,660,000 tons of ore. Removal and relocation of this material would result in permanent modifications to the topography of the area, as well as permanent removal of the mineral resources (gold and silver). Potentially acid-producing rock in the mine area represents a small fraction (approximately 1%) of the waste rock to be extracted and relocated. The mixing of such material with the surrounding acid-neutralizing rock during the excavation, hauling, and dumping processes is expected to neutralize any acidic leachate which may form in waste rock or ore piles. Likewise, the occurrence of acid-generating materials in the postmining pit walls is expected to be insignificant in relation to the acid-neutralizing potential of the surrounding rock.

Paleontological Resources. Because the potential for occurrence of significant fossils within the mine area is very low, direct and indirect impacts to *paleontological resources* would be unlikely and are not considered significant.

Air Resources. The proposed mine would result in the generation of dust and vehicular emissions; however, these emissions would not result in exceedance of federal or state air quality standards.

Water Resources. Excavation of the mine pit and creation of the waste rock dump and heap leach facility would alter surface drainage patterns and result in a slight reduction (approximately 4%) in surface water discharge from Olinghouse Canyon. This water would at least partially recharge groundwater within the project area instead of in Dodge Flat. Because most runoff in Olinghouse Creek is associated with discharges from springs and seeps in the main canyon, the quantity and duration of flows responsible for maintaining *riparian* vegetation along the creek downstream from the mine are not expected to be affected by excavation of the pit.

Construction activities and mine operations, especially on 403 acres of disturbance outside the pits, would have the potential to result in increased erosion and sedimentation in existing drainages around the facility. Standard erosion control measures would be used to reduce the potential *sediment load* in the drainage network. Sediment loading and any chemical contamination of surface drainages on the project site is not expected to move downstream as far as the Truckee River due to high infiltration rates and drainage barriers on the *alluvial* fan west of the river.

Withdrawal of water from Dodge Flat for project consumption would result in *aquifer drawdown* radiating outward from the project supply well. It is estimated that the maximum groundwater drawdown in the vicinity of the Truckee River would be negligible (PTI 1997). Water levels in the Truckee River would not be affected, but total stream flow in the river would be reduced by approximately 0.5 cfs.

Although there would be some potential for release of hazardous chemicals from the process area due to spills, failure of pad liners, or major storm events, it is unlikely that any such releases would reach the groundwater below the project site. Groundwater occurs 270 ft below the process area, and any hazardous constituents would likely be bound by iron and carbonates in the soil or oxidized and degraded before reaching the water table. A catastrophic release of all the cyanide solution on-site might not degrade fully before reaching groundwater, but the likelihood of such a failure is remote.

Water quality in the postmining pit lake is expected to be good with continuous flow through the pit area along the hydraulic gradient. Concentrations of sulfate and total dissolved solids are expected to be below background concentrations on groundwater, elevated slightly above background surface water quality levels, and exceed secondary water quality criteria at equilibrium concentrations.

<u>Soils</u>. The Proposed Action would disturb an area of approximately 502 acres. Of this area, some 165 acres have been previously disturbed by historic mining or exploration activities. The majority of the disturbance area is occupied by soil associations which have limited salvage potential and reclamation suitability due to steep slopes and shallow bedrock. By salvaging growth medium wherever practical within the disturbance area, sufficient soil material may be stockpiled to enable re-application on most disturbed areas to a depth of 5 to 22 inches. Growth medium would not be reapplied within the pit area.

<u>Vegetation and Wetlands</u>. The Proposed Action would disturb approximately 337 acres of natural communities consisting primarily of Wyoming big sagebrush-bottlebrush squirreltail (142 acres), Wyoming big sagebrush-Utah juniper (124 acres), and Wyoming big sagebrush-desert needlegrass (50 acres). One small seasonal seep in Frank Free Canyon would be disturbed. No other springs or *wetlands* are anticipated to be affected by the Proposed Action.

<u>Wildlife</u>. Wildlife habitat loss associated with the Proposed Action would include 403 acres of temporary loss (life of project) and 99 acres of permanent loss in the pit area. Project development and operations are expected to cause some temporary wildlife displacement and lower population levels in the immediate project vicinity. Direct wildlife mortality resulting from the project is expected to be minor, although some species would be susceptible to collision mortality along the access road and haul road. Impacts to *raptors*, waterfowl, upland gamebirds, big game, and fisheries are expected to be negligible. Using conservative exposure assumptions, no significant risks to wildlife would occur due to water quality in the pit lake.

Threatened, Endangered, and Candidate Species. No *threatened*, *endangered*, or *candidate* plant or animal species are expected to be affected by the project. The endangered cui-ui and threatened Lahontan cutthroat trout in the Truckee River could be adversely affected if the project were to cause river contamination as a result of toxic discharges or reduced river flows as a result of groundwater pumping; however, neither scenario is likely to occur as a result of the project.

Range Resources. Development of the project is expected to result in the temporary loss of approximately 19 animal unit months (AUMs) of *forage* in the Olinghouse Allotment and the permanent loss of approximately 4 AUMs in the unreclaimed pit area.

Recreation. The Proposed Action is expected to have minimal effect on outdoor recreation in the vicinity of the project area because the area receives only light to moderate use at the present time. Recreational use of lands used exclusively for mining would be lost for the life of the project, and recreational values on lands immediately adjacent to mining activities would be diminished.

Access and Land Use. Under the Proposed Action, there would be no change in land ownership, except that Alta would likely purchase some private lands within the project area. Land use would remain essentially the same except that 502 acres would be used exclusively for mining, and grazing and recreation use would be excluded. Grazing and dispersed recreation would continue without interruption on adjacent lands and on the project area once the mine is abandoned and reclamation occurs. There would be no impacts to existing rights-of-way in the project area or immediate vicinity.

Traffic on the Olinghouse County Road and on State Route 447 through Wadsworth would increase by approximately 120 passenger vehicles and 2-12 trucks per day during project construction. This represents an increase of approximately 14-15% in the number of vehicles passing through Wadsworth each day. During operations, the mine traffic through Wadsworth would include approximately 228 passenger vehicles and 2-12 trucks per day or an increase of about 27 to 28%.

Visual Resources/Noise. The waste rock dump would be the most visually obtrusive feature of the proposed project. The generally moderate color *contrast* of the dump, combined with the flat top, would introduce a straight, horizontal line element that would be more geometric than the natural line features in the area. However, it would be relatively small in the context of the natural mountain landscape. Overall, the proposed project would be visually prominent from *Key Observation Point (KOP)* #1 on State Route 447 directly east of the proposed mine site, but most viewers would be traveling at highway speeds of 55 mph or more and at right angles to the view, so views would be brief and at a distance of approximately 4 mi. As seen from KOP #1, the Proposed Action would meet the standards of the applicable Visual Resource Management (VRM) classes. The proposed project would be most visually prominent from KOP #2, on State Route 447 at the intersection with Olinghouse County Road, where northbound travelers from Wadsworth would have a nearly direct forward view of the project area lasting more than 2 minutes at highway speeds. As seen from this KOP, compliance with VRM Class III standards would be marginal for the waste rock dump at the height of mining, but should be readily achievable after reclamation. The Proposed Action would meet VRM objectives as viewed from KOP #3 on Interstate 80, and after completion of reclamation, most casual viewers would find it difficult to discern the project facilities from that viewpoint.

Worst-case noise levels associated with machinery and equipment operations are projected to be less than 49 *dBA* at the nearest residence to the project site. These noise levels would be higher than existing levels in the rural environment, but less than the 65 dBA level that is generally considered acceptable for exterior noise at a residential area.

It is not likely that Wadsworth residents would experience perceptible changes in background noise levels from development and operation of the proposed project. Blasting noise would be experienced at the nearest residence and perhaps in Wadsworth as a very brief and muted clap of thunder preceded by a warning whistle or siren. Blasting would be scheduled at the same time every day.

Cultural Resources. It is unknown at this time whether the disturbances associated with the Proposed Action would affect any cultural resource sites that are eligible for the National Register of Historic Places (NRHP). No eligible sites have been found in the pit and waste dump areas although eligible sites have been found in adjacent areas. A final determination on eligibility of several *lithic scatter* and road segment sites identified in the process area will be made after review by the BLM and SHPO. Native American religious concerns associated with the Proposed Action are also undefined at this time.

Socioeconomics. The project would result in the direct employment of approximately 60 workers during the construction phase and 114 workers during operations. Indirect employment projected in nearby communities as a result of the project would include two additional workers during construction and 17 during mine operations. Local population increase associated with this increased employment base is projected to be approximately 15 people during construction and 107 people during operations.

The project is expected to stimulate housing demand for approximately 13 new households during construction and 37 new households during operation. Although the local housing market is generally tight, adequate housing is available within commuting distance of the project and additional local housing is under construction. All public utilities are adequate within most of the area in which new households would likely be established.

Financial benefits to the public are projected to include an annual payroll of $3.6 million and total project tax revenues of $3.4 million.

Hazardous and Solid Waste. Impacts to soils, surface and groundwater resources, and wildlife could result from an accidental hazardous material spill or exposure to these materials. The relatively small amount of soil that could potentially be contaminated, coupled with appropriate and timely cleanup, would result in negligible impacts. Proper containment of hazardous material would limit potential surface and groundwater contamination to negligible levels. The Proposed Action would involve transport of sodium cyanide and other hazardous materials to or from the mine along State Route 447 through Wadsworth and along the Truckee River corridor. The risk of accidental spillage or other exposure for the local populace would be very low.

ALTERNATIVES

The summary below focuses on those specific impacts, by technical discipline, which are expected to differ from those projected for the Proposed Action.

Alternative A

Soils. Alternative A would involve soil disturbance and potential topsoil loss on approximately 521 acres as opposed to 502 acres for the Proposed Action.

Vegetation and Wetlands. Alternative A would disturb approximately 356 acres of natural vegetation communities compared to 337 acres for the Proposed Action. Most of the additional disturbance would occur in the shadscale-Bailey greasewood and shadscale-bud sagebrush communities.

Wildlife. Approximately 19 acres of habitat along the alternative access corridor route would be disturbed for road widening and left unreclaimed at the end of the project. This habitat loss occurs in the vegetation communities discussed above.

Access and Land Use. Alternative A would eliminate the need for mine-related traffic to use State Route 447 through Wadsworth.

Hazardous and Solid Waste. By eliminating mine-related traffic through Wadsworth, Alternative A would also eliminate exposure risk from hazardous materials being transported through the community to or from the mine.

No Action Alternative

Under the No Action Alternative, the proposed Plan of Operations would not be implemented and the associated adverse and positive impacts identified above would not occur.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF FIGURES

LIST OF FIGURES (Continued)

LIST OF TABLES

LIST OF TABLES (Continued)

ACRONYMS AND ABBREVIATIONS

acre-ft	Acre-feet
acre-ft/year	Acre feet per year
ADR	Carbon adsorption/desorption/recovery
Alta	Alta Gold Company
ANFO	Ammonium nitrate/fuel oil
ARD	Acid-rock drainage
AUM	Animal unit month
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
cfs	Cubic feet per second
dBA	A-weighted decibels
EIS	Environmental impact statement
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right to Know Act
FLPMA	Federal Land Policy and Management Act of 1976
ft	Feet
ft/s	Feet per second
ft^2	Square feet
gal	Gallon(s)
gpd	Gallons per day
gpd/ft^2	Gallons per day per square foot
gpm	Gallons per minute
gpm/ft^2	Gallons per minute per square foot
HAP	Hazardous air pollutant
HDPE	High-density polyethylene
hr	Hour(s)
H:V	Horizontal to vertical
JBR	JBR Environmental Consultants, Inc.
kV	Kilovolt(s)
KOP	Key observation point
lb	Pound(s)
lb/acre	Pounds per acre
$\mu g/m^3$	Micrograms per cubic meter
m	Meter(s)
m/m	Meters per minute
m/s	Meters per second
mg/l	Milligrams per liter
mg/m^3	Milligrams per cubic meter
mph	Miles per hour
MSDS	Material Safety Data Sheet
MWMP	Meteoric waters mobility procedure
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NDEP	Nevada Division of Environmental Protection
NDOW	Nevada Division of Wildlife
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NRHP	National Register of Historic Places
oz	Ounce(s)
oz/ton	Ounces per ton
P.L.	Public Law
PM_{10}	Respirable particulate matter less than 10 microns in aerodynamic diameter
ppm	Parts per million
PSD	Prevention of Significant Deterioration
RMP	Resource Management Plan
ROW	Right-of-way
RV	Recreational vehicle
SARA	Superfund Amendments and Reauthorization Act
SCS	Soil Conservation Service
SHPO	State Historic Preservation Office
SMI	Shepherd Miller, Inc.
TCLP	Toxicity characteristics leaching procedure
TDS	Total dissolved solids
TE&C	Threatened, endangered, and candidate
TROA	Truckee River Operating Agreement
USCOE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile organic compounds
VRM	Visual Resource Management
yd^3	Cubic yards

1.0 INTRODUCTION

Alta Gold Company (Alta) of Henderson, Nevada, controls mining claims in the Olinghouse Mining District under rights granted by the General Mining Law of 1872, as amended, which allows any prospector who discovers a valuable mineral deposit on public lands open to mineral entry to locate and work a mining claim. Portions of the land to be disturbed as part of the Olinghouse Mine Project are federal surface managed by the U.S. Department of the Interior, Bureau of Land Management (BLM), which is responsible (as directed in regulatory provisions of 43 Code of Federal Regulations [CFR] 3809) for preventing unnecessary or undue degradation of federal lands from activity authorized under the General Mining Law of 1872. This document will also be the decision document for the Washoe County Commissioner regarding issuance of a Special Use Permit.

Alta submitted a Plan of Operations to the BLM Carson City Field Office of the BLM for development of the Olinghouse Mine Project on March 28, 1996. The mine would be located approximately 6 miles west of Wadsworth, Nevada, in Washoe County in portions of Sections 16, 17, 19, 20, 21, 22, 27, 28, 29, 30, 32, and 33, T21N, R23E (Figure 1.1). Approximately 5,209 acres are contained within Alta's claim boundary, and 502 acres would be disturbed by the proposed mining and processing facilities. Much of the proposed project is located on public lands administered by the BLM; therefore, review and approval of Alta's Plan of Operations is subject to compliance with the Federal Land Policy and Management Act of 1976 (FLPMA) and implementing regulations (43 CFR 3809, Surface Management Regulations). Because of the potential for the proposed project to result in *significant*[1] environmental impacts, the BLM has determined that an environmental impact statement (EIS) should be prepared pursuant to the National Environmental Policy Act of 1969 (NEPA) to fully inform decision makers and the public about the environmental impacts of the proposed mine. The BLM is the lead agency preparing this EIS, with Washoe County, Lyon County (Town of Fernley), the Pyramid Lake Paiute Tribe, the Bureau of Indian Affairs (BIA), the U.S. Fish and Wildlife Service (USFWS), and the U.S. Army Corps of Engineers (USCOE) acting as cooperating agencies.

The proposed Olinghouse Mine Project would include construction of two open mine pits, a waste rock dump, haul roads, an ore crushing plant and ore agglomerating system, a 280-ft tall *heap leach* pad, *pregnant* and *barren solution* sumps, a double-lined process solution pond

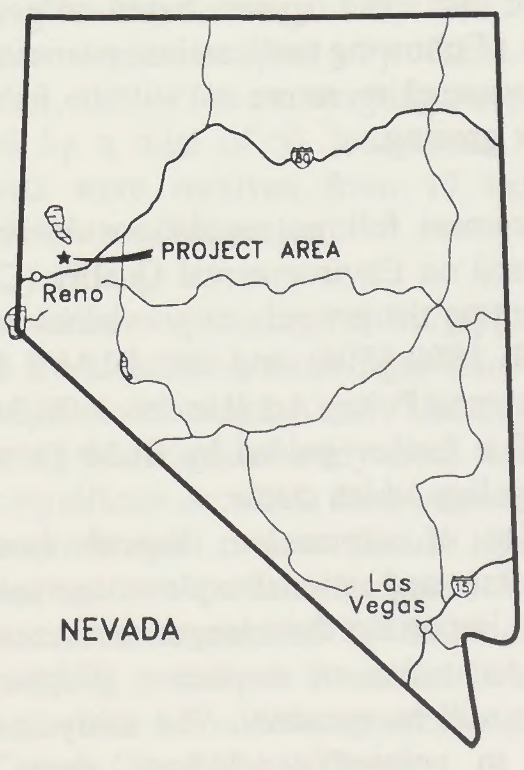


Figure 1.1 General Location Map.

---

1 Each term in the Glossary (Section 8.0) is italicized at its first occurrence in the summary and the text for the reader's convenience.

(working pond), a single-lined storm event pond, a carbon adsorption plant, a gravity milling plant, an administrative office, an equipment maintenance building, an analytical laboratory, a fuel storage facility, a reagent storage facility, an emergency power generation plant, an off-site well, water pipelines, and power lines.

Access to the mine would be from State Route 447 (the Wadsworth-Nixon Highway) to the Olinghouse County Road. The proposed mine would be located approximately 5 miles from the State Route 447 intersection. Water would be piped underground from a well located in Dodge Flat. Chemical treatment and/or water would be used to control dust on the mine and access roads.

The open mine pits would be located in an area of historical mining adjacent to Green Hill (Green Mountain) just north of Olinghouse Canyon. Mining would be accomplished by conventional truck/loader operation with two shifts operating 7 days a week and would begin in the spring of 1998 and last about 5 years based on proven ore reserves. Following reclamation, postmining land use is expected to return to wildlife habitat and livestock grazing.

This document follows regulations developed by the Council on Environmental Quality (CEQ) for implementing the procedural provisions of NEPA (40 CFR 1500-1508) and the BLM's National Environmental Policy Act Handbook (BLM 1988). This EIS is further guided by BLM Carson City District policy which states:

> Clarity of expression, logical thought processes and rational explanations are far more important than length or format in the discussion of impacts. Subjective terms will be avoided. The analysis will lead to pointed conclusions about the amount and degree of change (impact) caused by the proposed action and alternatives. Descriptions of the affected environment will be no longer than is absolutely necessary to understand the impacts of the alternatives. The length of the EIS will be kept to a minimum by incorporating materials by reference. The EIS will concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail. The EIS will be written in plain language. The EIS writer will reduce paperwork and the accumulation of extraneous background data and emphasize real environmental issues and alternatives. The EIS will be concise, clear, and to the point, and shall be supported by evidence that agencies have made the necessary environmental analyses.

1.1 PURPOSE AND NEED

The purpose of the Proposed Action is to enable the commercial mining and beneficiation of gold ore by a private entity (Alta) pursuant to their rights under the 1872 General Mining Law, as amended, and the authority of BLM. U.S. mining laws, and the regulations by which they are enforced, recognize the statutory right of mining claim holders to develop federal mineral resources to meet continuing national needs and economic demands as long as undue environmental degradation is not incurred. Further, such development is encouraged and is consistent with the Mining and Mineral Policy Act of 1970 and the FLPMA. The need for the project is reflected by the demand for gold, an established commodity with an international market, and an important export commodity for the U.S. to satisfy increasing demands from the global market for jewelry, electronics, and investments.

1.2 RELATIONSHIP TO BLM AND NON-BLM POLICIES, PLANS, AND PROGRAMS

The Olinghouse Plan of Operations has been reviewed for compliance with BLM policies, plans, and programs. The proposal is in conformance with the minerals decisions in the Record of Decision for the Lahontan Resource Management Plan (RMP) approved September 3, 1985 (BLM 1985). Through the EIS process, the proposed project is evaluated for conformance with existing land use plans and restrictions by the State of Nevada and requirements for permitting by Washoe County.

1.3 AUTHORIZING ACTIONS

The proposed operations must comply with FLPMA, the Mining and Mineral Policy Act of 1970, and the surface management regulations (43 CFR 3809). These regulations recognize the statutory right of mining claim holders to develop federal mineral resources under the General Mining Law of 1872. These statutes require the BLM to analyze the proposed mining operation to ensure that: 1) adequate provisions are included to prevent undue or unnecessary degradation of public lands; 2) measures are included to provide for reasonable reclamation of *disturbed areas*; and 3) proposed operations would comply with other applicable federal, state, and local laws and regulations.

Although NEPA will provide the regulatory framework to evaluate the Proposed Action, a number of other federal, state, and local regulatory requirements would be applicable. The resource agencies that require consultation and coordination are listed in Table 1.1.

Alta would develop a Stormwater Pollution Prevention Plan; an Emergency Response Plan; and a Spill Prevention, Control, and Countermeasure Plan for the Olinghouse Mine Project, as required by the State of Nevada.

Reclamation bonding requirements for the project are outlined in Nevada Administrative Code (NAC) 519A.350-519A.630. For the BLM, the Surface Management Regulations (43 CFR 3809) establish bonding policy relating to mining and mineral development. The BLM and the State of Nevada have entered into a cooperative agreement establishing reclamation bond levels at not less than $2,000/acre for mining operations.

1.4 PUBLIC SCOPING

The BLM Carson City Field Office published a Notice of Intent to prepare the EIS for the Olinghouse Mine Project in the Federal Register on June 13, 1996. Publication of this notice in the Federal Register initiated a public *scoping* period for the Proposed Action. BLM mailed a scoping letter to 73 individuals, organizations, and agency offices and distributed copies of the scoping notice at the public scoping meeting. In addition, BLM published announcements of the public scoping meeting in the legal notices sections of three local and regional newspapers.

The first public scoping meeting was held by BLM at the Washoe County offices in Reno, Nevada, on July 3, 1996, and a second meeting was held in Fernley, Nevada, on August 8, 1996. Written comments were accepted by BLM through August 23, 1996. The two scoping meetings were attended by a total of 51 individuals. Written comments were received from 19 individuals, organizations, and agencies.

CEQ guidelines for scoping (1501.7[a] [2] and [3]) provide for identifying those significant issues to be analyzed in depth and identifying and eliminating from detailed study those issues which are not significant or which have been covered by prior environmental review. Issues identified by BLM during review of the Proposed Action and written comments received by BLM during the public scoping period are contained in a Scoping Summary which is available upon request from the BLM Carson City Field Office.

Table 1.1 Regulatory Responsibilities.

Authorizing Action/Permit/ Regulatory Requirement	Regulatory Agency
Plan of Operations	U.S. Department of the Interior, Bureau of Land Management (BLM)
National Environmental Policy Act	BLM and Environmental Protection Agency (EPA)
National Historic Preservation Act	BLM and Nevada State Historic Preservation Office
Native American Graves Protection and Repatriation Act	BLM
American Indian Religious Freedom Act	BLM
Environmental Justice	BLM
Clean Water Act (Section 404)	U.S. Army Corps of Engineers (USCOE)
High Explosive License/Permit	Bureau of Alcohol, Tobacco, and Firearms
Industrial Artificial Pond Permit	Nevada Division of Wildlife (NDOW)
Water Appropriation Permits	Nevada State Engineer, Nevada Division of Water Resources
National Pollution Discharge Elimination System (NPDES) Permit	Nevada Division of Environmental Protection (NDEP)
401 Certification	NDEP
Surface Disturbance Permit (Air Quality)	Washoe County Health Department, Air Quality Division
Permit to Construct (Air Quality)	Washoe County Health Department, Air Quality Division
Permit to Operate (Air Quality)	Washoe County Health Department, Air Quality Division
Water Pollution Control Permit	NDEP
Mine Reclamation Permit	NDEP
Solid Waste Disposal Permit	NDEP
Potable Water	NDEP
Sewer System Approvals	Nevada Department of Health, NDEP
Safety Plan	Mine Safety and Health Administration (MSHA)
Threatened and Endangered Species Act	U.S. Fish and Wildlife Service (USFWS)
Hazardous Materials Permit	Nevada State Fire Marshall
Special Use Permit	Washoe County
Building Permit(s)	Washoe County
Encroachment Permit	Nevada Department of Transportation (NDOT)

2.0 PROPOSED ACTION AND ALTERNATIVES

This chapter describes the Proposed Action and alternatives to this action. The Proposed Action is to develop a new open pit gold mining operation including an on-site ore processing facility. The No Action Alternative is to reject the Plan of Operations as submitted by the applicant. The No Action Alternative, which assumes continuation of ongoing exploration activities but the absence of further mine development alternatives, also serves as a basis for comparison of anticipated impacts between the mine development alternatives which includes along with the Proposed Action, Alternative A--the construction of an alternative mine access road to bypass the town of Wadsworth.

Alternatives considered in this document are based on issues identified by the BLM and public comments received during the scoping process. The alternatives are intended to reduce or minimize potential impacts associated with the Proposed Action. Alternatives considered but dismissed from detailed analysis are also described in this chapter.

2.1 PROPOSED ACTION

This section summarizes the mine and ore processing facilities as proposed by Alta in their Plan of Operations/Reclamation Plan (Alta 1996) and Water Pollution Control Permit Application (JBR Environmental Consultants Inc. [JBR] 1996f). The complete application (or Plan of Operations) is available for public review at the BLM Carson City Field Office. The Washoe County Special Use Permit application is available at the Washoe County Department of Development and Review in Reno.

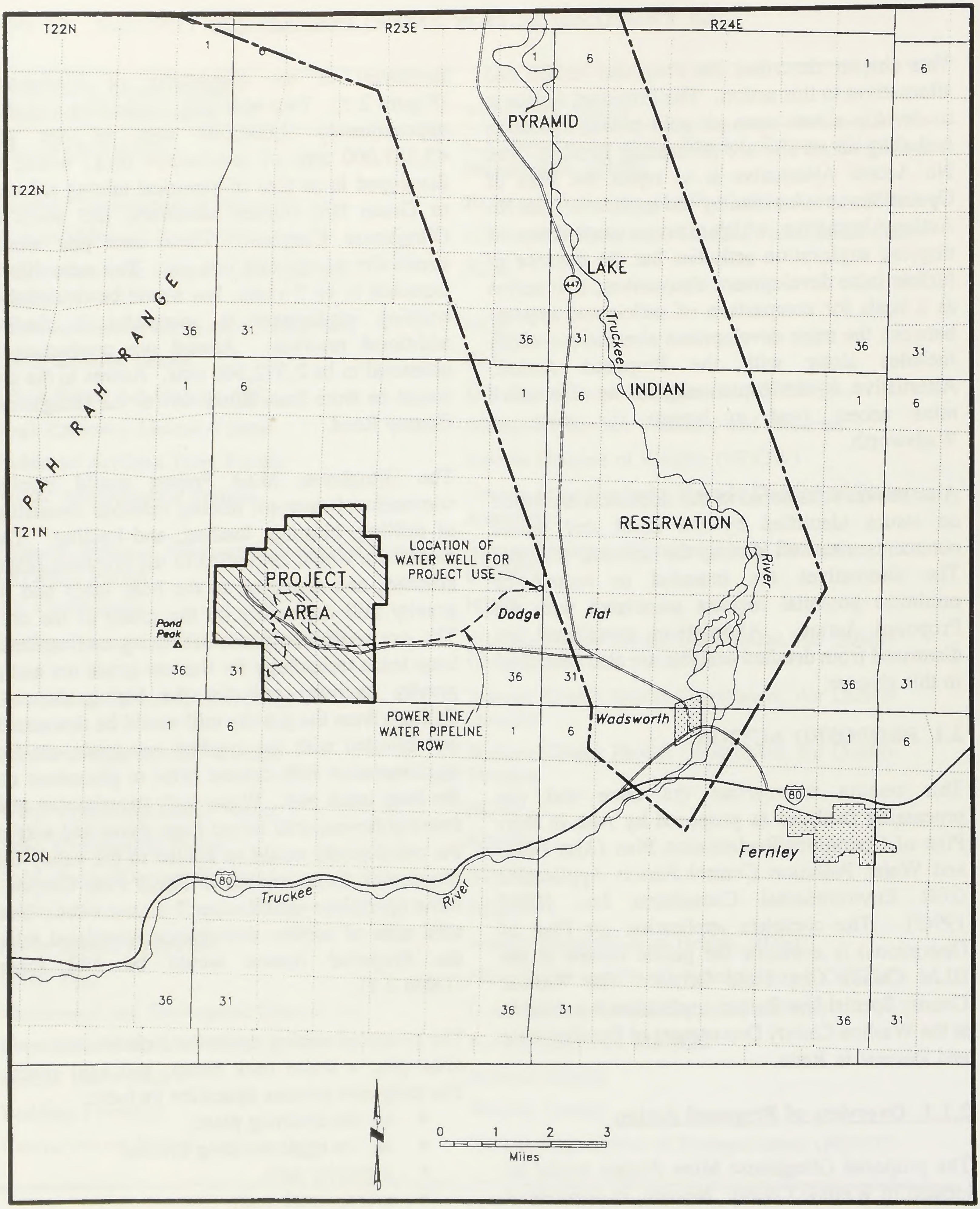
2.1.1 Overview of Proposed Action

The proposed Olinghouse Mine Project would be located in Washoe County, Nevada, in portions of Sections 16, 17, 19, 20, 21, 22, 28, 29, 30, and 32 of T21N, R23E, approximately 7 miles northwest of the community of Wadsworth (Figure 2.1). Two open pits, containing a total of approximately 9,660,000 tons of ore and 43,385,000 tons of *overburden* rock, would be developed in an area of historical mining adjacent to Green Hill (Green Mountain) just north of Olinghouse Canyon. These two pits would eventually merge into one pit. The mine life is expected to be 5 years, but would be extended if ongoing exploration is successful in finding additional reserves. Annual ore production is estimated to be 2,372,500 tons. Access to the site would be from State Route 447 to the Olinghouse County Road.

The Olinghouse Mine Project would involve conventional open-pit mining methods consisting of drilling, blasting, loading, and hauling. The mined ore would be hauled to the crushing plant, crushed, and conveyed to the heap leach pad or gravity mill depending on the grade of the ore. The ore would be processed using conventional heap leach technology for the low-grade ore and a gravity recovery mill for the high-grade ore. Tailings from the gravity mill would be dewatered and blended with the crushed low-grade ore for agglomeration with cement prior to placement on the heap leach pad. Waste rock (overburden and *interburden* material mined from above and within the ore deposit) would be hauled to the valley-fill waste rock dump located in Frank Free Canyon. Mine operations would occur 7 days a week. The total area of surface disturbance associated with the Proposed Action would be 502 acres (Table 2.1).

The proposed mining operation includes two open mine pits, a waste rock dump, and haul roads. The proposed process operation includes:

- an ore crushing plant;
- an ore agglomerating system;
- a gravity mill;
- a heap leach pad;
- a carbon adsorption/desorption/recovery (ADR) plant;



20669\CUMULTM\PROJWELL

Figure 2.1 Project Location Map.

Table 2.1 Acreage of Surface Disturbance for Project Components for the Proposed Action and Alternative A.

	Disturbance (acres)	
Project Component	Proposed Action	Alternative A
Mine Pit #1	19.7	19.7
Mine Pit #2	79.6	79.6
Waste rock dump	208.2	208.2
Haul road/truck maintenance facility	48.1	48.1
Crusher and mill area	7.4	7.4
Heap leach pad	71.2	71.2
Process area	13.2	13.2
Topsoil stockpile areas	20.3	20.3
Water pipeline	6.6	6.6
Surface water control and diversion structures	3.0	3.0
Clay borrow area	24.7	24.7
Alternative mine access road	0	18.9
Total	502.0	520.9

- pregnant and barren solution sumps fabricated with steel plate;
- a double-lined process solution pond to hold any overflow from the process solution sumps;
- a single-lined storm event pond;
- a solution distribution system;
- an emergency power generation plant;
- an analytical laboratory;
- a reagent storage facility;
- a water well and pipeline; and
- power lines.

Ancillary facilities would include an administration office, an equipment maintenance shop, a warehouse, and a fuel storage facility.

Figures 2.2, 2.3, and 2.4 depict the locations of the major project components, including the stormwater diversion channels, and Figure 2.5 diagrams the proposed processing operation.

The construction workforce would total approximately 60, whereas the mine would employ approximately 114 permanent employees during mining. Construction of the proposed facilities and commencement of mining are projected to begin in early 1998. Mining would continue for approximately 5 years. Leaching, detoxifying the heap, and final reclamation are expected to extend 2 years beyond the end of mining, and all reclamation is expected to be complete in the year 2005.

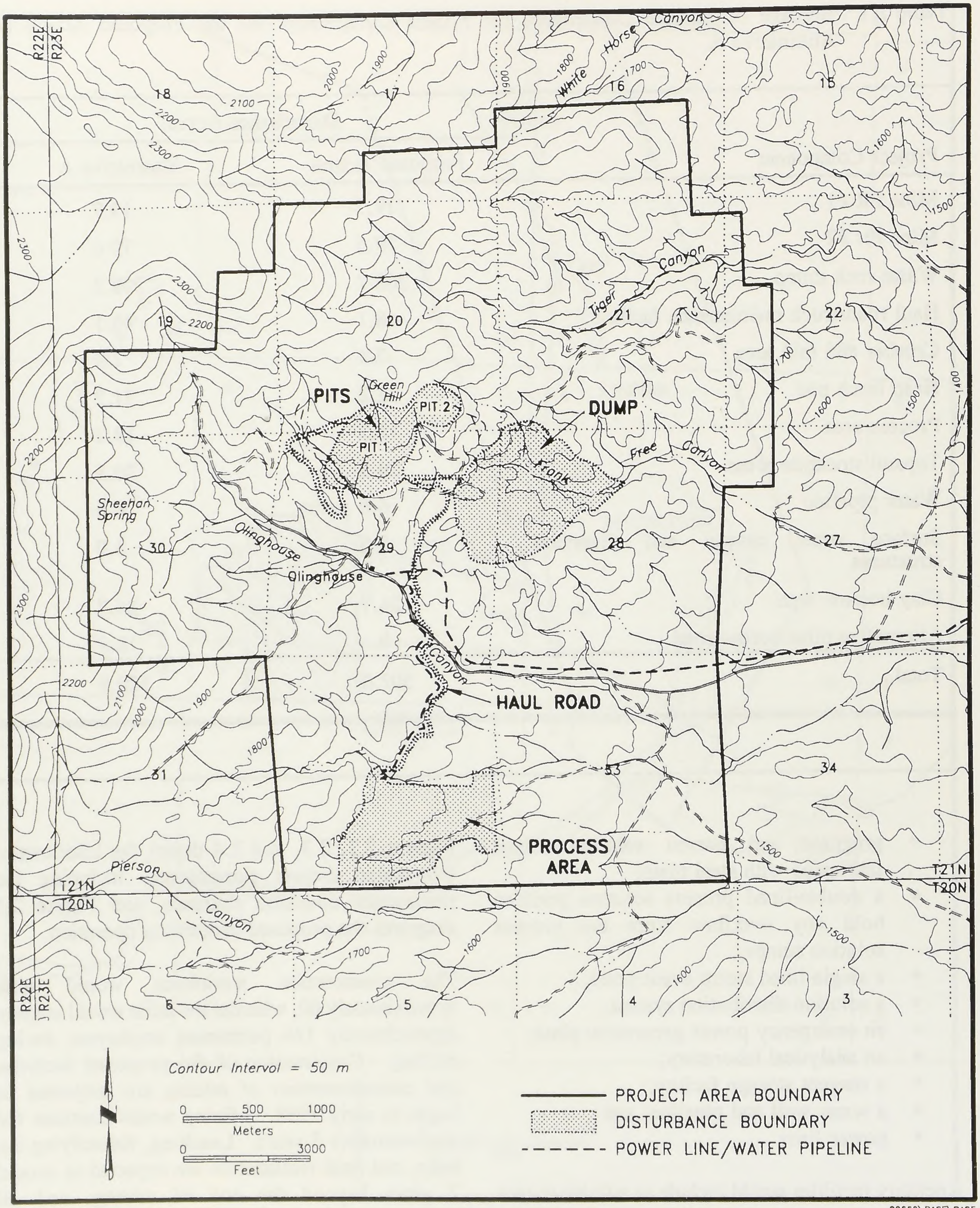


Figure 2.2 Location of Project Components for the Proposed Action (Excluding Access Corridor).

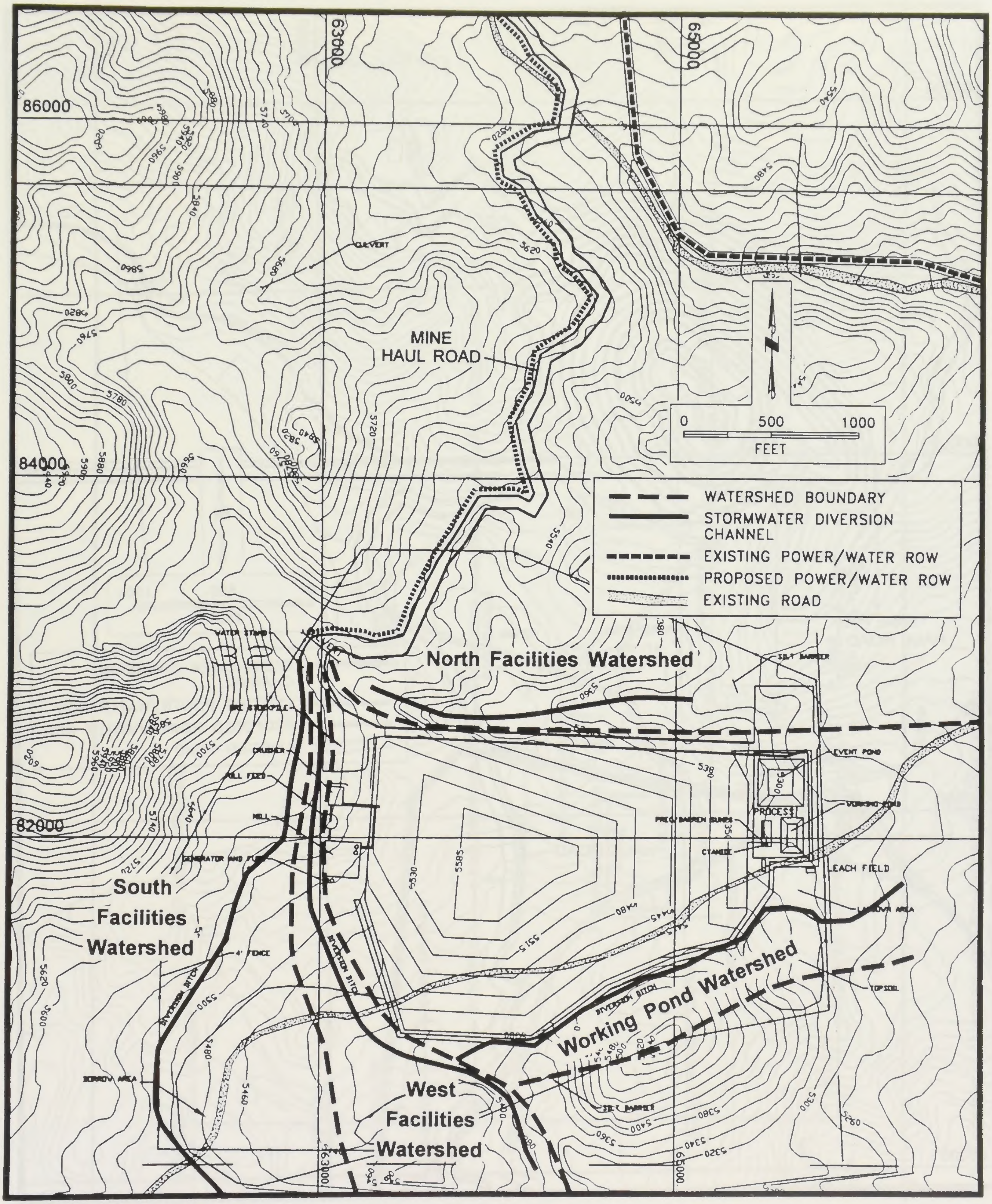


Figure 2.3 Ore Processing Area and Diversion Channels, South Portion of Mine Operations.

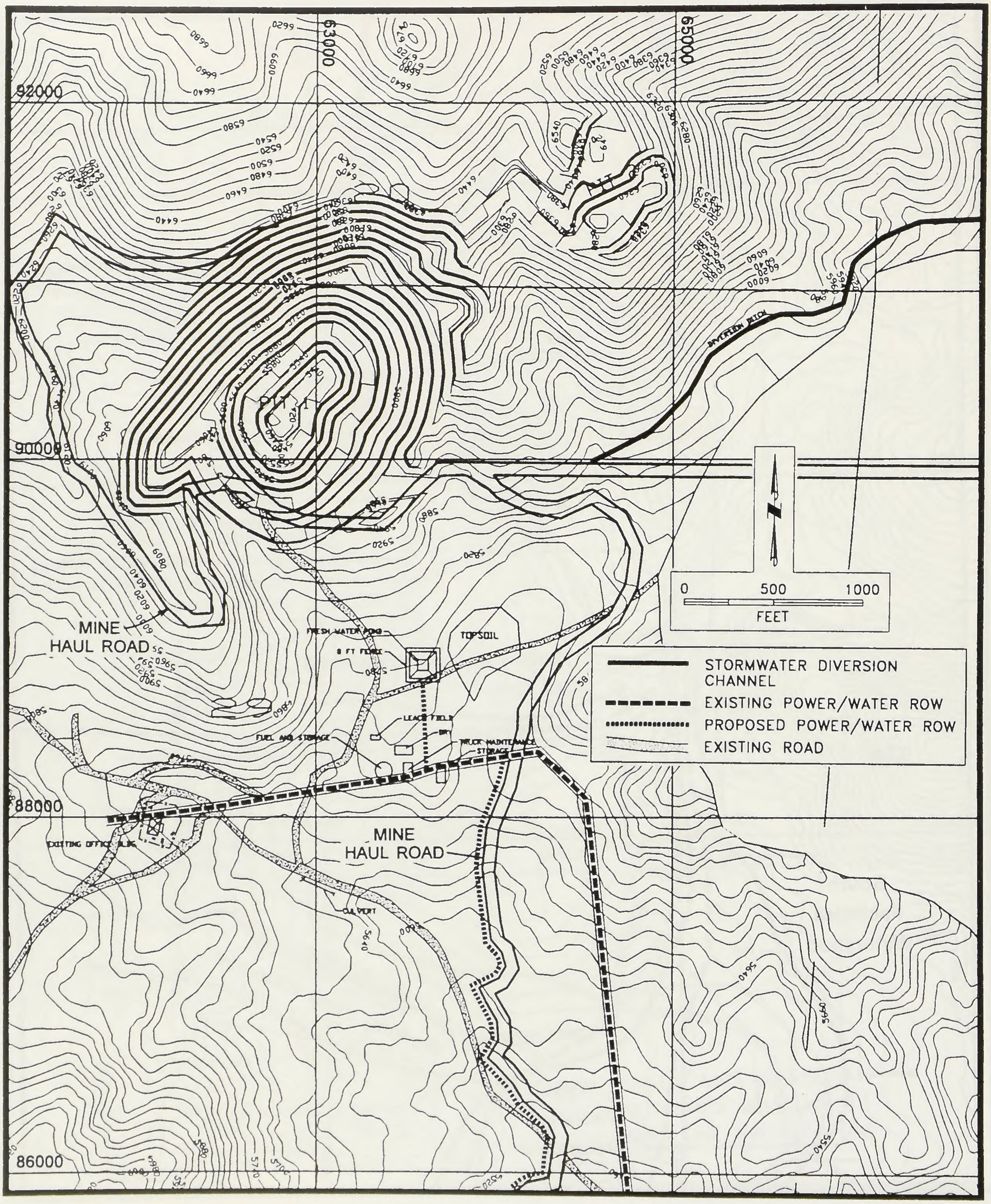


Figure 2.4 Facilities in North Portion of Mine Operations.

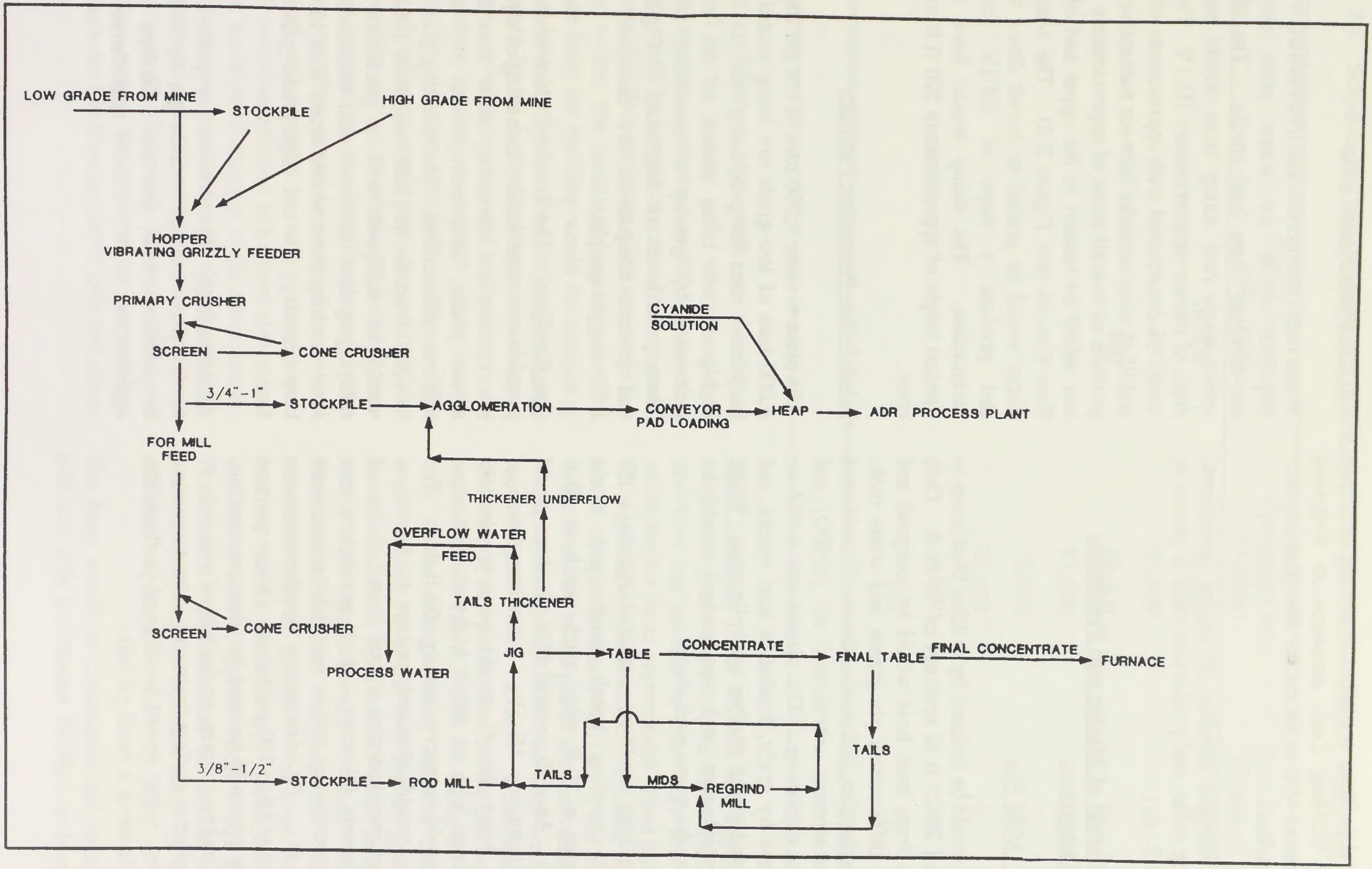


Figure 2.5 Schematic Diagram of Ore Processing Operations.

Structural facilities would be constructed to Zone 4 Unified Building Code standards to withstand intensities of VIII to IX on the *Modified Mercalli Intensity Scale*.

The anticipated schedule of capital investment, operating costs, and production rates is shown in Table 2.2.

2.1.2 Details of Mining and Processing Operations

2.1.2.1 Mine Pits

Mining would be initiated by drilling blast holes to depths of 20-25 ft at spacings of 10-16 ft. Drill cuttings from each hole would be analyzed and used to differentiate ore grades and waste rock. Ore, interburden, and overburden would be blasted using ammonium nitrate/fuel oil (ANFO) and emulsion explosives. The blasted ore would be segregated by grade, loaded in haul trucks, and transported to the crusher stockpile area. Waste rock (interburden and overburden) would be hauled to the waste rock dump.

Active mining would be conducted utilizing a 15- to 20-ft working bench height and would incorporate a 20-ft wide catch bench at 60-ft intervals. As such, overall final pit slope would be approximately 1H:1V. Upon completion of mining, Mine Pit #1 would be approximately 510 ft deep with an 880-ft highwall, and Mine Pit #2 would be approximately 400 ft deep. The two pits would ultimately merge to become a single pit encompassing a total disturbed area of approximately 99 acres. It is anticipated that minor groundwater inflow would be encountered in Pit #1. Pit dewatering requirements are estimated at 10 to 100 gal/minute. Water pumped from the pit could be used for dust suppression, process make-up water, or discharged with little or no treatment to surface drainages. Upon cessation of mining, water would be allowed to flow into the pit, forming a small pit lake.

2.1.2.2 Waste Rock Dump

Waste rock (interburden and overburden) would be disposed of at the waste rock dump by end-dumping from haul trucks. The slope of active waste rock dump faces would be at the angle of repose--approximately 1H:1V. The dump would be constructed with approximate 40-ft lifts and 95-ft wide setbacks between successive lifts to produce an overall slope of approximately 3H:1V and would be located in the upper end of Frank Free Canyon (see Figure 2.2). The waste rock dump would be graded to knock down benches and produce a slope of 3H:1V for final reclamation. The dump would have a final vertical height of approximately 500 ft from toe to crest.

2.1.2.3 Ore Processing Facilities

Alta plans to mine 6,500 tons of ore per day, with 6,000 tons of low-grade ore being routed to the heap leach area for processing and 500 tons of high-grade ore being routed to the mill for processing by gravity concentration methods. These procedures are diagramed in Figure 2.5, and process components are described in the following paragraphs.

Ore Crushing. The crushing plant would be a portable two-stage facility consisting of a primary jaw crusher and secondary cone crusher, two screen plants, and conveyors to the adjacent agglomeration circuit. The crushing plant would be uphill from the mill and heap leach facility and would be equipped with a pneumatic water spraying system to control dust emissions. The same crushing plant would crush both low-grade heap leaching ore and high-grade gravity mill feed.

Agglomeration. The crushed low-grade ore and the dewatered tailings from the gravity mill would be blended with Portland Cement at the agglomerator to form a stable agglomerate.

Table 2.2 Schedule of Capital Investment, Operating Costs, and Gold Production (Cummings 1997c).

Year	Capital Investment ($1,000s)	Operating Costs ($1,000s)	Gold Production (1,000s of oz)
1998	16,800	12,000	60
1999	1,200	25,600	128
2000	400	19,200	96
2001	800	17,600	88
2002		19,600	98
2003		20,000	100
2004		6,000	30
2005		500	0

Milling. Crushed high-grade ore would be conveyed to the gravity mill, which would be designed to treat approximately 500 tons per day. The mill would be housed in a metal building with a concrete slab floor and stem walls to contain any spillage within the building (see Figure 2.3). Drainage from the building would be directed to the lined heap leach pad. Recovery of the coarse gold would be by a gravity circuit consisting of primary grinding, mineral jigs, gravity concentration tables, a regrind mill, and a thickener to dewater the mill tailings. The dewatered tailings would be pumped to the agglomerating circuit, blended with the low-grade ore, and leached on the heap leach pad. The thickener overflow would be pumped to the mill water tank and recycled as mill process water. The mill would be operated as a closed system and no water would be discharged to the environment. The only reagents used in the gravity plant would be a detergent and a flocculent used to promote dewatering in the thickening process. The gold concentrate would be smelted at the refinery producing a *doré bullion* (unparted gold and silver in bars).

Heap Leaching. The crushed and agglomerated heap leach grade ore would be transported by belt conveyer and stacked in 20-ft high lifts with a radial stacker on an impermeable, lined pad. Each lift would have a 30-ft setback, resulting in overall slopes of approximately 3H:1V. Final ore heap height from toe of the pad to crest elevation would be approximately 280 ft and the heap would cover approximately 66.5 acres. Maximum heap thickness at any given point on the pad would be approximately 180 ft. Each lift would be leached with a low strength leach solution containing approximately 0.2 to 0.3 lb of sodium cyanide per ton of solution at a *pH* of 10. Each leach cycle would last approximately 90 days prior to placement of the next overlying lift. The leach solution would be applied to the heap with drip emitters and/or wobbler-type sprinklers at an application rate of approximately 0.003 gpm/ft^2. The solution would percolate through the ore and drain to the pregnant solution sump by gravity, and then be pumped to the ADR plant.

The heap would be constructed and operated as one unit with no internal dividers or berms. It would be lined with 80-mil high-density polyethylene (HDPE) membrane placed on top of a 12-inch thick, compacted, low-*permeability* underliner made of locally obtained silty clay material. The downslope 550 ft of the pad liner would be double rough-sided, 80-mil HDPE for improved frictional resistance. The exposed liner at the downslope peripheral berm would also be lined with the same rough-sided material to improved the footing for workers. The overall grade on the pad would be approximately 8% from the upslope end to the downslope end.

The set-back of the toe of the heap from the inside edge of the upslope and side peripheral berms of the pad would be 17.5 ft, and the set-back from the inside edge of the downslope peripheral berm, alongside the solution collection ditch, would be 31 ft. The HDPE liner between the peripheral berms would be overlain by an 18-inch thick permeable overliner of fine-crushed ore. A drain system consisting of 3-inch diameter, perforated, corrugated, polyethylene pipe to assist gravity flow of solutions to the downslope end of the pad at the solution collection ditch would be contained within the overliner bed.

A clay borrow area would be located just southwest of the heap leach area for use in constructing the leach pad foundation (see Figure 2.3).

Solution Collection and Storage. The solution collection ditch would follow the downslope pad margin on the east side of the pad and along a portion of the south side (Figure 2.6). An 18-inch diameter perforated HDPE pipe would be placed in the bottom of the collection ditch and covered with coarse rock to eliminate exposure of the solution in the ditch except in a small open area where the fluid would transfer to a 10-inch diameter, solid polyethylene pipe that would convey the pregnant solution by gravity downhill to the pregnant solution sump east of the pad. A leak detection system would be installed under the solution collection ditch.

The solution collection ditch would connect to the process piping ditch on the east side of the leach pad and would serve to provide secondary containment for the pregnant and barren solution pipes placed in the bottom of the ditch. The ditch would be sized to carry the *peak flow* from the 100-year, 24-hour storm event on the leach pad. The lower end of the process piping ditch would empty into the double-lined working pond which would have a capacity of approximately 1.33 million gal and would be used to store process makeup water, as well as up to 9.2 hours of full pregnant or barren solution overflow from the process solution sumps. The pond would be fitted with two HDPE liners and a leak detection system between the liners.

The working pond would have a lined overflow ditch to the storm event pond located just downhill. The single-lined storm event pond would have a working capacity of 5.67 million gal to contain the runoff from the pad, ditch, and pond areas resulting from a 25-year, 24-hour precipitation event with the assumption that 100% of the precipitation would contribute to the runoff. The only time this pond would contain leach solution is during a major storm event. It would normally be dry. The combined capacities of the working and event ponds would be sufficient to contain the 25-year, 24-hour precipitation event and a 24-hour pad drain down.

The solution collection pipe from the pad would be connected to a 10,000-gal steel pregnant/barren solution sump (tank) located adjacent to the lower end of the process solution piping ditch. This sump would be divided into two chambers to separate pregnant and barren solutions. An overflow weir from the pregnant to the barren chamber would handle overflow from the pregnant solution system. The barren solution chamber would overflow through an 8-inch HDPE pipe to the working pond.

Solution would be pumped between the sumps, ponds, heap, and process plant at an average rate of 1,200 gpm (maximum of 2,000 gpm). The

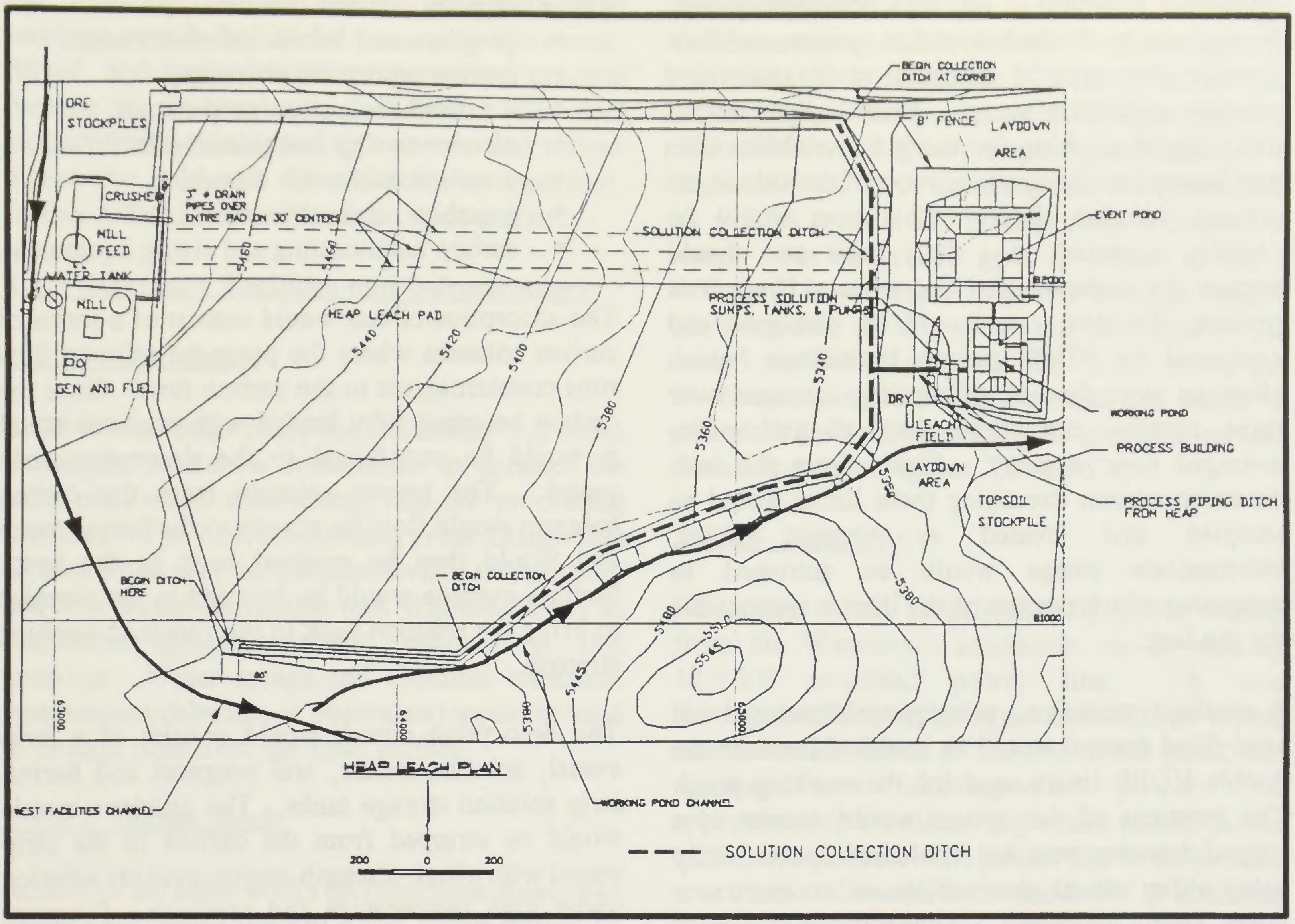


Figure 2.6 Heap Leach Pond and Solution Collection Ditch.

sumps would be kept in rough balance by increasing or decreasing the pumping rate to the heap or to the process plant and adjusting the inflow of fresh water. To replace evaporative losses, the flow of fresh water to the barren pond would average approximately 300 gpm, depending on the season.

The area between the sump and the process building would be underlain with an 80-mil HDPE liner sloped downward toward the working pond to provide spill containment for the solution sump by directing any spills to the working pond. The outer edges of the liner would terminate in a small berm, and the liner edges around the working pond would be welded to the pond liner. This lined area would be covered with fine-crushed rock and the process solution sump would be placed on the rock cover. A liquid cyanide tank and anti-scalant reagent tank would also be located on this lined area.

<u>Leak Detection System</u>. Leak detection systems would be used for both the leach pad and the working pond (JBR 1997). The leak detection system for the leach pad would be contained between the HDPE liner and the underliner. Under the solution collection ditches, a geotextile material would be placed on top of the compacted soil underliner to provide a base for permeable geogrid material. Any liquid leaking through the HDPE liner should flow between the liner and

underliner downhill to this leak detection system, be captured by the leak detection system, and flow through the geogrid material to a sand-filled primary collection sump. Buried pipes would drain liquid reaching the sump to an observation port located on the upper portion of the side of the process solution ditch. This port would be visually inspected on a daily basis and should remain dry under normal operations. If water is present, the flow rate would be measured and compared to NDEP permit limitations (which allow no more than 45 gallons/day averaged over three months, nor more than 15 gallons/day averaged over a year). Flows from the leak detection system exceeding these limits would be sampled and treated as process water. Intermediate sumps would be activated to determine which portion of the liner is responsible for the leak.

A similar system (i.e., using geogrid material and sand-filled sumps) would be installed between the double HDPE liners used for the working pond. The terminus of the system would consist of a capped detection port that would be inspected daily using either visual observations or an electronic water level indicator. Accumulated water in excess of permit limitations for double-lined ponds (in this case, 150 gallons/day averaged over a 3-month period or 50 gallons/day averaged over a year) might be indicative of a leak requiring repair of the liner. If necessary, accumulated water would be pumped from the detection port and treated as process water.

<u>Carbon Adsorption/Desorption/Recovery Plant</u>. The ADR plant would be housed in a metal building erected on a concrete slab with 12-inch high foundation walls designed to contain any spills within the plant. Any spills and wash water would flow to a floor sump and be pumped to the working pond. Drainage from the plant would flow by gravity to the working pond in the event of a power failure.

The ADR plant consists of:

- pregnant and barren solution sumps,
- carbon adsorption columns,
- a carbon desorption/strip circuit,
- *electrowinning* and smelting facilities,
- a carbon acid wash circuit,
- a carbon regeneration kiln, and
- carbon conditioning and sizing equipment.

The adsorption circuit would consist of a series of carbon columns where the pregnant solution flow runs countercurrent to the carbon flow. Once the carbon becomes fully loaded with precious metal it would be transferred to the desorption strip vessel. The barren solution from the carbon columns would flow by gravity to the barren sump and would then be pumped back to the heap. Sodium cyanide would be injected in the pipeline to bring the solution back to the required leaching strength.

The desorption circuit would consist of a strip vessel, solution heater, and pregnant and barren strip solution storage tanks. The precious metals would be stripped from the carbon in the strip vessel with a high-strength caustic-cyanide solution under high temperature and pressure. Pregnant solution containing the precious metals would flow to the pregnant solution storage tank and the electrowinning circuit, whereas the barren carbon would be recycled to the adsorption or carbon reactivation circuit.

The recovery circuit would consist of the electrowinning cell and a propane-fired crucible smelting furnace. Pregnant solution from the desorption circuit would flow through the electrowinning cell where the precious metals would be electrowon (e.g., plated out) on stainless steel wool. The barren solution would then be pumped to the barren strip solution storage tank and recycled as feed for the strip vessel.

As the cathodes in the electrowinning cell load with electrowon metal, they would be pulled and the resulting cathodic sludge containing the precious metals would be removed, dewatered, fluxed, and smelted in the propane-fired crucible furnace to produce a doré bullion. The doré bullion would be shipped to a commercial refiner where the gold and silver would be separated, further refined, and sold on the open market.

2.1.3 Ancillary Facilities and Infrastructure

2.1.3.1 Haul Roads

A 70-ft wide haul road, approximately 3.0 miles in length, would be constructed to connect the mine pits, waste rock dump, and ore processing facilities. The haul road would cross Olinghouse County Road near the historic town of Olinghouse, and Alta would coordinate with Washoe County to implement adequate traffic controls at this crossing. Water sprays and chemical treatment (magnesium chloride, or equivalent) would be used to control dust from the road surface.

2.1.3.2 Access Roads

Access to the mine would be from State Route 447 to the Olinghouse County Road, which would be improved by the addition of a gravel surface from the intersection of State Route 447 to the proposed haul road; however, the road would not be widened. Alta would negotiate with the Pyramid Lake Paiute Tribe for access across Reservation lands. Water sprays and chemical treatment (magnesium chloride, or equivalent) would be used to control dust from the road surface. Mine shift schedules would be arranged so as to avoid mine-related traffic during school hours. Car-pooling would be encouraged.

2.1.3.3 Water Supply

Water for the project would be provided by a well to be located in the SE¼SE¼SE¼ of Section 24, T21N, R23E in the Dodge Flat area (see Figure 2.1). A buried water line would be constructed along an existing right-of-way (ROW) to transport the water to a 1.5 million-gal freshwater pond lined with HDPE and located in the SW¼NE¼ of Section 29, T21N, R23E (see Figure 2.4). The pond would be approximately 200 x 200 ft with 3H:1V slopes approximately 7 ft high and would provide storage for fire protection, as well as process and mining needs estimated to range from about 285 gpm in winter to about 460 gpm in summer, with an average annual pumping rate of 356 gpm. An extension of the water pipeline would be run south from the freshwater pond to the process area and would be placed in the haul road ROW to minimize surface disturbance (see Figures 2.3 and 2.4).

2.1.3.4 Electricity

Electricity would be provided by Sierra Pacific from the Wadsworth substation via an existing 12.5-kV overhead power line. A new aboveground power line approximately 500 ft long would furnish power to the freshwater pond, and another new aboveground power line approximately 1.2 miles long would furnish power to the process area. The power line to the process area would follow the haul road ROW to minimize surface disturbance (see Figures 2.3 and 2.4). Standby emergency power would be provided by skid-mounted diesel generators.

2.1.3.5 Administrative Complex

The administrative complex would utilize an existing shop and parking area in NE¼SW¼ of Section 29, T21N, R23E, and would require no additional disturbance (see Figure 2.4).

2.1.3.6 Equipment Maintenance/Warehouse Building

The mine maintenance shop/warehouse building would be a metal structure erected on a concrete slab approximately 0.25 mile south of the freshwater pond in the SW¼NE¼ of Section 29, T21N, R23E (see Figure 2.4). A graded parking lot would also be located in front of this building.

2.1.3.7 Fuel Storage

The fuel storage area would be located just west of the equipment maintenance/warehouse building (see Figure 2.4) within a 80-mil HDPE-lined bermed area large enough to contain 110% (22,000 gal) of the largest tank. One 20,000-gal aboveground diesel storage tank and one 6,000-gal aboveground unleaded gasoline storage tank would be located within this fuel storage area, as would drums of rock drill oil.

2.1.4 Water Management and Erosion Control

Silt fences, straw bales, and/or sediment control structures would be placed in strategic locations along the diversions and natural drainages to minimize sediment transport. The combined capacities of the working and event ponds would be sufficient to contain the runoff from a 24-hour storm with a 25-year recurrence interval, as well as 24-hour draindown from the heap. The only time the event pond would contain cyanide solution would be during a storm event. The entire process area would be designed for zero discharge.

Sizing of stormwater diversion channels would be based on a design storm of 24-hour duration and 100-year recurrence interval per NAC 445A.433.1.(c). A storm of this magnitude would produce 2.8 inches of rainfall (JBR 1996b). The area around the leach pad, mill, and other process components was divided into four watersheds (North Facilities, South Facilities, West Facilities, and Working Pond) to calculate expected runoff from the design storm for channel sizing (see Figure 2.3). Specific information for each watershed is presented in Table 2.3.

The North Facilities watershed drains into the ravine along the north side of the proposed leach pad area, and the ravine is expected to readily convey runoff from the design storm. Minor storm water diversion ditches would be constructed from the narrow strip north of the pad to this ravine. Location of these ditches would be determined after final grading. They are expected to be less than 1.0 ft deep and less than 1.0 ft wide. The South Facilities watershed lies west of the proposed road leading to the truck maintenance shop and would drain via multiple natural channels to an engineered, rip-rapped channel west of the road that would drain to the south. The West Facilities watershed lies west of the proposed mill and leach pad and east of the proposed road leading to the truck maintenance area. This watershed would drain into a rip-rapped trapezoidal channel around the mill area and the western flank of the proposed leach pad and then southward out of the area. The Working Pond watershed lies east and south of the proposed leach pad. An engineered triangular, rip-rapped channel would collect surface runoff and route it eastward out of the area. During construction, it may become necessary to merge this channel with the West Facilities channel at an elevation of 5,350 ft. If that becomes necessary, the lower portion of the West Facilities channel would be resized to convey the increased flow volume resulting from the merger of the two channels. Design characteristics of these engineered channels are presented in Table 2.4.

A single preliminary alignment of a diversion channel is located to the northwest of the waste rock dump.

2.1.5 Uses, Storage, Transport, and Disposal of Hazardous Materials

Alta would maintain a file containing Material Safety Data Sheets (MSDSs) for all chemicals, compounds, and/or substances which would be used during the course of mining at Olinghouse. The approximate types, quantities, and uses of hazardous and extremely hazardous materials that are projected to be stored at the property are listed in Table 2.5, and the approximate types, quantities, and origin of hazardous and extremely hazardous wastes and by-products that are projected to be produced at the property are listed in Table 2.6.

Table 2.3 Watershed Information for Process Area.

Subbasin	Location	Area (acres)	Curve No. (CN)	Flow Volume (acre-ft)	Peak Discharge (cfs)[1]
North Facilities	North and northwest of pad	787.3	80	72.31	743.07
South Facilities	West of pad and road to truck maintenance shop	65.1	65	2.27	29.28
West Facilities	West of mill and pad	37.1	65	1.29	16.69
Working Pond	East and south of pad	15.6	65	0.54	7.02

[1] cfs = cubic feet per second.

Table 2.4 Engineered Storm Water Channel Information.

Name of Channel	Protects	Design Flow (cfs)[1]	Mean Slope (%)	Flow Regimen	Type	Velocity (fps)[2]
West Facilities	Truck road and mill	29.28	4.75	Super-critical	Rip-rapped trapezoidal	6.34
South Facilities	Mill and west flank of pad	16.96	8.86	Super-critical	Rip-rapped trapezoidal	5.30
Working Ponds	South and east flank of pad and working ponds	7.02	5.83	Super-critical	Rip-rapped trapezoidal	4.84

[1] cfs = cubic feet per second.
[2] fps = feet per second.

Table 2.5 List of Potentially Hazardous/Regulated Materials to Be Utilized and Stored at Olinghouse Mine Site.

Chemical	Maximum Quantity Stored On-site	Consumption per Month	Maximum Delivery Frequency (loads/month)	Use
Ammonium nitrate	80 tons	200 tons	5	Blasting agent
Blasting caps, primer cord and boosters	Variable	Variable	1	Blasting
Gasoline	6,000 gal	5,000 gal	1	Fuel for equipment/ vehicles
Fuel oil (diesel)	20,000 gal	105,000 gal	10	Fuel for equipment/ vehicles and blasting agent
Propane	5,000 gal	4,000 gal	1	Heating fuel for buildings
Motor oil	4,000 gal	2,000 gal	1	Motor lubricant
Hydraulic oil	4,000 gal	1,000 gal	1	Hydraulic fluid
Rock drill oil	220 gal	220 gal	1	Drilling fluid
Solvents	110 gal	55 gal	1	Cleaning
Anti-scalent	7,000 gal	3,500 gal	1	Scale inhibitor for piping
Cement	100 tons	900 tons	24	Ore agglomeration and pH buffering
Sodium cyanide	60,000 lbs	90,000 lbs	3	Reagent used to leach gold
Muriatic acid (Hydrochloric acid)	12,000 lbs	6,000 lbs	1	Acid wash of carbon and equipment
Silver nitrate	5 gal	1 gal	1	Analytical uses
Sodium hydroxide	12,000 lbs	6,000 lbs	1	pH control
Soda ash (sodium carbonate)	250 lbs	50 lbs	1	Processing
Nitre (potassium nitrate)	200 lbs	50 lbs	1	Processing
Borax (sodium borate decahydrate)	500 lbs	100 lbs	1	Processing
Calcium hypochlorite	6,000 lbs	Variable	Variable	Cyanide cleanup and neutralization
Antifreeze (ethylene glycol)	220 gal	110 gal	1	Antifreeze for equipment/ vehicles

Table 2.6 List of Potentially Hazardous By-products and Wastes to be Produced at Olinghouse Mine Site.

Chemical	Maximum Quantity Stored On-site	Production per Month	Maximum Production Frequency (loads/month)	Origin
Slag	2,000 lbs	200 lbs	1 (per year)	Smelter by-product[1]
Lead crucibles	2,000 lbs	100 lbs	1 (per year)	Analytical lab[1]
Mercury	est. 12 oz	--	1 (per year)	Smelter by-product
Waste Oil	10,000 gal	3,500 lbs	1	Vehicles/equipment
Antifreeze waste	440 gal	220 gal	1	Vehicles/equipment

[1] This material would be considered a by-product if it would be recycled into the gravity recovery process. If additional precious metal recovery is not viable from this material, it would be disposed of off-site in an appropriate manner as a waste.

Alta would be responsible for ensuring that all production, use, storage, transport, and disposal of hazardous and extremely hazardous materials associated with the proposed project would be in accordance with all applicable existing or hereafter promulgated federal, state, and local government rules, regulations, and guidelines. All project-related activities involving the production, use, and/or disposal of hazardous or extremely hazardous materials would be conducted so as to minimize potential environmental impacts.

Alta would comply with emergency reporting requirements for releases of hazardous materials. Any release of hazardous or extremely hazardous substances in excess of the reportable quantity, as established in 40 CFR 117, would be reported as required by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended. The materials for which such notification must be given are the extremely hazardous substances listed in Section 302 of the Emergency Planning and Community Right to Know Act (EPCRA) and the hazardous substances designated under Section 102 of CERCLA, as amended.

Alta would prepare and implement several plans and/or policies to ensure environmental protection from hazardous and extremely hazardous materials. These plans/policies include:

- a Monitoring Plan;
- a Spill Prevention Control and Countermeasure Plans;
- Emergency Response Plans;
- inventories of hazardous chemical categories pursuant to Section 312 of the SARA, as amended; and
- a Temporary Closure Plan.

All mining operations must comply with applicable regulations promulgated under the Resource Conservation and Recovery Act, Water Pollution Control Act (Clean Water Act), Safe Drinking Water Act, Toxic Substances Control Act, Mine Safety and Health Act, Occupational Safety and Health Act, and the Clean Air Act. In addition, operations must comply with all attendant state rules and regulations relating to hazardous material reporting, transportation, management, and disposal.

All hazardous materials would be stored in U.S. Department of Transportation-approved containers and all containers would be secondarily contained by basins, tubs, or specified storage buildings. All containers of hazardous materials, by-products, and wastes would be appropriately labeled. All employees working with hazardous materials would be trained in their proper storage and labeling.

Hazardous materials required for the heap leach operation and process plant would include sodium cyanide solution, caustic soda, acids, bases, and solvents. The storage area for cyanide and other reagents would be lined with HDPE and graded to drain to the double-lined working pond in the event of a spill. The ADR plant would be constructed with concrete stem walls and floor to contain potential spills. The plant sumps would flow by gravity to the working pond in the event of a power failure. Gasoline and diesel fuel would be stored in aboveground tanks located in bermed, lined areas sufficient to contain 110% of the tanks' contents in the event of a major spill or tank rupture. Solvents, motor oil, rock drill oil, and lubricants would be stored in their original containers in the maintenance shop or in aboveground tanks in bermed and lined areas. Waste oil, solvents, and waste antifreeze would be stored in aboveground tanks in a bermed lined area until they are shipped off-site for disposal or recycling.

Hazardous materials would be transported via U.S. Department of Transportation-certified hazardous material transporters, who would be expected to follow all applicable regulations, including those related to spills of hazardous materials while on-site or transporting materials to the site. Sodium cyanide would be delivered to the mine by bulk truck in a dry solid form. Caustic soda (sodium hydroxide) would be delivered in bulk as a solid flake. Ammonium nitrate would be shipped in granular form in bins or 100-lb bags. Other materials that would be transported in bulk include diesel, gasoline, and cement. Acids and bases would be transported in concentrated solutions.

Certain precious metal-bearing wastes (e.g., doré furnace slag, crucibles) would be recycled by re-grinding and introduction into the gravity recovery process. Where economic precious metal recovery is not viable, such wastes would be disposed off-site in an appropriate manner. Wastes attributable to vehicle maintenance (e.g., waste oil, used antifreeze) would be transported off-site for recycling and re-use.

2.1.6 Handling and Disposal of Solid Waste

Solid waste produced at the Olinghouse Mine, and which is determined to be nonhazardous, would likely include floor sweepings, shop rags, lubricant containers, welding rod ends, metal shavings, worn tires, packaging material, used filters, and office and food wastes. These Class II solid wastes would be collected in enclosed containers and disposed of at the Lockwood Regional Landfill. Some inert Class III solid wastes, such as wood and concrete, may occasionally be disposed of within the permit boundary in accordance with a NDEP-approved solid waste disposal plan. A NDEP- and Washoe County-permitted sewer system consisting of a septic tank(s) and leach field(s) would be utilized to dispose of sewage. Major lubrication, oil changes, etc., of most equipment would be performed inside the equipment maintenance building, where waste oil would be contained and deposited in a bulk storage tank. The collected waste oil would then be transported off-site for recycling or disposal.

2.1.7 Soil Salvage and Storage

Prior to development of the individual project components, all growth medium would be stripped and salvaged from the areas targeted for disturbance. Topsoil would be stockpiled for future use in site reclamation and seeded with a

BLM-approved seed mixture (see Section 2.1.8) to minimize soil loss from wind and water erosion.

2.1.8 Reclamation

The objective of site reclamation would be to return the area to a condition suitable for premining land uses--mineral development, livestock grazing, and wildlife habitat. The entire disturbed area, with the exception of the interior of the pits, would be topsoiled and reseeded with a BLM-approved seed mixture.

Open pits would be left in their final mining configuration with wall slopes of approximately 1H:1V and 15-ft catch benches at 60-ft intervals. A 5-ft tall safety berm would be constructed around accessible portions of the pit to provide public safety. All roads accessing the pit area would be removed and reclaimed to reduce public access potential, and warning signs would be posted at strategic locations. The equilibrium elevation of the postmining pit lake is estimated to be approximately 5,500 ft, resulting in a 3.4-acre lake approximately 90 ft deep.

The waste rock dump would be graded to an irregular, hummocky surface with outer slopes of approximately 3H:1V. The dump would then be topsoiled, harrowed, broadcast-seeded, and harrowed again. Stormwater diversions would remain in place to divert water around the reclaimed waste rock dumps.

The final closure plan of the leach facility would be coordinated with the NDEP as required by the Nevada Administrative Code (NAC 445.24386). Cyanide detoxification would be accomplished by rinsing the pad with recycled solution and fresh water. The rinse solution would be circulated through the process carbon columns to remove residual metals in the rinse solution, after which it would be evaporated in the working pond where cyanide would continue to break down through natural degradation. Upon completion of rinsing and detoxification operations, the heap would be regraded to approximately 3H:1V slopes, topsoiled, harrowed, broadcast-seeded, and harrowed. The pad would be sized to contain the entire heap following reclamation without pushing any material off the liner. Stormwater diversions would remain in place to divert water around the reclaimed leach pad.

Liquids in the working and storm event ponds would be allowed to evaporate. Alternatively, spray evaporation or land application, or a combination thereof (in accordance with applicable regulatory requirements), may be employed. Remaining sludge in the bottom of these ponds would be tested with both meteoric waters mobility procedures (MWMPs) and toxicity characteristics leaching procedures (TCLPs). If the sludge fails to meet NDEP guidelines, it would be dewatered and removed for disposal in an appropriately licensed facility. If it is determined that the sludge does not pose a threat to groundwater, the liner would be folded in the bottom of the pond and the earthen berms would be pushed in to fill the depression. The surface would then be contoured, topsoiled, harrowed, and broadcast-seeded. The freshwater pond would be reclaimed by folding the liner in the bottom of the pond, pushing the earthen berms in to fill the area, and topsoiling, harrowing, and broadcast-seeding.

All roads within the permit area would be recontoured to approximate original topography with the exception of the main Olinghouse County Road, which would remain in its upgraded configuration. Maintenance of the Olinghouse County Road would revert to Washoe County. Culverts would be removed as the roadways are recontoured, and road surfaces would be ripped, harrowed, broadcast-seeded, and harrowed a second time. Water bars would be employed on recontoured slopes, as deemed appropriate, to divert run-off.

Mining, ore processing, and ancillary facilities and equipment would be dismantled and removed from the property. Concrete foundations and paved slabs would be broken up and covered with at least 2 ft of topsoil. The underground water pipeline and sewer piping would be abandoned in place, as would any underground electrical lines. Overhead power lines constructed specifically for the project would be removed.

Topsoil would be spread to a depth of 4-6 inches over all disturbed areas except the open pits. This topsoiled surface would then be harrowed prior to broadcast seeding. A BLM-approved seed mixture would be applied by broadcast seeding and the areas lightly harrowed to cover the seeds. Anticipated seed mixture and seeding rates are presented in Table 2.7.

2.1.9 Environmental Protection and Monitoring

All mine shafts, portals, *adits*, and tunnels encountered within the pit areas would be sealed or mined away. Prior to sealing or disturbing, a survey would be conducted to determine the presence of bats. If bats are present, but there are no immobile young, the bats would be forced to abandon the shaft. If young immobile bats are present, forced evacuation would be delayed until the young bats can fly. The structure would then be sealed. Shafts, portals, adits, and tunnels located throughout the project area that are not expected to be disturbed would have gates or grates installed to allow access to bats while excluding human entry for safety considerations. The openings of some shafts and adits that would not be affected by mining and which provide bat habitat would be stabilized and grated to exclude human entry.

The entire process area would be fenced with woven wire and barbed wire to keep livestock and wildlife out of the area. The solution ponds, including the fresh water pond, would be enclosed by an 8-ft chain link fence. The working pond would be netted to exclude birds.

Air pollution control measures would be implemented on several sources to control emissions (Table 2.8). Particulate emissions would be controlled using measures such as pneumatic fogging sprays and fabric filters. Water spray at the crusher facility would reduce particulate emissions by an estimated 95%.

The maximum hourly and annual emissions from the Proposed Action are summarized in Tables 2.9 and 2.10, respectively, and assume that measures in Table 2.8 are incorporated to control emissions. Emission rates are based on maximum processing rates, drop points, unloading rates, fuel consumption, or storage tank throughput. The emission factors and equations used to calculate emissions were obtained from: EPA Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources (AP-42); best engineering estimates; and air quality permit application limitations. The primary emissions are PM_{10} from crushing and conveying (Tables 2.9 and 2.10). Criteria pollutants from combustion and petroleum storage tanks are minimal.

A buffer strip consistent with riparian habitat enhancement would be planted along the main access road when the road is within 20 ft (horizontal) of the bankfull channel margin. This buffer strip would ensure that sediment sidecast during road grading would not be delivered directly to the stream channel. A buffer strip may also be needed on the opposite bank of the creek at the base of eroding, currently disturbed hillsides. The planting would consist of a mixture of native grasses, *forbs*, and shrubs or trees. Use of native species would ensure consistency with the Executive Order implementing the Federal Native Plant Conservation Initiative.

Alta would also conduct those environmental *mitigation* measures and monitoring programs specified by the individual regulatory agencies in conjunction with the Air Quality Permit to Operate, Water Pollution Control Permit, Artificial Pond Permit, and Stormwater Discharge Permit. These programs are expected to include the following general provisions:

- air quality and meteorological monitoring on-site and implementation of dust control practices including application of water and chemical sprays on road surfaces and

Table 2.7 Proposed Reclamation Seed Mixture.

Species	Application Rate (lbs/acre)[1]
Basin Wildrye	4.0
Bluebunch Wheatgrass	4.0
Indian Ricegrass	4.0
Pacific Aster	0.5
Munroe Globemallow	0.5
Arrowleaf Balsamroot	2.0
Palmer Penstemon	1.0
Total	16.0

[1] Pure live seed.

Table 2.8 Control Measures and Efficiencies.

Source	Pollutant	Control	Efficiency
Primary Crushing	PM_{10}	Pneumatic Fogging Sprays	95%
Secondary Crushing	PM_{10}	Pneumatic Fogging Sprays	95%
Drop Points	PM_{10}	Pneumatic Fogging Sprays	95%
Cement Silo Loading	PM_{10}	Fabric Filter	98%
Cement Silo Unloading	PM_{10}	Pneumatic Fogging Sprays	95%
Prill Silo Unloading	PM_{10}	Fabric Filter	99%

Table 2.9 Summary of Maximum Hourly Emissions (lbs/hr).[1]

Source	PM_{10}	SO_2	NO_x	CO	VOC
Primary Crushing	1.000				
Secondary Crushing	3.200				
Drop Points	1.600				
Emergency Generator	0.445	4.067	23.148	5.291	0.728
Lime Silo (load and unload)	0.240				
Prill Silo	0.140				
Fuel Storage Tanks					0.139
Misc Diesel Combustion	0.500	0.046	0.705	0.152	0.058
Drying Oven	0.000	0.000	0.010	0.000	0.000
Mercury Retort	0.680				
Gold Melting Furnace	0.110	0.010	0.150	0.020	0.010
Carbon Regeneration Kiln	0.450	0.010	0.150	0.020	0.010
Strip Solution Heater	0.000	0.010	0.150	0.020	0.010

[1] Assumes that control measures and efficiencies in Table 2.8 are incorporated. Source: JBR (1997a, 1997b).

Table 2.10 Summary of Maximum Annual Emissions (tons/yr).[1]

Source	PM_{10}	SO_2	NO_x	CO	VOC
Primary Crushing	3.800				
Secondary Crushing	12.000				
Drop Points	6.000				
Emergency Generator	0.110	1.020	5.790	1.320	0.180
Lime Silo (load and unload)	0.130				
Prill Silo	0.007				
Fuel Storage Tanks					0.610
Misc Diesel Combustion	0.217	0.203	3.087	0.665	0.252
Drying Oven	0.000	0.000	0.010	0.000	0.000
Mercury Retort	0.990				
Gold Melting Furnace	0.160	0.020	0.220	0.030	0.010
Carbon Regeneration Kiln	0.660	0.020	0.220	0.030	0.010
Strip Solution Heater	0.010	0.030	0.430	0.060	0.020

[1] Assumes that control measures and efficiencies in Table 2.8 are incorporated. Source: JBR (1997a, 1997b).

use of pneumatic fogging sprays at the crushing facilities;

- surface water quality sampling and flow monitoring at springs on-site and in Olinghouse Creek downstream from the mining and processing operations;
- groundwater quality sampling and water level monitoring at monitoring wells around the project area; and
- stormwater discharge sampling and analysis around the operations area, including Frank Free Canyon, to ensure compliance with zero discharge.

The Proposed Action is the agency-preferred alternative provided agreement between Alta and the Pyramid Lake Paiute Tribe can be achieved concerning a ROW for that portion of the Olinghouse County Road that crosses Tribal lands.

2.2 ALTERNATIVE A

Alternative A was developed by the BLM and Alta with the goal of reducing or mitigating environmental impacts while meeting project objectives. Alternative A is identical to the Proposed Action except for the components described in detail as being different.

2.2.1 Alternative A - New Mine Access Road That By-passes Wadsworth

Alternative A involves construction of a mine access road to by-pass both the town of Wadsworth and the Pyramid Lake Indian Reservation (Figure 2.7). This would eliminate the need for mine-related truck traffic through Wadsworth and across tribal lands at the east end of the Olinghouse County Road and would require upgrading of 4 miles of dirt and gravel service road along an existing ROW, primarily on private surface. The road would connect with an existing Interstate 80 frontage road. The access road would have a 40-ft wide gravel running surface and would be treated with water and/or a chemical dust suppressant, as necessary. Surface disturbance for this alternative would be similar to the Proposed Action except for the addition of 18.9 acres associated with access road construction. Most of this area has been disturbed previously for pipeline installation. Final reclamation of the road would include narrowing to a two-lane configuration.

2.2.2 Alternatives Considered But Not Analyzed In Detail

Several additional alternatives were considered but not analyzed in detail because they were considered unreasonable, impractical, or outside the scope of this EIS. The topography in the vicinity of the proposed mine limits the availability of potentially usable alternative sites for the process area and waste rock dumps. Alta's early mine planning evaluated placement of the process facilities on the hill adjacent to the open pits. Subsequent construction and engineering constraints determined this site to be not feasible. No new alternative facility sites were suggested during scoping, and the placement of the proposed facilities poses no overriding environmental concerns.

An alternative using two waste rock dumps rather than one was considered. This alternative was dropped from detailed evaluation because it did not noticeably reduce visual impacts and disturbed approximately 10% more surface area.

The alternative of total or partial backfilling of the mine pits with waste rock was eliminated from detailed consideration for three principal reasons: 1) future mining of the pits could occur in the event of higher metal prices and/or new mining technologies, and backfilling may make these future options uneconomical; 2) since pit backfilling during mining would interfere with operations, any backfill material would have to be re-excavated from the waste rock dump and hauled uphill to the pits following mine closure--an economically prohibitive option; and 3) water quality in the pit lake is projected to be of good quality.

A selective waste rock handling plan was considered but eliminated from further analysis because of a minimal amount of acid-generating materials.

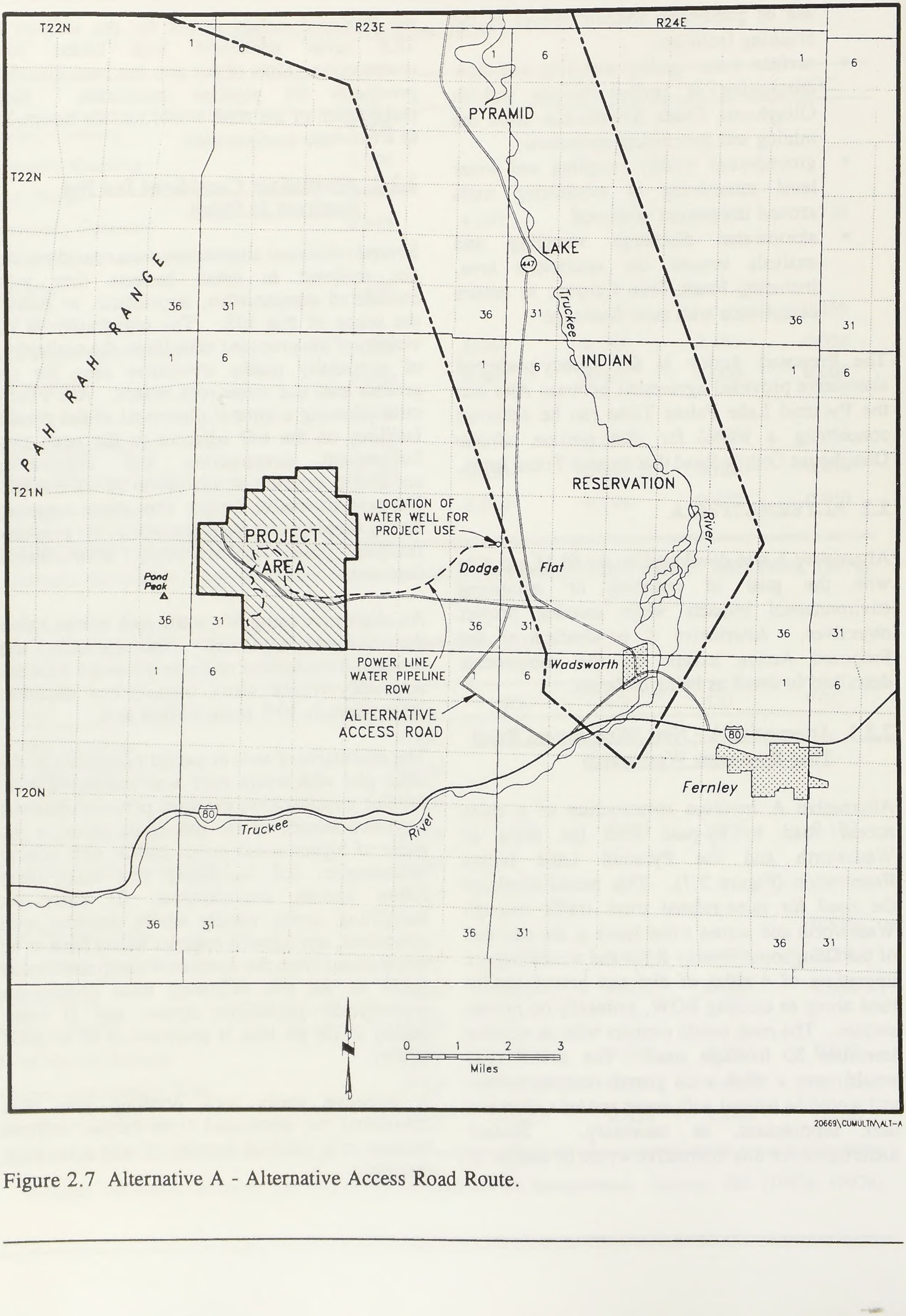


Figure 2.7 Alternative A - Alternative Access Road Route.

Underground mining was also considered. Alta proposes to use open-pit mining, a method that has proven both successful and profitable throughout Nevada for similar ore deposits and is widely utilized and accepted as an economically and environmentally sound method to recover near-surface low-grade minerals. Alternative mining methods were considered unreasonable for this deposit and were not analyzed in detail.

2.3 THE NO ACTION ALTERNATIVE

Under the No Action Alternative, Alta's gold mining Plan of Operations would be rejected and the proposed mining and processing operations would not occur as planned. No additional facilities or construction activity would occur. The currently approved exploration work would continue, and areas disturbed by ongoing and future exploration activities would eventually be reclaimed; however, existing historic mining disturbances would remain in their current condition.

For the purposes of this analysis, the No Action Alternative assumes that none of the action alternatives would be implemented. It should be noted that these lands are not closed to mineral entry and they contain proven ore reserves. The selection of the No Action Alternative in this EIS would not preclude a subsequent Plan of Operations in the same area by the same applicant or by others. However, the No Action Alternative provides a comparison of the environmental consequences of mining these lands versus not mining them.

2.4 SUMMARY COMPARISON OF ALTERNATIVES

Table 2.11 summarizes the environmental impacts for the Proposed Action, Alternative A, and the No Action Alternative.

Impacts associated with alternatives are identified only as they differ from the impacts associated with the Proposed Action. Detailed descriptions and analyses of all impacts are presented in Chapter 4, Environmental Consequences.

Table 2.11 Summary Comparison of Impacts Among Alternatives.

Resources/Issues	Proposed Action	Alternative A (Alternative Access Road)	No Action Alternative
Summary of Disturbance			
Surface disturbance	502 acres	521 acres	None
Acres not reclaimed (open pits, roads)	99.4 acres	99.4 acres	None
Geology and Minerals			
Excavated ore	9.660 million tons	Same as Proposed Action	None
Excavated waste rock	43.385 millon tons	Same as Proposed Action	None
Extracted gold	600,000 oz	Same as Proposed Action	None
Extracted silver	600,000 oz	Same as Proposed Action	None
Seismic risk to structures	Low	Same as Proposed Action	No change from existing conditions
Acid-rock drainage	Negligible	Same as Proposed Action	No change from existing conditions
Subsidence/landslide risk	Low	Same as Proposed Action	No change from existing conditions
Paleontological Resources			
Risk of disturbing important fossils	Low	Same as Proposed Action	No change from existing conditions
Air Resources			
Exceedance of federal and state standards	None	None	None
Water Resources			
Surface water quantity	Reduction in discharge by about 4%	Similar to Proposed Action	No change from existing conditions

Table 2.11 (Continued)

Resources/Issues	Proposed Action	Alternative A (Alternative Access Road)	No Action Alternative
Surface water quality	Increased potential for erosion and sedimentation from 395 acres of disturbance outside the pit, slight potential for hazardous chemical release to surface drainages	Slightly greater than Proposed Action	No change from existing conditions
Groundwater drawdown	Negligible drawdown at the Truckee River; 16.4-ft maximum drawdown at the well	Same as Proposed Action	No drawdown
Groundwater consumption	Pumping of an average annual rate of 356 gpm	Same as Proposed Action	None
Groundwater quality	Slight potential for hazardous chemical release to groundwater	Same as Proposed Action	No change from existing conditions
Pit lake	Water quality generally good with sulfate and TDS slightly above secondary water quality criteria but below background concentrations in groundwater	Same as Proposed Action	No pit lake
Soils			
Topsoil availability	269.2 to 1,172.9 thousand cubic yards; average depth of 5 to 22 inches	308.5 to 1,231.0 thousand cubic yards; average depth of 6 to 23 inches	No disturbance
Vegetation and Wetlands			
Disturbance Area			
Natural communities	337 acres	356 acres	None
Previously disturbed	165 acres	165 acres	No additional disturbance
Seeps/springs/wetlands	1 seep in Frank Free Canyon	Same as Proposed Action	None
Wildlife			
Direct mortality risk	Negligible	Same as Proposed Action	No change from existing conditions

Table 2.11 (Continued)

Resources/Issues	Proposed Action	Alternative A (Alternative Access Road)	No Action Alternative
Displacement	Generally limited to areas of surface disturbance and small buffer area	Same as Proposed Action	No change from existing conditions
Habitat Loss			
Temporary	403 acres	422 acres	None
Permanent	99 acres	99 acres	None
TE&S Species			
Plants	None	None	None
Animals	None	None	None
Fish	Negligible	Same as Proposed Action	None
Range			
Loss of Productivity			
Temporary	19 AUMs	19 AUMs	None
Permanent	4 AUMs	4 AUMs	None
Recreation	Minimal effect	Same as Proposed Action	None
Access and Land Use			
Land Ownership and Use	Minimal effect	Same as Proposed Action	No change from existing conditions
Traffic through Wadsworth			
Construction Phase			
Passenger vehicles	120/day	No change from existing conditions	No change from existing conditions
Trucks	2-12/day	No change from existing conditions	No change from existing conditions
Operational Phase			
Passenger vehicles	228/day	No change from existing conditions	No change from existing conditions
Trucks	2-12/day	No change from existing conditions	No change from existing conditions

Table 2.11 (Continued)

Resources/Issues	Proposed Action	Alternative A (Alternative Access Road)	No Action Alternative
Visual Resources			
Visibility from			
KOP #1	Prominent	Similar to Proposed Action	No change from existing conditions
KOP #2	Prominent	Similar to Proposed Action	No change from existing conditions
KOP #3	Visible but distant	Similar to Proposed Action	No change from existing conditions
Meets VRM class standards	Yes	Yes	Yes
Noise			
Projected noise levels at nearest residence	49 dBA	Same as Proposed Action	No change from existing conditions
Cultural Resources			
NRHP-eligible sites affected	(under review)	Same as Proposed Action	No change from existing conditions
Socioeconomics			
Direct employment			
Construction Phase	60 workers	Same as Proposed Action	No change from existing conditions
Operational Phase	114 workers	Same as Proposed Action	No change from existing conditions
Indirect employment			
Construction Phase	2 workers	Same as Proposed Action	No change from existing conditions
Operational Phase	17 workers	Same as Proposed Action	No change from existing conditions
Local population increase			
Construction Phase	15 people	Same as Proposed Action	No change from existing conditions
Operational Phase	107 people	Same as Proposed Action	No change from existing conditions

Table 2.11 (Continued)

Resources/Issues	Proposed Action	Alternative A (Alternative Access Road)	No Action Alternative
Annual payroll	$3.6 million	Same as Proposed Action	No change from existing conditions
Capital investment	$19.2 million	Same as Proposed Action	No change from existing conditions
Tax revenues	$3.4 million	Same as Proposed Action	No change from existing conditions
Hazardous and Solid Wastes			
Exposure risk in Wadsworth	Low	No change from existing conditions	No change from existing conditions
Contamination risk to ecosystems	Low	Same as Proposed Action	No change from existing conditions

3.0 AFFECTED ENVIRONMENT

This chapter describes the existing conditions of the resources that were identified during the scoping process or interdisciplinary team review as having the potential to be affected. Critical elements of the human environment (BLM 1988) that could be affected by the proposed project include air quality, hazardous and solid wastes, cultural resources, Native American religious concerns, *threatened* or *endangered species*, water quality, and *wetlands/riparian* zones. Four critical elements (areas of critical environmental concern, prime and unique farmland, wild and scenic rivers, and wilderness) are not present in the project area and are not addressed further. In addition to the critical elements of the human environment, this EIS discusses the status and potential effects of the project on geology and mineral resources, soils, paleontological resources, vegetation, wildlife and fisheries, range resources, access and land use, recreation, visual resources, noise, and socioeconomics.

The project area is located in the southeastern Pah Rah Range, in the northwestern *Great Basin*, which includes most of western Nevada. Elevations range from approximately 4,920 ft on the southeastern side of the project area to 7,810 ft along the northwestern side. Vegetation is primarily mountain sagebrush and big sagebrush. The climate is characterized as an arid continental type.

The community of Olinghouse and local mining activity flourished from the late 1890s until late 1907, when low ore grades and the Panic of 1907 brought a halt to local mining operations. Small-scale mining continued intermittently in the district until the gold embargo of World War II (JBR 1995f). More recent mining activities include *placer operations* by Kiewit in the 1980s and exploration activities by Phelps Dodge (1991 to 1994), and later by Alta (1994 to present).

All previous mining activities in the project area have ended and no functional facilities associated with these operations remain, although the general vicinity of the project area contains hundreds of adits, test holes, and other excavations, including a large pit resulting from placer dredging. This placer dredging operation included a pipeline supplying water to the project area from a well on Dodge Flat approximately 4 miles to the east, and both pipeline and well remain in place, although neither are serviceable.

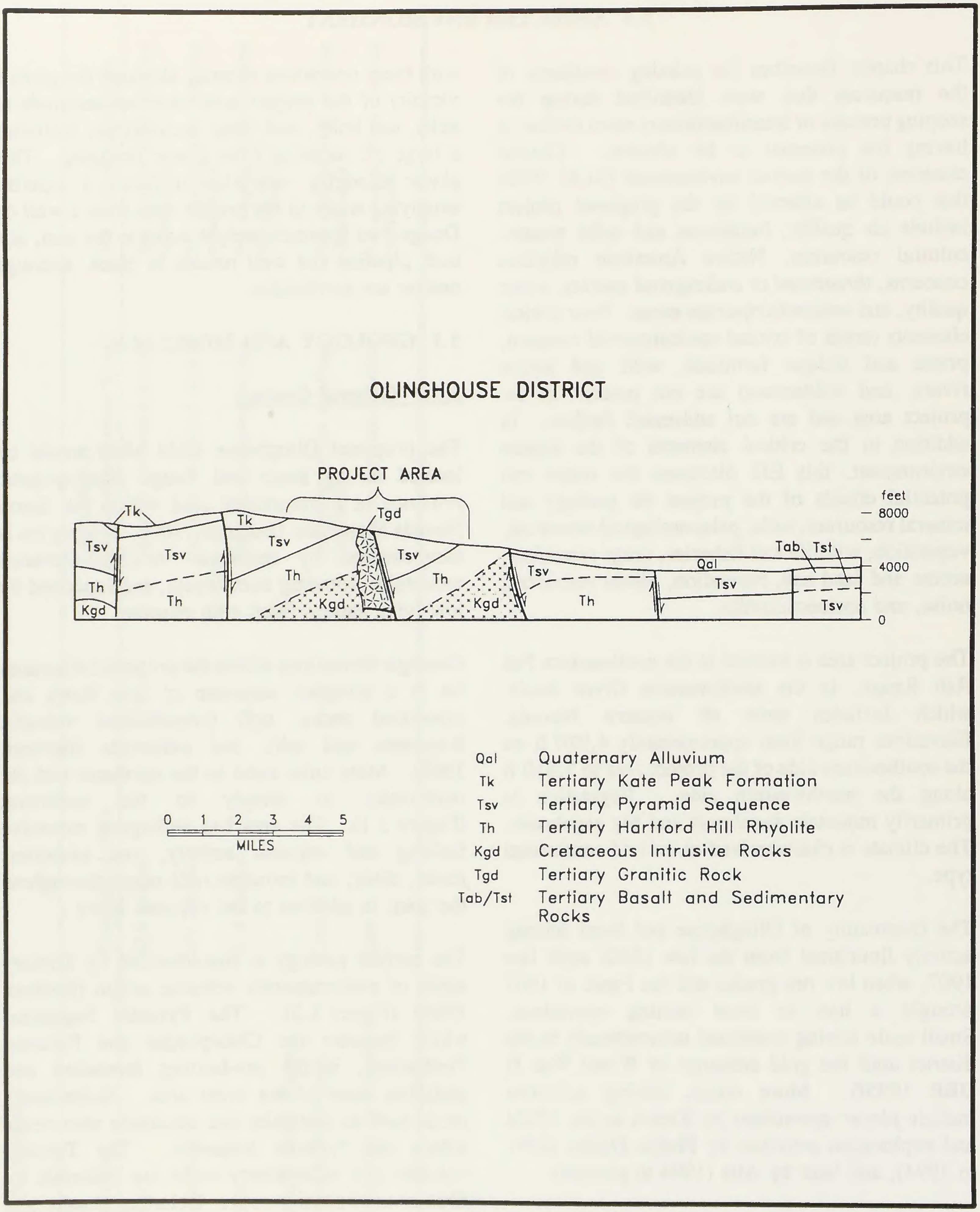
3.1 GEOLOGY AND MINERALS

3.1.1 General Geology

The proposed Olinghouse Gold Mine would be located in the Basin and Range *physiographic province* in a transitional area within the Sierra Nevada Mountains (Bonham 1969). This region is characterized by moderate- to high-elevation mountains, trending north/south, and separated by low-lying valleys filled with *alluvium*.

Geologic formations within the proposed mine area lie in a complex sequence of lava flows and associated rocks, *tuffs* (consolidated volcanic fragments and ash), and sediments (Bonham 1969). Most units trend to the northeast and dip moderately to steeply to the northwest (Figure 3.1). The area has undergone extensive faulting and volcanic activity, and numerous *faults*, *dikes*, and *intrusive rock* occur throughout the area, in addition to the volcanic flows.

The surface geology is characterized by *Tertiary* rocks of predominantly volcanic origin (Bonham 1969) (Figure 3.2). The Pyramid Sequence, which includes the Chlorphagus and Pyramid Formations, is the ore-bearing formation and underlies most of the mine area. *Sedimentary rocks* such as diatomite and sandstone also occur within the Pyramid Sequence. The Tertiary volcanic and sedimentary rocks are underlain by *Cretaceous* intrusive rocks, including granite and granodiorite. Other portions of the project area are underlain by granitic rocks, and the eastern



20669\GEO-XSEC

Figure 3.1 Geological Formations Within the Proposed Mine Area (Bonham 1969).

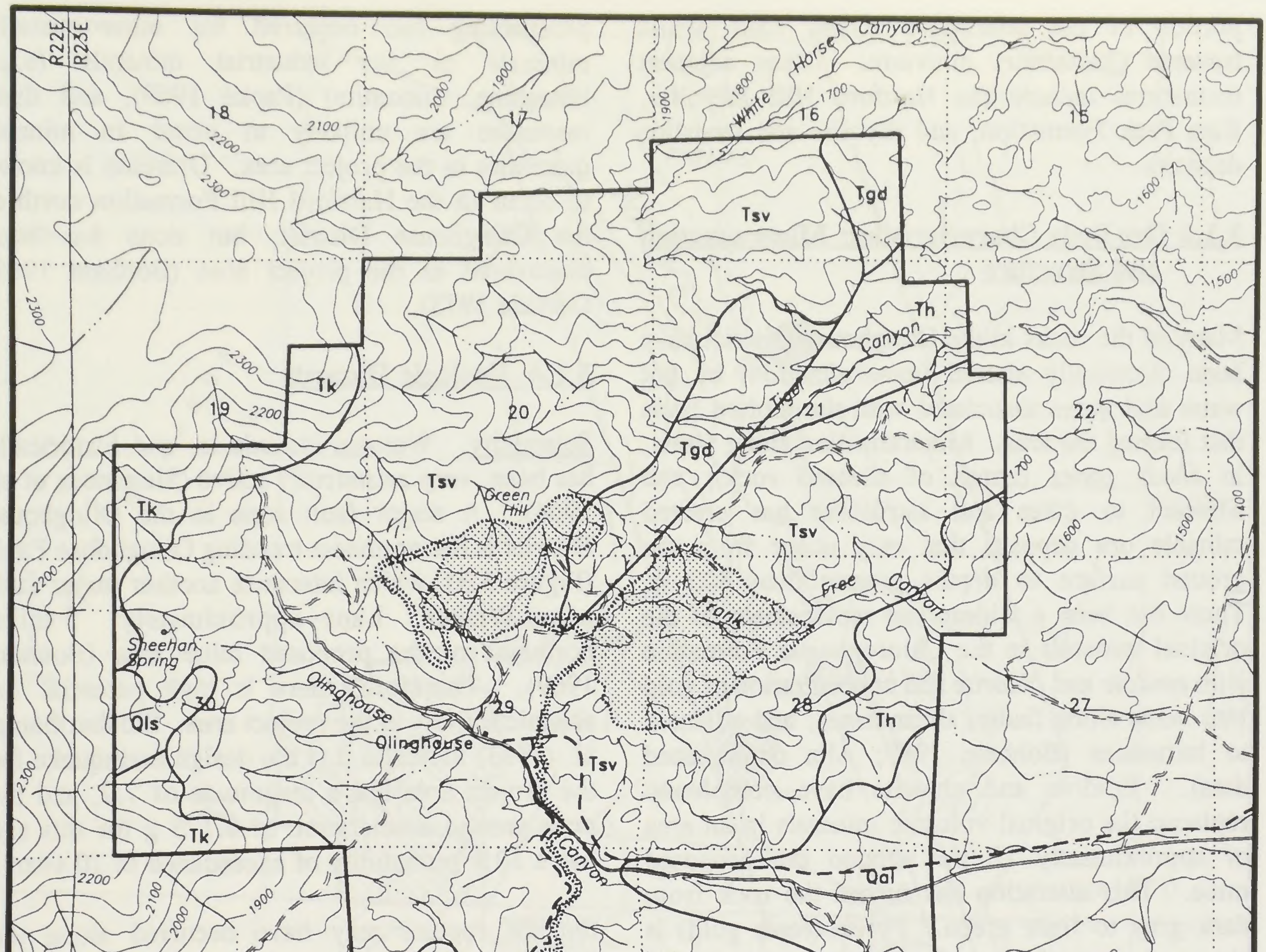


Figure 3.2 Surficial Geology of the Project Area (Excluding Access Corridor) (Bonham 1969).

portion of the alternative access road would traverse *Quaternary* alluvium. Other adjacent formations include the Hartford Hill Rhyolite, Kate Peak Formation, and rhyolite and landslide deposits.

3.1.2 Ore Body Characteristics: Mineralization and Structure

Many of the rocks in the Olinghouse District have been chemically altered (*mineralization*) by hot water and gases associated with the molten lavas that formed the area. Mineralization along faults, in *shear zones* (zones of sheared rock), and adjacent to dikes and intrusions has created minable ore deposits that may occur from the ground surface to depths greater than 800 ft. There has been a widespread replacement of the original minerals in the Chlorophagus Formation with *epidote* and *chlorite* and concentration of gold into veins along faults, shear zones, and adjacent to intrusions (Bonham 1969; Alta unpublished data). Epidote and chlorite have completely replaced the original volcanic minerals in an area of approximately 10 mi^2 around the proposed mine. This alteration has turned the rock from dark gray to light green. Pyrite (fools gold) is also a product of mineralization and comprises 1 to 2% of the altered rocks.

Mineralized ore bodies within the proposed mine area occur in a series of near-parallel structures (Alta unpublished data). Alteration along these northeast-trending sheer zones consists of veins of quartz, adularia (feldspar), and calcite, which also contain minable quantities of native gold (Alta unpublished data). Gold also commonly occurs as free grains in small veinlets.

3.1.3 Other Mineral Resources

Gold and silver are the only known mineral resources occurring within the project area (Papke 1969, 1973). Silver content is low, seldom exceeding 0.1 oz/ton (Alta unpublished data). Coal, oil, and gas do not occur in the area (Garside et al. 1988; James 1996). No prospecting has occurred for other metallic minerals or for industrial minerals (e.g., limestone, diatomite) (Papke 1969), and these resources are unlikely to occur in minable quantities in the project area. Uranium is known to occur in the Hartford Hill Formation north of the Olinghouse District, but none has been discovered in the project area (Bonham 1969; Garside 1973).

3.1.4 Geologic Hazards

Seismicity. Western Nevada is, and historically has been, very *seismically* active (Slemmons et al. 1964). A major fault zone in the Olinghouse District is the northeast-trending Olinghouse Fault (Figure 3.3), which intersects another major fault zone--Walker Lane--approximately 5 miles northeast of the proposed mine area (Bonham 1969). Therefore, there is high potential for seismic activity in the project area. Siddharthan et al. (1993) indicates that the design earthquake for the project area has a magnitude of 7.2, and the peak ground acceleration of 0.175 g for this site has a 10% probability of exceedance in 10 years.

Surface rupture may have occurred along the Olinghouse Fault during a circa 1869 earthquake, which had a magnitude of 6.7 on the *Richter Scale*. Numerous earthquake *epicenters* occur in the vicinity of the proposed mine that have been associated with earthquakes ranging in magnitude from <4.0 to >7.0 (see Figure 3.3) (Slemmons et al. 1964).

Many additional faults occur within and adjacent to the project area (Bell 1984) (see Figure 3.3). The sheer zones associated with ore deposits are not considered active. However, all faults in the area are part of either the Olinghouse Fault or Walker Lane systems and have potential for movement during seismic events.

Landslides. Large landslides occurred in prehistoric times (Bonham 1969; Garside et al. 1996); however, these areas are now quite stable.

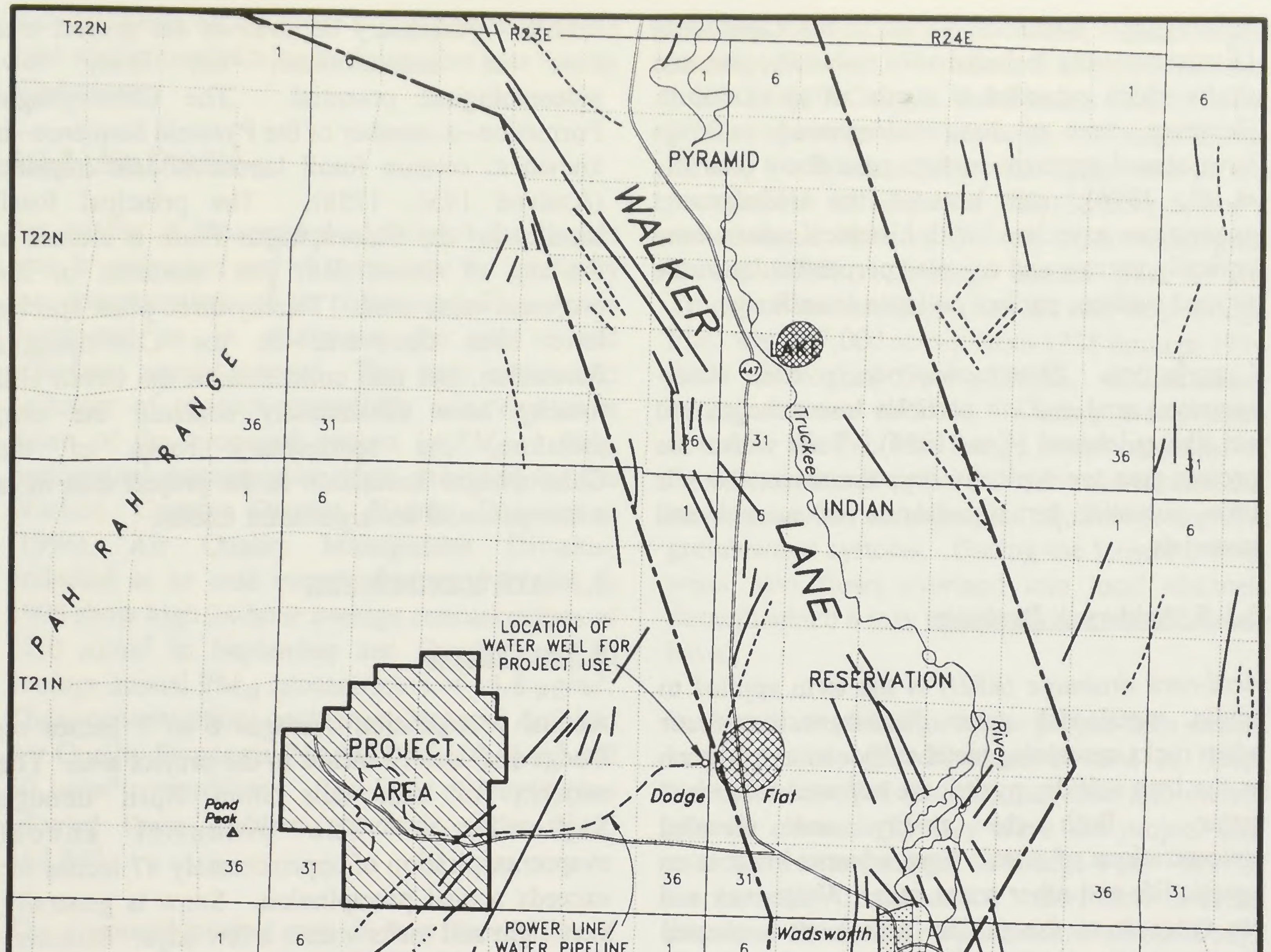


Figure 3.3 Location of Faults, Lineaments, and Earthquake Epicenters in the Vicinity of the Project Area.

Subsidence. Historical mines in the Olinghouse District typically included adits, trenches, pits, and shafts which extended to depths of up to 600 ft. However, none of these underground workings have caused apparent surface *subsidence* (Garside et al. 1996), and because the underground excavations associated with historical mines were typically narrow and oriented perpendicular to the ground surface, surface collapse is unlikely.

Liquefaction. *Liquefaction* occurs when water-saturated sand and silt particles lose strength and act like quicksand (Case 1986). Soils within the project area are typically dry; therefore, there is little potential for liquefaction of natural soil materials.

3.1.5 Acid-rock Drainage

Acid-rock drainage (ARD) is the term applied to acidic, metals-rich water discharges that occur when rocks containing metal sulfide minerals (such as the iron sulfide, pyrite) are exposed to air and water. Both the acidity and elevated concentrations of metals have adverse impacts on aquatic life and other water uses. Waste rock and ore types from the project area were evaluated geochemically in the laboratory to characterize their potential to generate acidic waters, and the potential for ARD during or after mining was found to be negligible (Shepherd Miller, Inc. [SMI] 1997). Potential acid-generating material accounts for approximately 1% of the waste rock and 2.2% of the surface area of the ultimate pit.

3.2 PALEONTOLOGICAL RESOURCES

Paleontological resources are fossils of prehistoric life. Rocks which form under very high temperatures and often high pressures, like volcanic rocks, have no potential to contain significant fossils because the remains and traces of organisms are destroyed by the molten rock; therefore, the Hartford Hill Rhyolite, granitic rocks, rhyolite, and volcanic rocks within the Pyramid Sequence and the Kate Peak Formation in the project area have no potential to contain fossils. Quaternary deposits in the project area have an undetermined, but likely low, paleontological potential. The Chlorophagus Formation--a member of the Pyramid Sequence--is known to contain fossil leaves or leaf imprints (Axelrod 1956, 1958). The principal fossil locality for the Chlorophagus Flora is located at the top of Green Hill just northeast of the proposed mine area. Twenty-three plant species have been discovered in the Chlorophagus Formation, and past collections at the Green Hill locality have substantially depleted the site; therefore, the sedimentary rocks of the Chlorophagus Formation in the project area have a low potential for significant fossils.

3.3 AIR RESOURCES

3.3.1 Climate

Annual precipitation averages 6 to 7 inches on Dodge Flat and 12 inches in the project area. The majority of rain falls from April through September. The potential annual evapotranspiration of approximately 47 inches far exceeds annual precipitation. Snow is generally very light and melts within a few days. Summers are characteristically hot (average summer temperature of 68°F), and winters are cold (average winter temperature of 34°F). Wind speeds average less than 7 miles per hour (mph), with prevailing winds from south to north in a clockwise direction (Soil Conservation Service [SCS] 1975, 1983).

Temperatures tend to rise rapidly after sunrise, remain fairly high during the day, and drop quickly after sunset. Daily temperature fluctuations of 50°F are not uncommon. Wadsworth, at an elevation of 4,200 ft, receives average annual precipitation of 5.9 inches, 60% of which falls in October and November (SCS 1975; Desert Research Institute 1996). Slightly less than 10% of the mean annual precipitation falls as snow. The project area, which ranges in elevation from 5,000 to more than 7,000 ft, receives an estimated 12 inches of precipitation each year, and snowfall likely accounts for a larger fraction of the total winter precipitation in the project area than in Wadsworth.

3.3.2 Air Quality

Air quality in the general vicinity of the project area is very good and characterized by relatively low concentrations of air pollutants. The area is designated as in attainment for all criteria pollutants except ozone. The only anticipated pollutant of concern potentially occurring as a result of the proposed project is *PM_{10}*. PM_{10} background concentration data provided by the Washoe County District Health Department (1996), Air Quality Management Division, collected at an area outside Sparks, Nevada, in 1995 show high 24-hour average concentrations of 37.0 $\mu g/m^3$ in September and October and an average annual PM_{10} concentration of 15.8 $\mu g/m^3$. These concentrations compare to National Ambient Air Quality Standards (NAAQS) of 150 $\mu g/m^3$ and 50 $\mu g/m^3$, respectively. The State of Nevada has adopted these *ambient* standards under NAC 445.843.

The proposed project area is in a Prevention of Significant Deterioration (PSD) Class II area, which allows for moderate growth and some degradation of air quality.

3.4 WATER RESOURCES

3.4.1 Surface Water

The watershed that includes the project area drains to the Truckee River approximately 14 miles upstream of Pyramid Lake, the terminus of the Truckee River basin, and encompasses parts of five named watersheds (White Horse Canyon, Tiger Canyon, Frank Free Canyon, Olinghouse Canyon, and Pierson Canyon) and one unnamed watershed between Olinghouse Canyon and Pierson Canyon (Figure 3.4). All but the White Horse and Pierson Canyon watersheds merge just above Gardella Canyon on Dodge Flat--a broad *alluvial* fan east of the Pah Rah Range--before entering the Truckee River. White Horse Canyon joins the Truckee River about 2 miles downstream from Gardella Canyon, and Pierson Canyon about 2 miles upstream of Wadsworth. Average annual flow of the Truckee River near Wadsworth for the period 1918 to 1993 was 268,133 *acre-ft*, for a mean annual flow of 370 cfs (U.S. Geological Survey 1996). Average annual flow of the Truckee River at Nixon (downstream from Dodge Flat) was 357,000 acre-ft from 1958 through 1994 (U.S. Geological Survey 1996), with a mean annual flow of 493 cfs. During precipitation events in the Pah Rah Range, water in excess of the evaporation potential infiltrates the surface and *recharges* either local perched aquifers or regional groundwater systems. During the largest events, water also flows overland into local channels through which it may eventually reach the Truckee River.

Surface water drainage in the project area occurs as entrenched, gravel-bedded streams in steep, bedrock-controlled canyons that open into *incised alluvial channels* as they leave the project area near the western margin of Dodge Flat. Beyond the mountain front, surface waters flow in broad dispersed channels or by sheetflow across Dodge Flat before entering an incised canyon--Gardella Canyon/Gardella Wash--and the Truckee River. Stream channels on Dodge Flat are wider, have lower gradient, exhibit a dispersive pattern of flow typical of alluvial fans, and are conducive to infiltration of surface water through the streambed. Defined channels are locally indistinct and discontinuous, indicative of the low frequency of surface water flow across Dodge Flat.

Seventeen seeps/springs sites have been identified within the project area (JBR 1995b; SMI 1997). Twelve are located in the Olinghouse Canyon drainage, one in Frank Free Canyon, three in the Tiger Canyon drainage, and one in the upper portion of the White Horse Canyon drainage (Figure 3.5). All had flow rates of less than 40 gpm (0.09 cfs). Surface water samples collected between May 1995 and April 1997 from 15 of the seeps/springs had *total dissolved solids*

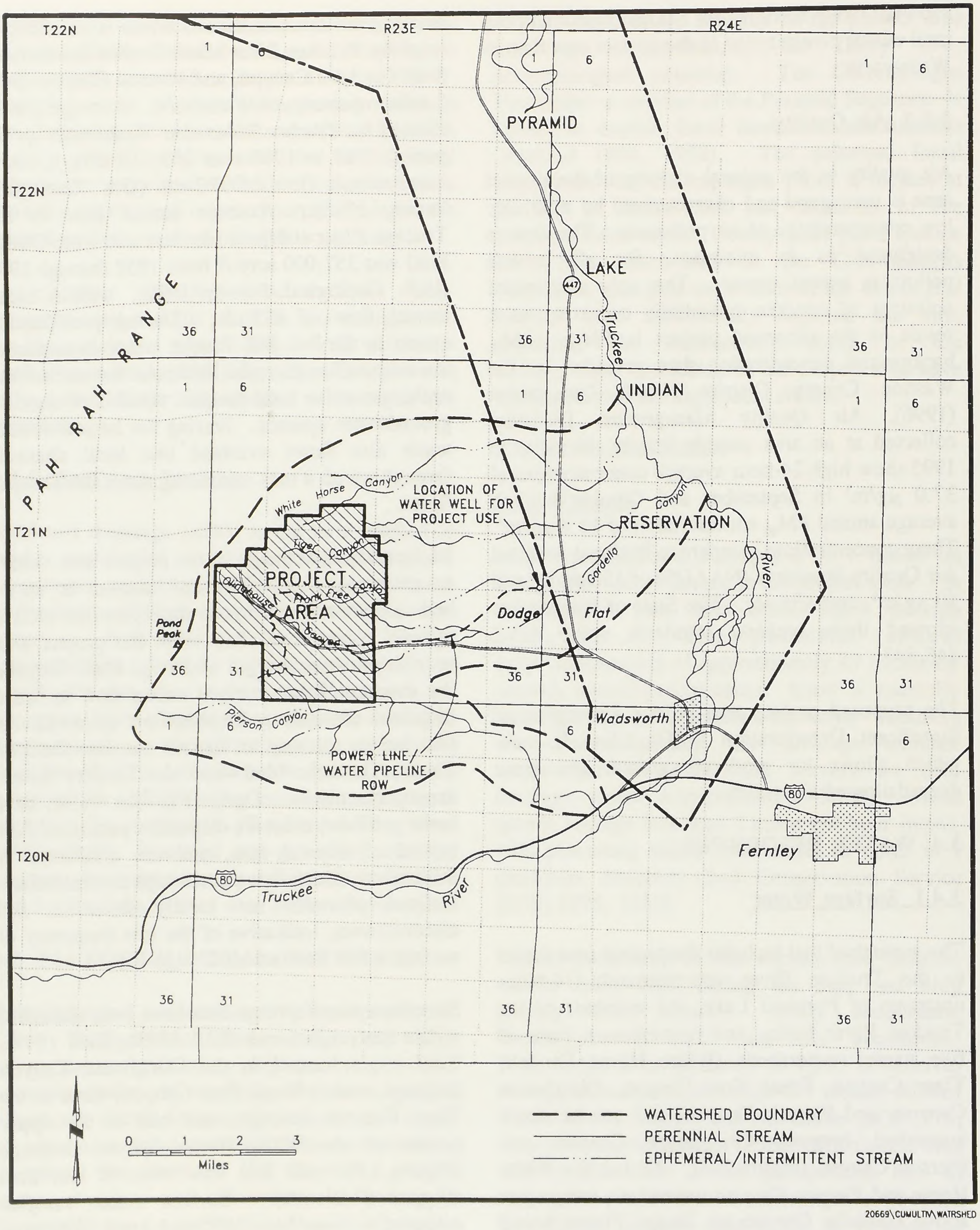


Figure 3.4 Watersheds in the Vicinity of the Project Area.

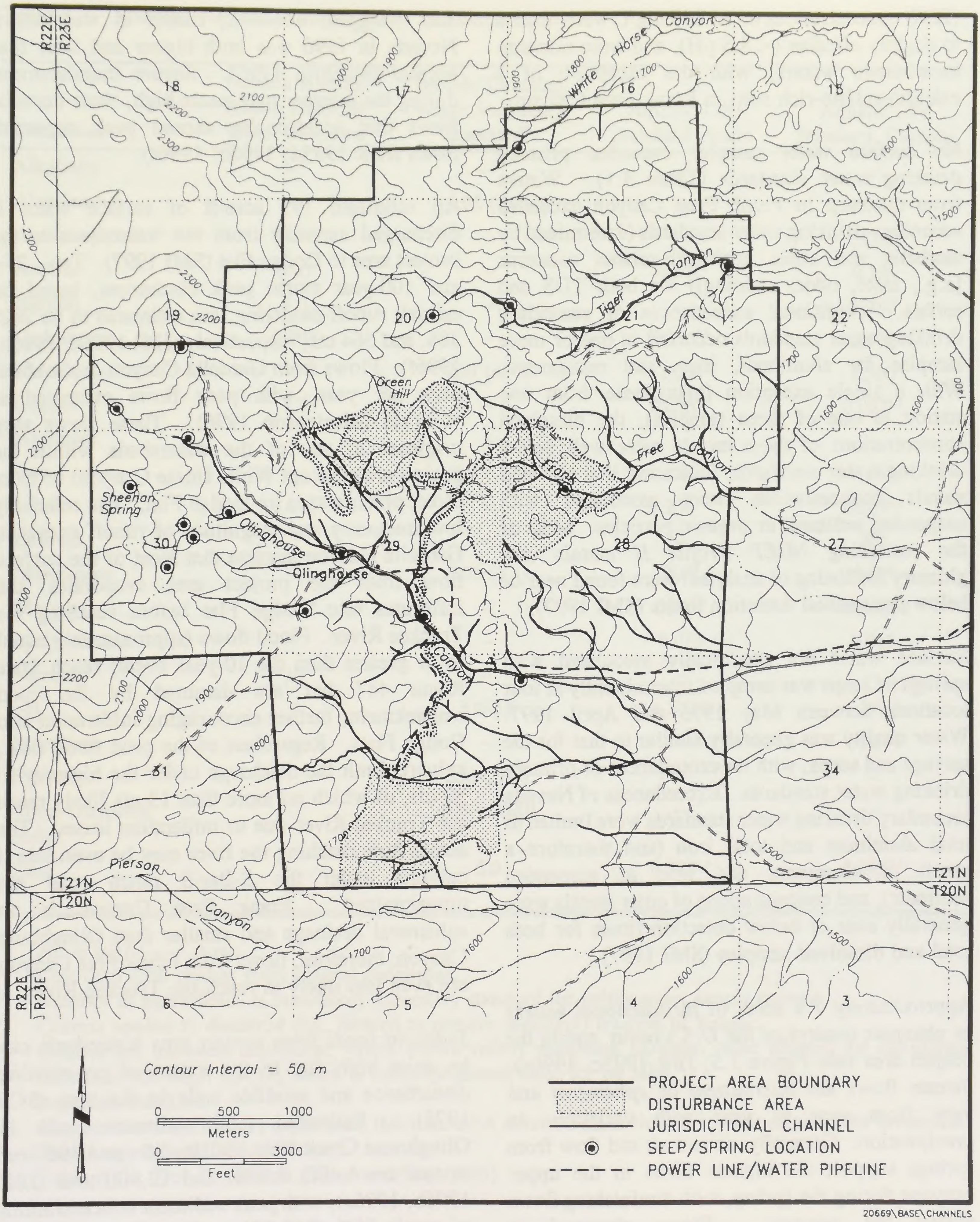


Figure 3.5 Location of Seeps/Springs and Jurisdictional Waters in the Project Area (Excluding Access Corridor) (JBR 1995b, 1995c, 1996a; SMI 1997).

(TDS) concentrations of 76-843 mg/l, were neutral to slightly *alkaline* (<8.5 pH), and were calcium-bicarbonate waters, with the exception of a calcium-sulfate-rich seep in Frank Free Canyon.

No surface water samples exceeded primary drinking water standards (Table 3.1). Waters from the seep in Frank Free Canyon exceeded secondary drinking water standards (determined by aesthetic and other nonhealth-related concerns [e.g., taste, odor, staining]) for both TDS and sulfate. Additional exceedances of secondary drinking water standards occurred in one or more samples for aluminum, iron, and manganese. With a single exception (manganese from one station in one of three samples), the dissolved concentrations of these metals were well below drinking water standards, indicating that elevated metals concentrations were associated with suspended sediment or organic particles. Most of the remaining *NDEP Profile II metals* (see glossary for listing of analytes) were found near or below the method detection limits (SMI 1997).

Surface water not specifically associated with springs or seeps was sampled intermittently at four locations between May 1996 and April 1997. Water quality was generally similar to that for the springs and seeps, with no exceedances of primary drinking water standards. Exceedances of Nevada secondary drinking water standards were limited to total aluminum and total iron (and therefore a result of aluminum and iron in suspended sediment), and concentrations of other metals were generally near or below detection limits for both total and dissolved samples (SMI 1997).

Approximately 7.8 acres of *jurisdictional waters* or channels (*waters of the U.S.*) occur within the project area (see Figure 3.5; JBR 1995c, 1996a). Stream flows are *intermittent* or *ephemeral* and vary from year to year with variations in precipitation. Generally, snowmelt and flow from springs support the highest flows in the upper canyons during the spring, with diminishing flows during the summer. Flows observed in Olinghouse Creek in late July 1996 ranged from 1 to 10 gpm; however, runoff in west-central Nevada in 1996 was both higher and later than normal (Sulahria 1996). Severe thunderstorms during the summer may cause high, short-duration flows that occasionally exceed peak snowmelt flows (JBR 1995d, 1996b, 1996f).

An estimated 195 acre-ft of surface water is discharged annually from the watersheds in the project area to Dodge Flat (SMI 1997). Ten-, 25-, and 100-year storm peak discharges, based on rainfall runoff modeling, are estimated to be 202, 386, and 564 cfs, respectively (JBR 1995d, 1996b, 1996f). Flows from Gardella Canyon occur about once per year, with peak flows estimated at <20 cfs (Mortenson 1996). These flows may originate in any of the watersheds within the project area (except White Horse Canyon) or from direct precipitation on Dodge Flat. The relatively low frequency and magnitude of runoff events in Gardella Canyon suggest that most of the surface flow from the project area evaporates and infiltrates into Dodge Flat before reaching the Truckee River. Flood flows (approximately equal to or greater than the 10-year event) reach State Route 447 but are dammed by the road embankment, further encouraging infiltration into Dodge Flats. Regardless of the peak flood flow, culverts limit the discharge under the highway to 30 cfs, of which no more than 13 cfs likely reach the Truckee River due to infiltration losses. The actual flow reaching the river may be even less if culverts under the S-Bar-S ranch road are unmaintained. Frank Free Canyon is an ephemeral drainage and smaller than Olinghouse Canyon; therefore, flows from Frank Free Canyon are even less likely to reach the Truckee River.

Sediment loads from project area watersheds can be quite high due to the extent of pre-existing disturbance and erodible soils in the area (SCS 1975). Estimated total sediment loads in Olinghouse Creek from the 10-, 25-, and 100-year storms are 4,400, 8,600, and 12,900 tons (JBR 1996b, 1996c), with peak sediment concentrations of nearly 25% (245,000 mg/l). These sediments are deposited primarily near the mouth of

Table 3.1 Selected Nevada Water Quality Standards.[1]

Constituent	Nevada Human Health Drinking Water Standard	Nevada Drinking Water Secondary Standard[2]	Aquatic Life Standard, Acute	Aquatic Life Standard, Chronic
Alkalinity	--[3]	--[3]	--[3]	--[3]
Aluminum	--	0.05 (0.2)	--	0.087[7]
Antimony	0.006	--	--	0.030[8]
Arsenic	0.05	--	0.342[4]	0.18[4]
Barium	1.0	--	--	0.004[9]
Cadmium	0.005	--	0.016[4,5]	0.003[4,5]
Chloride	--	250 (400)	1,500	1,500
Copper	1.3	--	0.056[4,5]	0.033[4,5]
Hardness	--	--	--	--
Iron	--	0.3 (0.6)	1.00	1.00
Lead	0.015	--	0.238[4,5]	0.005[4,5]
Lithium	--	--	--	82[9]
Manganese	--	0.05 (0.1)	200[6]	0.08[9]
Mercury	0.002	--	0.002[4]	0.000012
Molybdenum	--	--	0.019	0.019
Nitrate	10	--	--	--
pH	--	5.0-9.0	6.5-9.0	6.5-9.0
Strontium	--	--	--	1.5[9]
Sulfate	--	250 (500)	--	--
Total Dissolved Solids	--	500 (1,000)	--	--
Zinc	--	5.0	0.322[4,5]	0.292[4,5]

[1] All in mg/l; -- = none.
[2] Less than 25% change from natural conditions.
[3] Number in parentheses is mandatory secondary standard for public water supply systems.
[4] Criteria applies to dissolved (i.e., filtered to remove sediment) fraction of sample.
[5] Criteria are hardness dependent; values shown reflect maximum hardness value allowed for calculating criteria of 400 mg/l $CaCO_3$, which is below predicted value for pit lake.
[6] Irrigation standard.
[7] Aluminum standard is pH dependent; this is an EPA criterion since Nevada has not standard for aluminum.
[8] This is a proposed EPA criterion.
[9] Value is the Tier II criterion (Suter and Tsao 1996).

Olinghouse Canyon on active portions of the alluvial fan. More fine-grained sediments likely reach State Route 447 during flood flows (at substantially lower sediment concentrations) and settle out on the west side of the embankment. A relatively small quantity of sediment may reach the Truckee River. Both the modern alluvial fan at the lower end of Gardella Canyon and the slightly coarser sediments in the Truckee River just downstream from the mouth of Gardella Canyon are indicative of these high sediment loads (Gregory 1982).

Seven sediment samples collected in the watershed above Gardella Canyon were tested to determine levels of nine metals commonly present at elevated concentrations in areas associated with mineralized zones in Nevada (PTI Environmental Services 1996). Antimony, cadmium, lead, mercury, and selenium were found at concentrations below their respective analytical detection limits, whereas arsenic, copper, and zinc were generally either below the median levels in soils and sediments in the western U.S. or slightly elevated (Shacklette and Boerngen 1984). Manganese concentrations were all elevated, as would be expected near mineralized areas such as Olinghouse Canyon.

3.4.2 Groundwater

Two principal groundwater-bearing systems occur in the vicinity of the project area: 1) groundwater underlying the project area stored in a fractured volcanic bedrock *aquifer* system; and 2) groundwater underlying Dodge Flat (down-gradient from the project area) stored in basin fill material. Based on the Nevada State Engineer's water rights database, two wells occur within the project area, and numerous wells occur in Dodge Flat between the project area and Wadsworth (Figure 3.6). These are discussed further in Section 3.4.4.

3.4.2.1 Volcanic Bedrock Aquifer

Hydrology. Groundwater within the project area is found in fractures within the bedrock (i.e., volcanic flows and ash-flow tuffs of the Pyramid sequence and intrusive gabbro and granite rocks). Hydraulic properties of fractured-rock systems are a function of the degree of fracturing, fracture orientation, and connectivity between fractures (Domenico and Schwartz 1990), making such aquifer systems extremely difficult to characterize.

Five monitoring wells and one *piezometer* were installed in the vicinity of the proposed Mine Pit #1 to define the aquifer properties in this portion of the project area. These wells intercepted the regional groundwater aquifer. Static water levels measured in early March 1997 indicated that the groundwater level ranged from 71 to 179 m (233 to 588 ft) below the ground surface. The hydraulic gradient in the vicinity of Mine Pit #1 is 0.32 m/m, with flow directed to the southeast (Figure 3.7). Assuming that the water level measured in Borehole OH-213 near the process area represents the same regional aquifer, the gradient decreases between the pit area and the project area boundary to approximately 0.05 m/m. Based upon differing water chemistry (described below), the springs and seeps are considered to originate from perched groundwater (SMI 1997). It is unclear if the range-front fault to the east of the project area affects groundwater flow to Dodge Flat.

The bedrock aquifer in the project area is recharged by infiltration following snowmelt and rainfall. PTI (1997) estimated recharge for the portion of the east range of the Pah Rah Range bordering Dodge Flat to be approximately 1,900 acre-ft/year. Recharge within the project area was estimated at 350 acre-ft/year using the Maxey and Eakin (1949) method. A portion of the infiltrating water reaches groundwater systems and may subsequently be discharged to surface water systems such as Olinghouse Creek. As previously stated, the annual average discharge of surface water from the project area is approximately 340 acre-ft/year (JBR 1995c, 1996c).

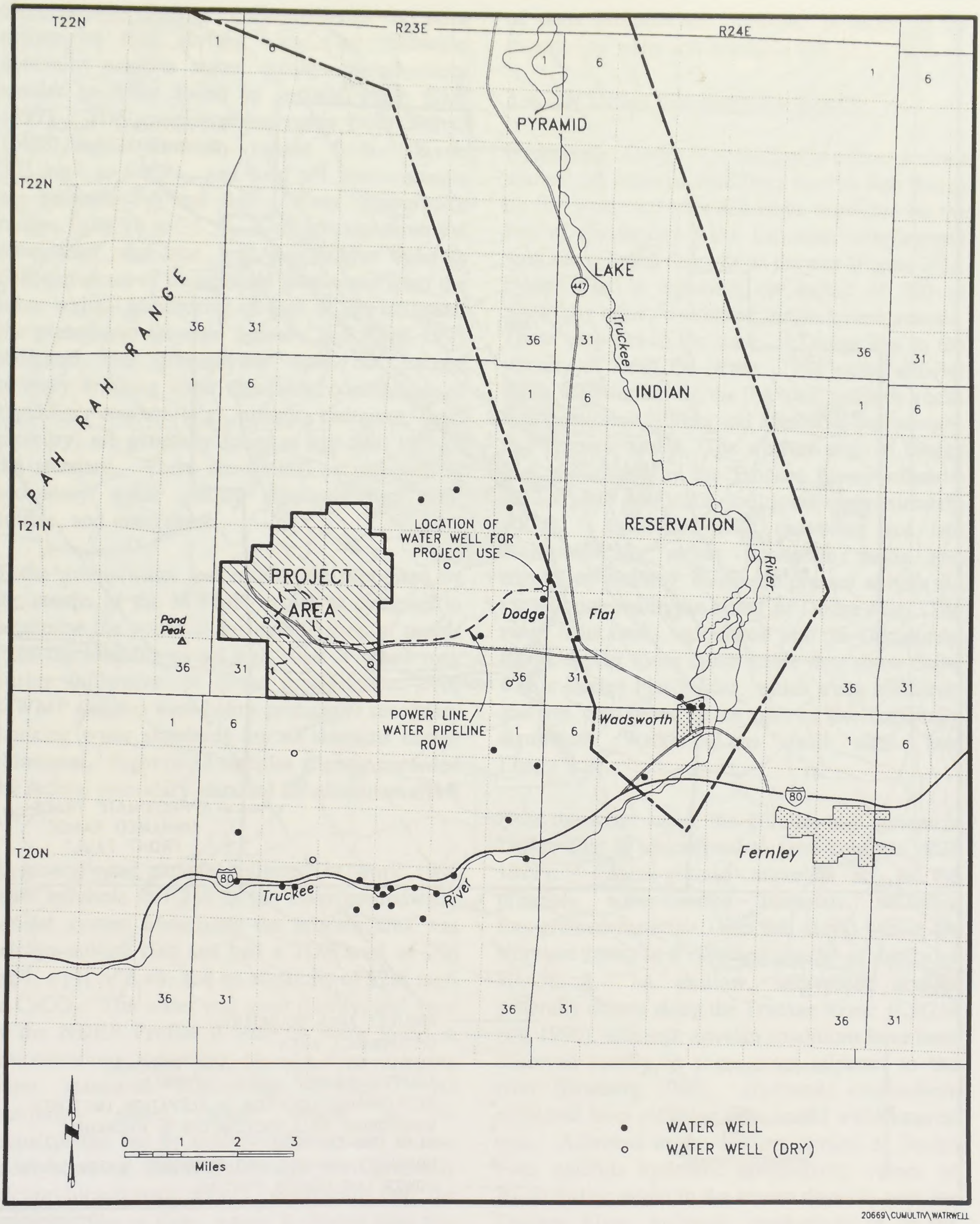


Figure 3.6 Location of Wells in the Vicinity of Olinghouse Mine Project (JBR 1996f; Williams 1997c).

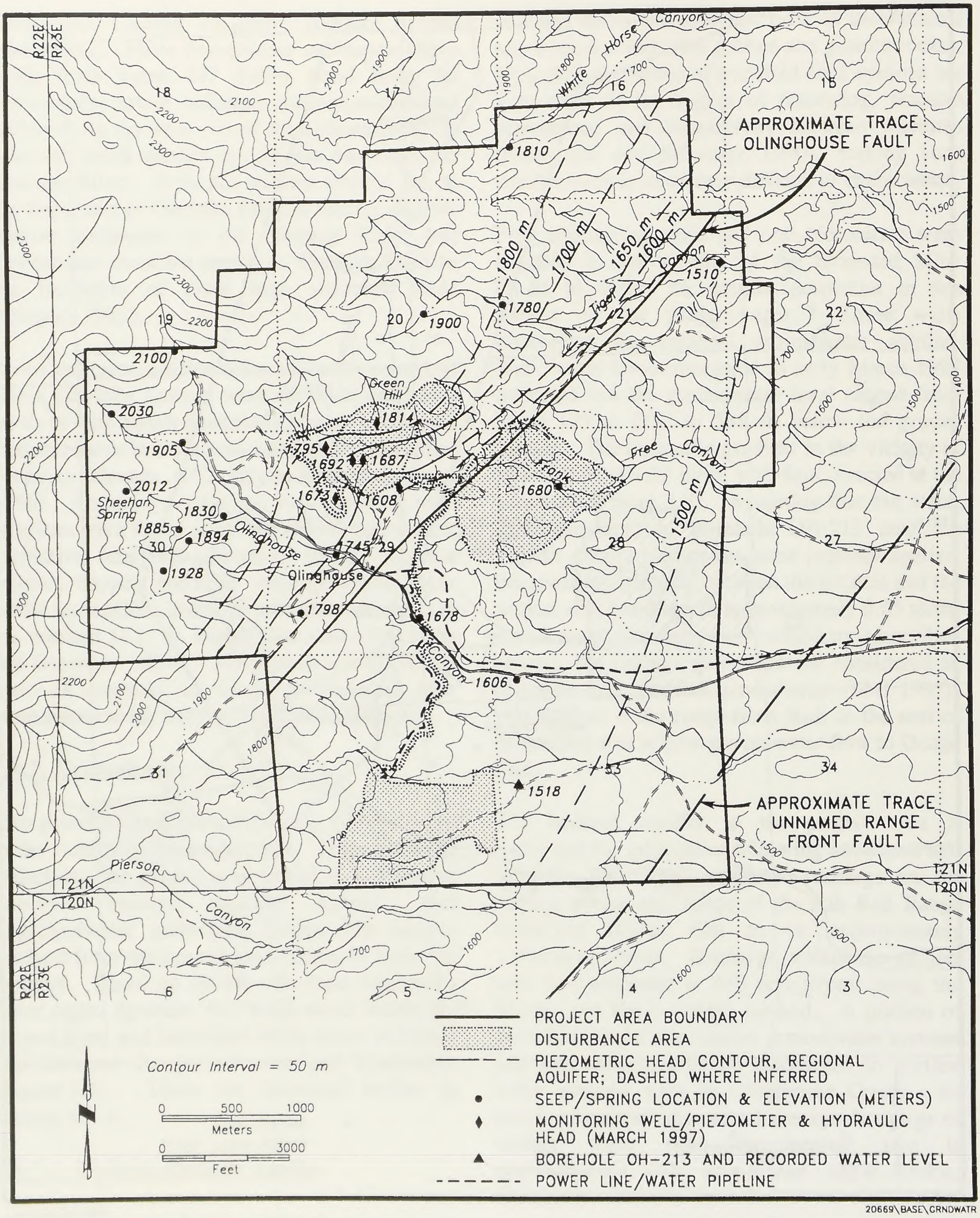


Figure 3.7 Estimated Groundwater Contours in the Project Area (Excluding Access Corridor).

Groundwater Quality. Groundwater is more sulfate-rich than surface water, but otherwise generally exhibits water quality characteristics similar to those found in surface water (SMI 1997). TDS concentrations range from 236 to 1,428 mg/l, alkalinity ranges from 109 to 305 mg/l as $CaCO_3$, and field pH measurements are between 7.0 and 8.0. Water temperature ranges from 18 to 35°C. Groundwater from the piezometer and one well has higher relative concentrations of bicarbonate than water from the other wells. Monitoring of four of the wells and the piezometer between January and April 1997 indicated that groundwater does not exceed primary drinking water standards; constituents of regulatory concern (e.g., arsenic, cadmium, lead, mercury) are generally found at less than 10% of the standard. There are limited exceedances of secondary water quality standards for TDS, sulfate, and manganese.

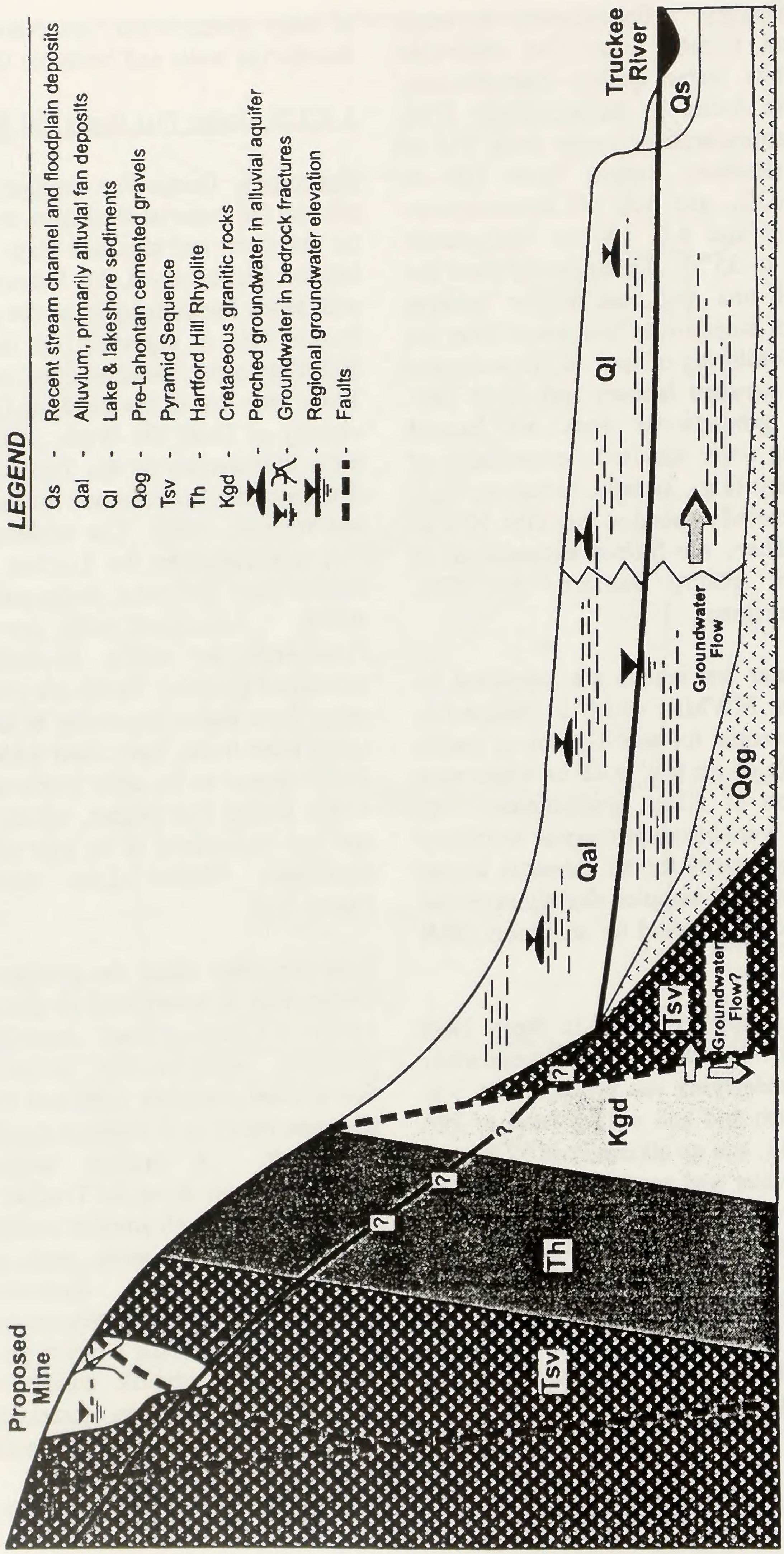
These groundwater test results are supported by the results of the MWMP, which is designed to determine the potential for mobilization of metals from the leaching of pit wall rock or waste rock during infiltration of direct precipitation. All MWMP samples were below primary or secondary drinking water standards for all elements except aluminum. Eight of 13 samples slightly exceeded the federal secondary standard for aluminum (SMI 1997).

A groundwater sample collected in April 1996 from borehole OH-213 in the deep groundwater aquifer system underlying the process area was calcium-sulfate rich and had a TDS level of 296 mg/l, a pH of 8.48, and an alkalinity of 52.8 mg/l as $CaCO_3$. The water was good quality, and none of the NDEP Profile II analytes were found at concentrations exceeding Nevada state drinking water standards (Cummings 1996b). As previously stated, water quality in the seeps/springs fed by shallow groundwater is also good; however, the seeps/springs were generally calcium-bicarbonate waters, suggesting that the residence time of these waters is shorter than that of deep groundwater observed in most of the monitoring wells and borehole OH-213.

3.4.2.2 Dodge Flat Basin Fill Aquifer

Hydrology. Dodge Flat consists of coarse-grained alluvial fan material shed from the Pah Rah Range on the west, and silts and clays deposited on the bed of Quaternary Lake Lahontan interfingered with sandy beach deposits on the east (Figure 3.8). Dodge Flat is underlain (at depths of 300 to 500 ft) by older, weathered and cemented gravels. These crop out to the south of Dodge Flat in the vicinity of Dead Ox Wash. The entire alluvial basin is underlain by the Tertiary volcanic rocks that form the Pah Rahs and Mesozoic sedimentary and volcanic rocks. The western edge of Dodge Flat is bounded by the Truckee River, which is incised into the lake sediments approximately 100 ft. Associated with the river are late Pleistocene to recent floodplain sands and streambed gravels. Faults are present at both the range front and in the center of Dodge Flat. The range front faults, associated with the Olinghouse Fault, appear to be more active than those faults within Dodge Flat proper, which trend northwest and are considered to be part of the regionally significant Walker Lane fault zone (see Figure 3.3).

Near the water table, the groundwater system in Dodge Flat is unconfined to semi-confined (PTI 1997). Coarse-grained materials act as the principle water-bearing materials. More fine-grained materials (silts and clays) within the alluvium result in a *confined aquifer* at depths of 40-450 ft. A shallow, *unconfined aquifer* generally occurs along the Truckee River (CH2M Hill 1990), although artesian conditions have been observed locally in some areas adjacent to the river (Bratberg 1980). *Hydraulic conductivity* estimated from pumping tests varied with material type. Alluvium in the western portion of Dodge Flats exhibits hydraulic conductivity values of 20-30 ft/day; while in the stream deposits near the Truckee River, hydraulic conductivity is on the



Note: vertical exaggeration is 10 times.

Figure 3.8 Conceptual Hydrogeologic Cross Section in the Vicinity of the Project.

order of 100 ft/day (PTI 1997). Hydraulic conductivity in the bedrock averages 0.3 ft/day (SMI 1997).

Recharge to the Dodge Flat groundwater system occurs in the Pah Rah Range to the west, where rainfall can reach up to 24 inches per year and from the Truckee River or irrigated areas south of the river. Recharge from the mountains occurs both as groundwater inflow and as infiltration of surface water flows at or slightly beyond the mountain front. No significant recharge occurs in Dodge Flat itself, because rainfall is so low relative to *evapotranspiration* (Maxey and Eakin 1949). Groundwater flows east and northeast, discharging to the Truckee River. There appears to be little groundwater flow leaving Dodge Flat except by this route (Glancy et al. 1973).

Groundwater Quality. In general, groundwater quality in Dodge Flat appears to improve with depth. Some groundwater samples collected from Dodge Flat west of the Truckee River have exceeded NDEP water quality standards for TDS, pH, aluminum, antimony, arsenic, chloride, iron, lead, manganese, nitrate, and sulfate (CH2M Hill 1990). Exceedances are highly dependent on well location and the stratigraphic interval over which the well collects groundwater.

A well formerly used by American Resources Corporation, Inc. for placer mining, located approximately 1,000 ft north of the proposed location of Alta's mine process water supply well, supplies water of acceptable quality for the intended use, with exceedances of Nevada drinking water standards for iron, sulfate, and TDS. Additional data documenting the chemical composition of groundwater in the vicinity of the American Resources Corporation, Inc. well are available from seven groundwater monitoring wells installed as part of a study to determine the feasibility of using Dodge Flat for wastewater infiltration. Data from these wells show variations from calcium-sulfate to sodium-sulfate waters and TDS concentrations ranging from 295 to 836 mg/l (CH2M Hill 1990). The well water exceeds drinking water standards for iron, aluminum, arsenic, sulfate, and TDS. A water sample from another well located about 1 mile north tapping a shallow confined aquifer had a TDS of 845 mg/l and exceeded the NDEP water quality standards for arsenic, iron, sulfate, and TDS.

Historical groundwater data from a number of wells located along the Truckee River corridor on Dodge Flat show similar variations in quality, and many indicate possible impacts from irrigation (CH2M Hill 1990).

3.4.3 Water Balance

The estimated present *water balance* for the project area and the cumulative assessment area (i.e., the Pah Rah Mountains and Dodge Flat from the Truckee River on the south to Dead Ox Wash on the north) is shown in Figure 3.9. The project area receives on average 12 inches of rainfall, of which less than 11% percolates to groundwater or runs off as streamflow (only to percolate to groundwater upon reaching the alluvium at the base of the mountains). The remainder is lost to evaporation and transpiration. Dodge Flat receives an average of 7 inches of rainfall, but contributions to groundwater and surface water are unlikely because most precipitation is lost to evaporation and transpiration (Maxey and Eakin 1949). Surface water crosses Dodge Flat and is discharged to the Truckee River only during moderate to large floods.

Based on calculations by PTI (1997), groundwater flows from the the project area to Dodge Flat at a rate of 350 acre-ft/year. Groundwater flows downvalley into the Dodge Flat at a net rate of 5,905 acre-ft/year, with the source distributed between the southeast (Fernley area) and the southwest (i.e., from the Truckee River or a lower alluvial aquifer). Estimates for the contribution coming from the southeast range between 2,100 acre-ft/year (Glancy et al. 1973) and 6,000 acre-ft/year (VanDenburgh and Arteaga 1985). Downstream from Wadsworth, 8,575 acre-ft/year of groundwater is predicted to

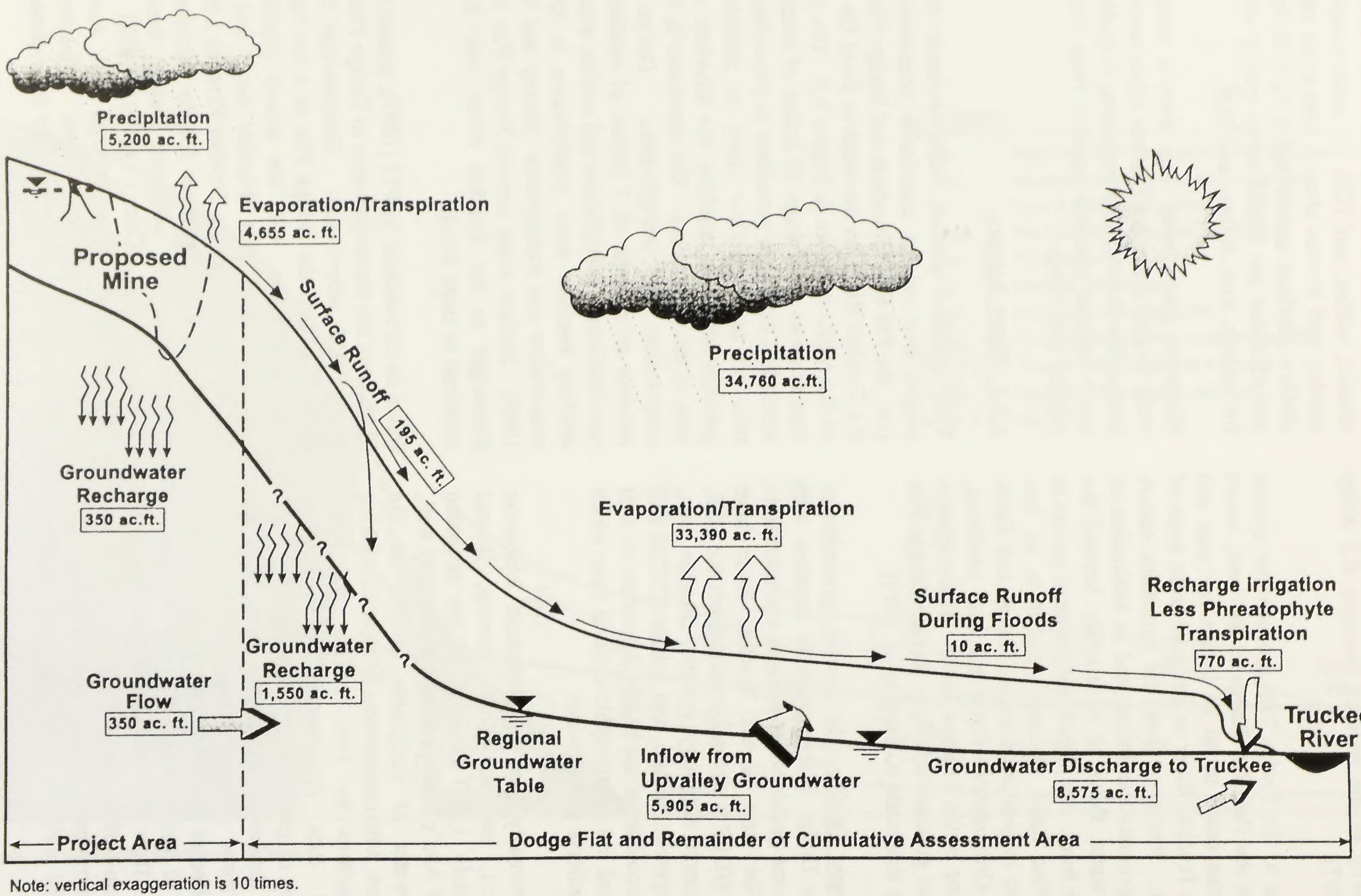


Figure 3.9 Annual Water Balance in the Vicinity of the Project.

discharge to the Truckee River; this is equivalent to 11.8 cfs (PTI 1997).

3.4.4 Water Use

Groundwater and surface water within the project area have historically been used for irrigation, mining and milling activities, stock watering, and wildlife. Groundwater in Dodge Flat has been used for irrigation, domestic and municipal water supply, stock watering, and mining and milling activities. Numerous water rights have been filed within the project area and in Dodge Flat (see Figure 3.6). The appropriations total 10,907.5 acre-ft/year and are summarized by use type and water source on Table 3.2. Additional wells that are not registered with the Nevada State Engineer's Office exist on the Pyramid Lake Paiute Reservation (see Figure 3.6). At least two wells are known to exist in the NW¼ of Section 36, T21N, R23E (CH2M Hill 1990); however, the locations and uses of these wells have not been verified.

3.5 SOILS

Soils within the proposed project area are typically very shallow and stony and have poor potential for reclamation and a severe water erosion hazard (Table 3.3). Of the nine soil associations present in the project area, only four would be disturbed by the proposed project: the Mizel-Skedaddle-Rock outcrop association; the Indiano-Duco-Skedaddle association; the Indian Creek extremely stony sandy loam; and the Sutcliff-Bundorf-Kleinbush association (Figure 3.10). The latter

Table 3.2 Olinghouse Water Rights Summary.[1]

Type of Use	Source	Diversion Rate (cfs)[2]	Annual Duty (mga)[3]	Annual Duty (a-ft/y)[4]
Miscellaneous Decreed	Stream	1.110	98.160	302.031
Domestic	Spring	0.002	0.020	0.062
Irrigated	Spring	0.547	112.551	346.311
	Underground	1.700	62.920	196.600
	Subtotal	2.247	175.471	539.911
Mining and Mineral Processing[5]	Spring	0.550	8.370	25.754
	Stream	0.050	0.000	0.000
	Underground	17.834	2,983.410	9,179.723
	Subtotal	18.434	2,991.780	9,205.477
Municipal and Quasi-municipal	Underground	3.416	254.595	783.369
Stock	Spring	0.624	10.250	31.538
	Stream	0.046	0.000	0.000
	Underground	6.650	14.660	45.108
	Subtotal	7.320	24.910	76.646
Total Appropriated Water Rights		**32.529**	**3,544.936**	**10,907.495**

1 Data source: Nevada State Engineer's Office.
2 cfs = cubic feet per second.
3 mga = million gallons per year.
4 a-ft/y = acre-feet per year.
5 Includes Alta's approved rights.

Table 3.3 Erosion Hazard and Soil Limitations of Soil Associations Occurring in the Project Area.[1]

Soil Association	Occurrence on Project Area (acres [%])	Erosion Hazard		Limitations				
		Water	Wind	Topsoil	Shallow Excavations	Small Commercial Buildings	Roads	Pond Reservoir Areas
Indian Creek extremely stony sandy loam	29 (1)	Slight	Slight	Poor; difficult to reclaim, small stones	Severe; cemented pan	Severe; slope, cemented pan	Severe; slope, depth to rock	Severe; cemented pan
Mizel-Skedaddle-Rock Outcrop	2,212 (42)	Severe	Slight	Poor; difficult to reclaim, small stones	Severe; slope, depth to rock	Severe; slope, depth to rock	Severe; slope, depth to rock	Severe; slope, depth to rock
Indiano-Duco-Skedaddle	2,179 (42)	Severe	Slight	Poor; difficult to reclaim, small and large stones	Severe; slope, depth to rock	Severe; slope, depth to rock	Severe; slope, depth to rock	Severe; slope, cemented pan
Sutcliff-Bundorf-Kleinbush	303 (6)	Slight-moderate	Slight	Poor; difficult to reclaim, small and large stones	Moderate to severe; large stones, slope, cemented pan, too clayey	Moderate to severe; large stones, slope, shrink-swell, cemented pan	Severe; low strength, shrink-swell, cemented pan	Severe; slope, cemented pan
Xman-Zephan-Mizel	54 (1)	Moderate-severe	Slight	Poor; difficult to reclaim, small stones, slope	Severe; depth to rock, slope	Severe; depth to rock, slope, shrink-swell	Severe; low strength, slope, shrink-swell, depth to rock	Severe; depth to rock, small stones
Kayo stony sandy loam	42 (1)	Slight	Slight	Poor; small stones, difficult to reclaim	Severe; cutbanks cave	Severe; flooding	Moderate; flooding, frost action	Severe; seepage
Singastse-Mizel-Stingdorn	57 (1)	Moderate	Slight	Poor; difficult to reclaim, small stones, slope	Severe; depth to rock, slope, cemented pan	Severe; slope, depth to rock	Severe; slope, depth to rock	Severe; depth to rock, slope, cemented pan
Softscrabble-Gabica-Sumine	309 (6)	Moderate-high	Slight	Poor; difficult to reclaim, small stones, slope	Severe; slope, depth to rock	Severe; slope, depth to rock	Severe; slope, depth to rock	Severe; slope, depth to rock
Bombadil-Hefed-Rubble land	24 (<1)	Severe	Slight	Poor; difficult to reclaim, small stones, slope	Severe; depth to rock, slope, cutbanks cave	Severe; slope, depth to rock	Severe; slope, depth to rock	Severe; depth to rock, slope, seepage

[1] Source: SCS (1975, 1983).

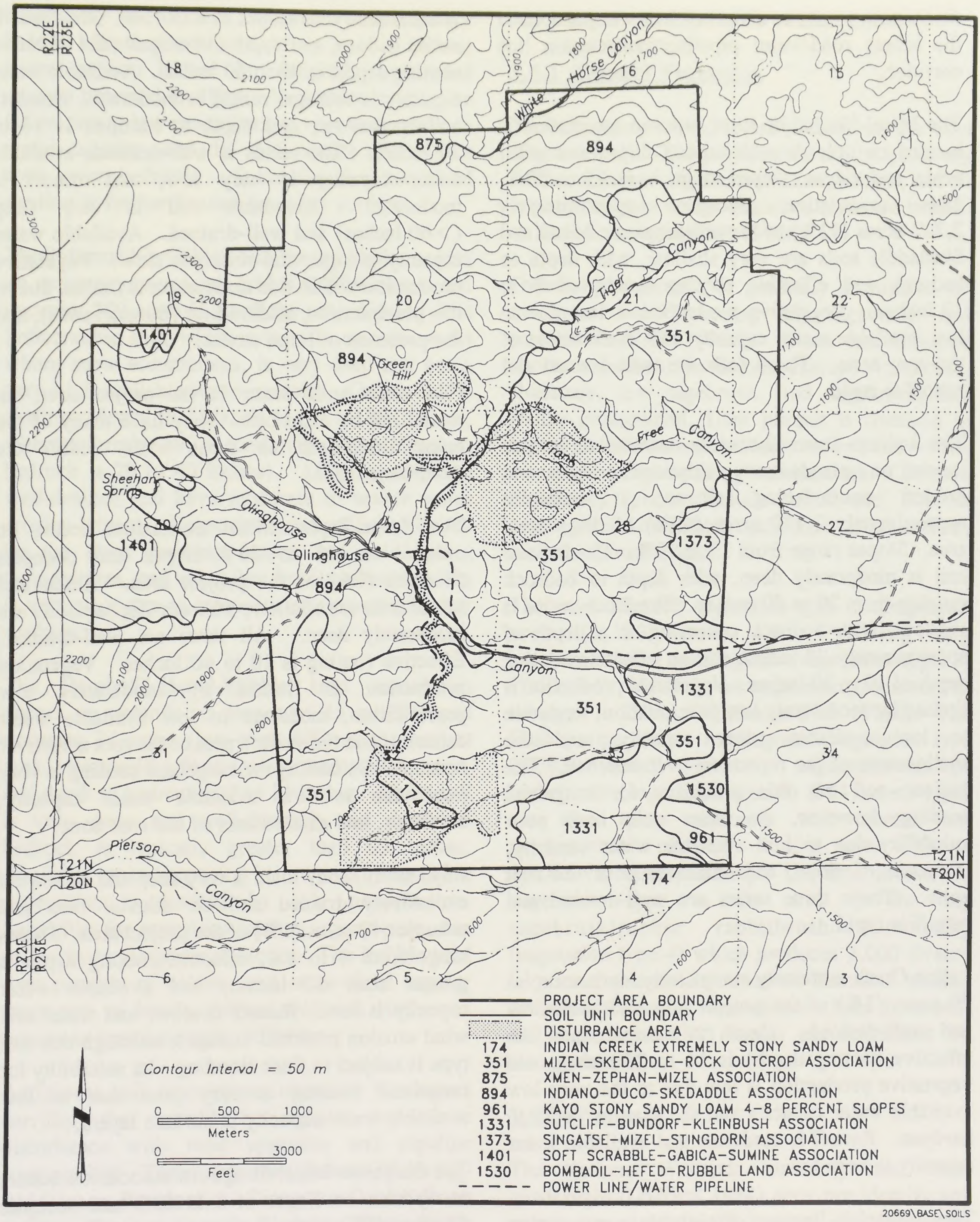


Figure 3.10 Soils in the Project Area (Excluding Access Corridor) (JBR 1996d).

association would be disturbed in lower portions of the access road/water pipeline/transmission line corridor.

The Mizel-Skedaddle-Rock outcrop association is located on uplands with eroded slopes and small peaks and ridges; slopes range from 15 to 70%. This association occupies approximately 2,212 acres (42%) of the project area. Mizel and Skedaddle soils are very shallow, with depth to bedrock and effective rooting depths of 3 to 12 inches. Vegetative production is low due to low available water capacity and shallowness of the root zone. These soils are well-drained and runoff is rapid.

The Indiano-Duco-Skedaddle association is also located on uplands having sideslopes, ridges, and eroded south-facing slopes; it occupies approximately 2,179 acres (42%) of the project area. Slopes range from 15 to 70%. The Indiano soil is moderately deep, with depth to bedrock ranging from 20 to 40 inches. The Duco series is shallow, with bedrock occurring at a depth of approximately 20 inches and an effective rooting depth of 10 to 20 inches. Vegetative production is limited by moderately low precipitation, moderate to low available water capacity, and the shallowness of the root zone over bedrock. The Indiano soil has fair suitability for rangeland seeding; however, the other units have poor suitability due to low available water capacity, steepness of slope, and shallowness of the root zone. These three series are well-drained and runoff is rapid.

Indian Creek extremely stony sandy loam occupies 29 acres (1%) of the project area and is shallow and well-drained. Depth to hardpan (and the effective rooting depth) is 14 to 20 inches, and vegetative production is low due to the very low available water capacity and the shallow depth to hardpan. Runoff is moderate and available water capacity is very low.

The Sutcliff-Bundorf-Kleinbush association occupies 303 acres (6%) of the project area on alluvial fans with slopes of 4 to 15%. The Sutcliff series is deep, and depth to hardpan (and effective rooting depth) is 40 to 60 inches. Available water capacity is low and runoff is moderate. Bundorf soil is shallow, and depth to hardpan is 14 to 20 inches. The series is well-drained, available water capacity is very low, and runoff is moderate. Kleinbush soil is very deep (>60 inches) and well-drained. Available water capacity is high, and runoff is slow. Vegetative production within this association is limited due to low precipitation, shallowness (Bundorf soils), and the presence of large stones.

Five other soils occur in the project area but would not be disturbed. They have many of the same limitations as those soils within the disturbance area.

The Xman-Zephan-Mizel association occurs on uplands on 15 to 50% slopes and occupies 54 acres (1%) of the project area. Xman and Mizel soils are shallow, whereas Zephan soils are moderately deep. All three are well-drained. Effective rooting is 10 to 40 inches. Vegetation production is limited by moderately low precipitation, moderate to low available water capacity, and the shallowness of the root zone over bedrock. Suitability for rangeland seeding is very poor due to low available water capacity, stoniness, and shallowness of the root zone.

Kayo stony sandy loam is very deep and somewhat excessively drained soil on alluvial fans and occupies 42 acres (1%) of the project area. Slopes range from 4 to 8%, effective rooting depth is greater than 60 inches, and available water capacity is low. Runoff is slow, and water and wind erosion potential is slight, although this soil type is subject to flash flooding. Its suitability for rangeland seeding is very poor due to low available water capacity in surface layers.

The Singastse-Mizel-Stingdorn association occurs on uplands on slopes of 8 to 50% and occupies 57 acres (1%) of the project area. All three soils in this association are shallow and well-drained to excessively well-drained. Available water capacity is low, effective rooting depth is 3 to 20 inches, water erosion hazard is moderate, and wind erosion potential is slight. Vegetative production is low due to low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. Suitability for rangeland seeding is further limited by stony surfaces.

The Softscrabble-Gabica-Sumine association occurs on mountainous uplands with 8 to 50% slopes and occupies 309 acres (6%) of the project area. The Softscrabble soil, which occurs in concave areas where snow accumulates, is very deep and has a very high available water capacity. Gabica soil is shallow (depth to bedrock is 10 to 20 inches), whereas Sumine soil is moderately deep (depth to bedrock is 20 to 40 inches). All three soils are well-drained and have moderate to severe water erosion hazard. Vegetative production is limited by the short growing season and cold spring temperatures, and suitability for rangeland seeding is very poor due to steepness of slopes and stony surfaces.

The Bombadil-Hefed-Rubble land association occurs on uplands on slopes of 15 to 70% and occupies 24 acres (less than 1%) of the project area. Bombadil soil is shallow and well-drained, and depth to bedrock is 7 to 14 inches. Hefed soil is very deep and well-drained, and depth to bedrock is typically greater than 60 inches. Available water capacity is low, and vegetative production is limited by low precipitation. Suitability for rangeland seeding is very poor, due primarily to steepness of slopes. The Rubble land type consists of cobble- and stone-sized angular fragments of basalt and metavolcanic rocks and occurs as screes on steep hillsides.

Additional soil associations occur in the access corridor that would be subject to minor disturbance with road upgrades and pipeline construction. These soil units include Bluewing-Biddleman-Bundorf, Pirouette-Osobb-Rock outcrop, Trocken-Stumble-Bluewing, Patna Sand, and Tipperary Sand.

3.6 VEGETATION AND WETLANDS

3.6.1 General Vegetation

Twelve vegetation types are present on the area (Figure 3.11). The project area can be generally characterized as mixed desert shrub habitat, and all vegetation types except disturbed areas are in mid- to late-seral stages (JBR 1996d).

Overstory vegetation is generally dominated by mountain and Wyoming big sagebrush and rabbitbrush (JBR 1996d). Other less common shrubs and subshrubs include antelope bitterbrush, shadscale, low sagebrush, bud sagebrush, and Bailey greasewood, Utah juniper is common in higher elevation areas, and cottonwood and willow occur intermittently along watercourses. Common understory species include desert and Thurber needlegrass, bottlebrush squirreltail, globemallow, and cheatgrass brome.

The most common vegetation type in the project area (1,123 acres) is Wyoming big sagebrush/desert needlegrass (vegetation type 8) (Table 3.4). Normal-year vegetation production in this type is 150 to 600 lb/acre (JBR 1996d). The Utah juniper/desert needlegrass (vegetation type 3) (800 acres) and big sagebrush/antelope bitterbrush (vegetation type 6) (724 acres) types are also quite common, with normal-year productivities of 250 lb/acre and 800 to 1,100 lb/acre, respectively. The most productive vegetation type in the area is the big sagebrush/rubber rabbitbrush community (vegetation type 4) which produces 3,000 lb/acre in normal years. In areas of historical mining activities, the *native vegetation* has been disturbed, and these areas (511 acres) are dominated by cheatgrass brome.

3.6.2 Wetlands

The National Wetlands Inventory map Reno quadrangle (USFWS 1984) does not identify any potential wetlands in the project area; however, surveys have located 17 seeps/springs in the

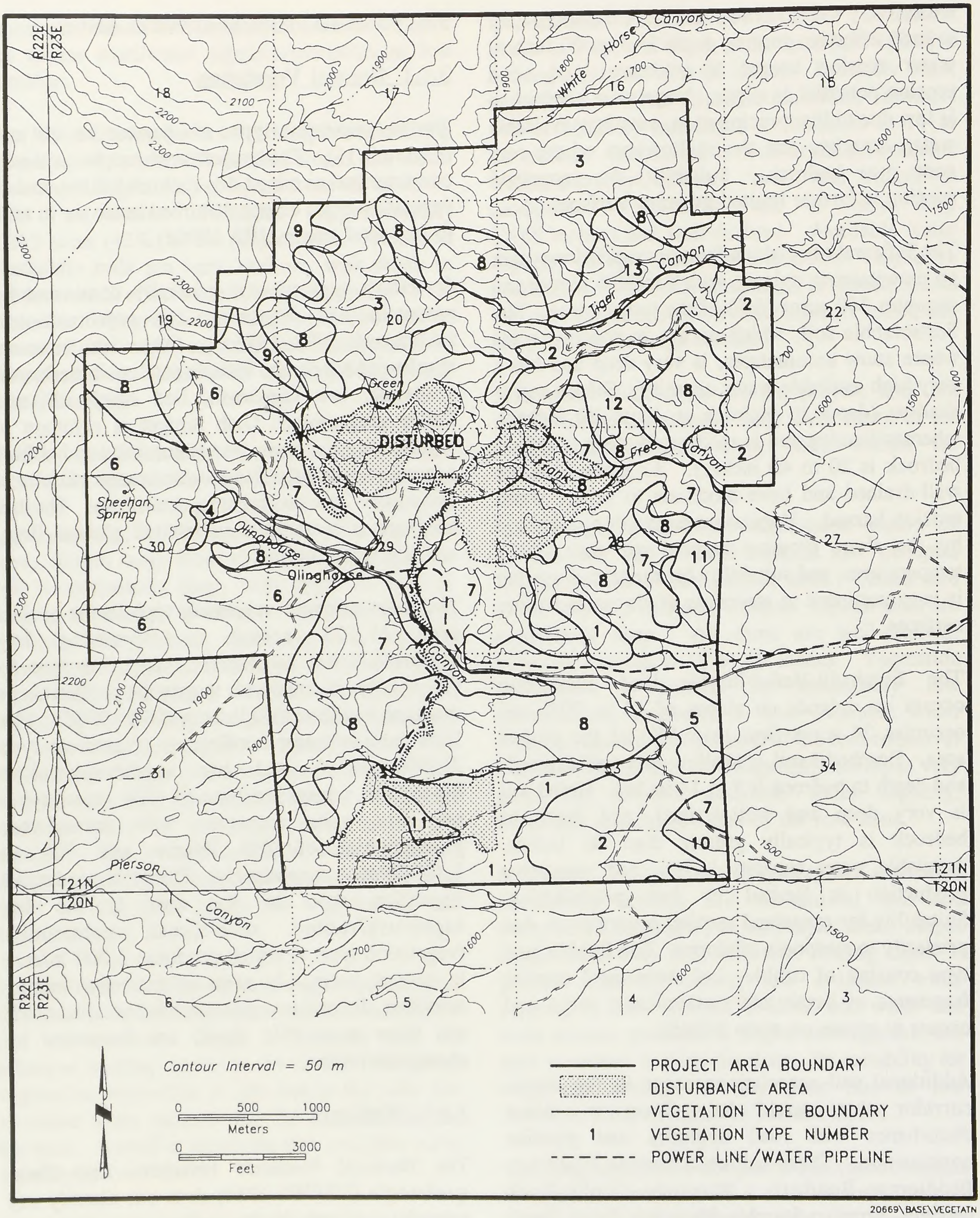


Figure 3.11 Vegetation on the Project Area (Excluding Access Corridor) (Refer to Table 3.6 for Key to Vegetation Types) (JBR 1996d).

Table 3.4 Vegetation Types on the Project Area.[1]

Vegetation Type Number	Dominant Species	Acreage	Soil Series	Potential Normal Year Herbage Production (lb/acre)
1	Wyoming big sagebrush, bottlebrush squirreltail	392	Washoe	600
2	Low sagebrush, bottlebrush squirreltail	475	Pahrange Sutcliff	300
3	Utah juniper, desert needlegrass	800	Duco	250
4	Big sagebrush, rubber rabbitbrush	16	Unnamed (deep/loamy)	3,000
5	Shadscale, Bailey greasewood	69	Bundorf	250
6	Big sagebrush, antelope bitterbrush	724	Indiano Softscrabble	800-1,100
7	Wyoming big sagebrush, Utah juniper	675	Old Camp, Zephan	450-600
8	Wyoming big sagebrush, desert needlegrass	1,123	Skedaddle Mizel	150-600
9	Big sagebrush, Thurber needlegrass	108	Indiano	800
10	Wyoming big sagebrush, Bailey greasewood	30	Kayo	300
11	Shadscale, bud sagebrush	68	Sutcliff	250
12	Lahontan low sagebrush, desert needlegrass	85	Unnamed (clayey inclusion)	600
13	Wyoming big sagebrush, Indian ricegrass	133	Mizel	150
Disturbed	Cheatgrass brome	511	Various	Unknown

[1] Source: JBR (1996d) and SCS (1992).

project area (JBR 1995b; SMI 1997) (see Figure 3.5). Vegetation at seeps/springs includes cottonwood, willow, tamarisk, sedges, rushes, and bluegrasses (JBR 1995b, 1996d). Preliminary evaluations of these seeps/springs indicate that they likely meet regulatory criteria to qualify as jurisdictional wetlands. In addition, portions of both Olinghouse and Tiger Canyons have scattered clumps of cottonwood and willow, indicating that a water source exists at some time during some years. These areas may also meet regulatory criteria to be classified as jurisdictional wetlands. Stream channels in the project area have been evaluated to determine their status as waters of the U.S. (see Section 3.4.1) and the USCOE has accepted the evaluation (JBR 1996a). The vegetation along jurisdictional channels is similar to that on adjacent upland areas, with occasional occurrences of willow, cottonwood, and wild rose.

3.7 WILDLIFE

3.7.1 Game Species

Game species in the project area include mule deer, pronghorn antelope, mountain lion, sage grouse, chukar, California quail, mountain quail, and mourning dove (Bardwell 1982). California bighorn sheep, a federal species of concern, historically inhabited the area, and reintroduction efforts to reestablish this species in the area are ongoing (Tanner 1997). Section 3.8.2 discusses bighorn sheep in greater detail.

The project area is classified as yearlong mule deer range (Nevada Division of Wildlife [NDOW] 1994) and is within Deer Management Area 2, Unit 022. The Pah Rah Habitat Management Plan (Bardwell 1982) objective for mule deer is provision of sufficient *forage* to sustain a population of 297 individuals. NDOW considers the higher elevations of the Pah Rah Range to be high-quality deer summer range; the flanks and foothills are considered good winter range (JBR 1996e). Portions of the steeper east-facing slopes below and east of the ridgeline of the Pah Rah Range and northwest of the upper Olinghouse Canyon Road (Sections 18, 19, and 30, T21N, R23E) contain mountain mahogany and juniper and have been identified by NDOW as important deer habitat (JBR 1996e). No deer migration corridors are known to exist in the area (Bardwell 1982; BLM 1982).

The Spanish Springs antelope herd inhabits the sagebrush habitat along the foothills of the Pah Rah Range and within the project area (Gebhart 1997; Dobel 1996; Tanner 1997). The pronghorn inhabit the higher elevations primarily in the summer, moving to bare ridges during the winter (JBR 1996e). The current population of this herd is approximately 200 individuals, slightly below the NDOW management level of 250 (Tanner 1997).

3.7.2 Bats

Habitat for bats within the project area includes the historic mining shafts and adits which may be used for roosting, hibernation, and nursery habitat. Eight bat species identified by the USFWS as species of concern may occur in the project area (see Section 3.8.2), as well as several other more common bat species (Table 3.5). Generally, one to four bats were observed at the 29 shafts and adits within the project area, and no more than 11 bats were observed at any one site (JBR 1995e).

Individuals of three bat species were positively identified within the project area during 1995 surveys (JBR 1995e), and additional species of the genus *Myotis* are probably present. Townsend's big-eared bat was the species most frequently observed and captured in the project area. Several sites appear to be used as bachelor roosts by individual males of this species. In addition, one suspected maternity roost is located in a shaft within the existing placer pit south and southeast of Green Hill, and a second maternity roost is suspected to occur in an adit south of Green Hill and west of the placer pit (JBR 1995e). Townsend's big-eared bat is listed by the USFWS as a species of concern, and two subspecies, pale

Table 3.5 Bat Species Which May Occur in the Project Area.

Common Name	Scientific Name	Status[1]	Potential for Occurrence
Little brown bat	*Myotis lucifugus*	No special status	Common in area
Yuma myotis	*Myotis yumanensis*	Species of concern	Identified in project area
Cave myotis	*Myotis velifer*	Species of concern	May occur in area
Long-eared myotis	*Myotis evotis*	Species of concern	May occur in area
Fringed myotis	*Myotis thysanodes*	Species of concern	May occur in area
Long-legged myotis	*Myotis volans*	Species of concern	May occur in area
Small-footed myotis	*Myotis ciliolabrum*	Species of concern	May occur in area
Silver-haired bat	*Lasionycteris noctivagans*	No special status	May occur in area
Western pipistrelle	*Pipistrellus hesperus*	No special status	Identified in project area
Big brown bat	*Eptesicus fuscus*	No special status	May occur in area
Hoary bat	*Lasiurus cinereus*	No special status	May occur in area
Spotted bat	*Euderma maculatum*	Species of concern	May occur in area
Townsend's (western) big-eared bat	*Plecotus townsendii*	Species of concern	Identified in project area
Pallid bat	*Antrozous pallidus*	No special status	May occur in area
Brazilian free-tailed bat	*Tadarida brasiliensis*	No special status	May occur in area

[1] Designated as a species of concern by the U.S. Fish and Wildlife Service.

Townsend's big-eared bat and Pacific Townsend's big-eared bat, are also listed by NDOW as species of concern. A single Yuma myotis was captured, but identification of other possible *Myotis* bats observed in flight could not be made to the species level. Therefore, additional species in the genus *Myotis* may inhabit the project area. The Yuma myotis is a USFWS species of concern, as are five other myotis species which could potentially occur within the project area (see Table 3.5). A single western pipistrelle was also captured in the project area, and other individuals of this species were observed during the surveys.

The majority of sites occupied by bats were located on Green Hill, in the area to the south and southwest of Green Hill and in Olinghouse Canyon. No bats were observed at the shafts or adits located at higher elevations in the unnamed canyon between Green Hill and Olinghouse Canyon. Additional features located in the project area, but outside the projected disturbance area, were not surveyed; however, their potential for bat use appears high (JBR 1995e).

3.7.3 Other Mammals

Other mammals documented in and adjacent to the project area include coyote, black-tailed jackrabbit, antelope ground squirrel, mountain lion, bobcat, kit and/or gray fox, striped and/or spotted skunk, least chipmunk, cottontail rabbit, bushy-tailed woodrat, desert woodrat, Norway rat, and deer mice (JBR 1996c). Additional nongame mammal species expected in the area include California ground squirrel and various species of mice.

3.7.4 Game Birds

A small- to medium-sized sage grouse population utilizes sagebrush habitats on benches and ridges in the Pah Rah Range. No *leks* have been found near the project area. NDOW has received reports of groups of up to 40 to 50 birds wintering on ridges in the project area (JBR 1996e).

Chukar occur in suitable habitat in the Pah Rah Range, including the project area (JBR 1996e). These birds prefer steep, rugged terrain near a water source. Because chukar populations may be limited by available surface water, management agencies have installed water catchment structures (*guzzlers*) to supplement existing water sources.

California, or valley, quail occur in and near riparian habitats, and a few mountain quail occur in the higher parts of the Pah Rah Range (JBR 1996e). Mountain quail utilize the pockets of mountain brush on the east slopes in the western portion of the project area (see also Section 3.8.2). Mourning dove are found throughout the project area and, as with most other wildlife species, make extensive use of springs, creeks, and guzzlers as water sources (JBR 1996e).

3.7.5 Raptors

No *raptor* nests are known to occur within the project area boundaries (Gebhart 1996); however, several raptor species nest in the vicinity of the project area, including red-tailed hawk and American kestrel. Northern harrier also has been observed in the area, and golden eagles are common (JBR 1996e). Short-eared owls, long-eared owls, and great horned owls may occur in the project area, and burrowing owl a USFWS and NDOW species of concern, may occur on fan habitats near the base of the Pah Rah Range (JBR 1996e) (see Section 3.8.2). Raptors and ravens use the metal power line towers occurring east and south of the project area for roosting and nesting sites. Nests suspected to belong to red-tailed hawks occur in large cottonwood trees in lower Olinghouse Canyon (JBR 1996e).

3.7.6 Other Bird Species

Other nongame bird species include resident species typical of the Great Basin, as well as species that either summer or winter in the area. Year-round resident or wintering bird species documented in the area include horned lark, black-billed magpie, plain titmouse, common bushtit, Townsend's solitaire rosy finch, house finch, sage sparrow, white-crowned sparrow, and dark-eyed (Oregon) junco. Breeding species include common poorwill, Say's phoebe, barn swallow, house finch, northern flicker, scrub and pinyon jays, rock wren, blue-gray gnatcatcher, robin, sage thrasher, green-tailed and rufous-sided towhees, and Brewer's sparrow (JBR 1996e).

3.7.7 Fish

There are no *perennial water sources* within the project area; therefore, no fishery is present. The fishery nearest the project area is the Truckee River approximately 6 miles to the east. Several game fish occur in the Truckee River, including rainbow trout, brown trout, and the threatened Lahontan cutthroat trout. The Truckee River is stocked with approximately 100,000 individuals of these three species per year. Other game fish include mountain whitefish, an occasional brook trout, and the channel catfish. The most common nongame species in the Truckee River include Lahontan and Tahoe suckers, redside shiner, speckled dace, and Paiute sculpin. Carp and fathead minnow also occur in the Truckee River, primarily below Reno (Warren 1997). The Truckee River provides critical spawning habitat for the endangered cui-ui (see Section 3.8.1) (Warren 1997).

3.7.8 Reptiles and Amphibians

Based on geographic range and habitat preference, only one amphibian species, the Great Basin spadefoot, has the potential to occur in the project area. A number of reptile species have the potential to occur in the project area, including zebra-tailed lizard, long-nosed leopard lizard, yellow-backed desert spiny lizard, Great Basin fence lizard, northern sagebrush lizard, northern side-blotched lizard, northern desert horned lizard, coachwhip, striped whipsnake, Mojave patch-nosed snake, Great Basin gopher snake, western long-nosed snake, wandering garter snake, desert night snake, and Great Basin rattlesnake (Stebbins 1966).

3.8 THREATENED, ENDANGERED, AND CANDIDATE/SENSITIVE SPECIES

3.8.1 Threatened, Endangered, and Candidate Wildlife Species

A list of threatened, endangered, and *candidate* (TE&C) species potentially occurring in the project area was obtained from the USFWS (Table 3.6) and includes American peregrine falcon (endangered), bald eagle (threatened), cui-ui (endangered), and Lahontan cutthroat trout (threatened). No candidate animal species or critical habitat occurs in the project area. Observation records of TE&C species in the project area were obtained from the Nevada Natural Heritage Program (Cooper 1996), a technical report describing results of baseline wildlife surveys (JBR 1996e), and contacts with BLM and NDOW biologists.

Peregrine falcons may migrate through the general area and use riparian habitat along the Truckee River for hunting; however, foraging habitat within the project area is limited, and it is likely that use of the area is infrequent (JBR 1996e). Peregrine falcons nest on tall cliffs, usually within 1.0 mile of a stream or river in habitats that provide concentrated food sources and open areas to hunt (Snow 1972; Call 1978). No known peregrine falcon nests have been recorded in the general vicinity of the project area, and neither nesting habitat nor concentrated food sources occur in the project area. Therefore, peregrine falcons are not discussed further in this document.

Bald eagles require cliffs, large trees, or sheltered canyons associated with concentrated food sources (e.g., fish or waterfowl concentration areas) for nesting and/or roosting areas (Edwards 1969; Snow 1973; Call 1978; Steenhof 1978; Peterson 1986). Migrating bald eagles pass through the state, and wintering birds occupy suitable habitat from December through March; however, no concentrated bald eagle food sources exist in the proposed project area, nor are any nests known in the vicinity. Therefore, bald eagle are not discussed further in this document.

The cui-ui, a member of the sucker family, was declared endangered on March 11, 1967 (USFWS 1992). The cui-ui evolved in the prehistoric lake that covered the Great Basin 2 million years ago and is now found only in the Truckee River drainage. Since 1905, more than half of the Truckee River has been diverted to irrigate crops in the Newlands project--the nation's first desert reclamation project--located near Fallon. Water diversions associated with the reclamation project caused the level of Pyramid Lake to drop 80 ft, exposing a sand bar at the mouth of the Truckee River that blocked access to upstream spawning grounds. This contributed to a decline in cui-ui spawning success and the extinction of the Lahontan cutthroat trout native to Pyramid Lake.

Cui-ui normally spawn in the lower Truckee River from April to June. Spawning occurs in relatively shallow, rapidly flowing water, often at the head of a sand or gravel bank which turns the current. A fishway (Marble Bluff) was constructed in 1976 to provide access to the Truckee River around the delta for migrating fish, and Truckee River reservoirs are managed to provide enhanced spawning flows in the Truckee. The cui-ui is well-adapted to survive sporadic spawning success, often living up to 45 years. Current management strategy would maximize spawning opportunities every year to increase the population.

Table 3.6 Threatened, Endangered, and Candidate Animal Species and Their Potential Occurrence Within the Olinghouse Project Area.

Common Name	Scientific Name	Status	Expected Occurrence
Birds			
American peregrine falcon	*Falco peregrinus anatum*	Endangered	Migrant
Bald eagle	*Haliaeetus leucocephalus*	Threatened	Migrant/occasional winter visitor
Fish			
Cui-ui	*Chasmistes cujus*	Endangered	Truckee River
Lahontan cutthroat trout	*Oncorhynchus clarki henshawi*	Threatened	Truckee River

The Lahontan cutthroat trout was formerly listed as an endangered species, but was downlisted to threatened in 1975. The range of Lahontan cutthroat trout at the time non-indigenous people first reached the region included the Truckee, Carson, Walker, and Quinn Rivers, as well as Lake Tahoe and Pyramid, Walker, Donner, Independence, and Summit Lakes (Behnke 1992). Summit Lake is now in a separate basin, isolated from the Lahontan basin by a lava flow, and native Lahontan cutthroat trout are extinct in Tahoe, Pyramid, Walker, and Donner Lakes, but still occur in Independence and Summit Lakes. The Summit Lake trout has been propagated extensively for stocking other areas.

The original Pyramid Lake population of Lahontan cutthroat trout disappeared in the 1940s after it lost access to spawning grounds in the Truckee River as a result of the previously mentioned Newlands irrigation project. Millions of Lahontan cutthroat trout from Summit and Heenan Lake stock have been introduced in Pyramid Lake in recent years, and a significant fishery exists for the species today in Pyramid Lake.

3.8.2 Sensitive Wildlife Species

Mammals. Several mammal species, including California bighorn sheep, pygmy rabbit, Preble's shrew, and several species of bat, were identified by USFWS and/or NDOW as *sensitive species* which potentially occur in the vicinity of the project area.

California bighorn sheep historically ranged throughout the project area vicinity. Twice in the past 10 years, NDOW has reintroduced sheep into the Big Canyon area in the northern Virginia Mountains. This population currently numbers less than 100 individuals and ranges south to Interstate 80, including the project area. NDOW plans to release additional sheep into the area within approximately the next 5 years (Tanner 1997), with the objective of re-establishing California bighorn sheep in portions of their historic range. During 1997, a hunting season for this herd will be initiated for the first time, with a small number (probably one) of licenses permitted (Tanner 1997).

The pygmy rabbit is a USFWS species of concern and a state sensitive species which occurs throughout the Great Basin, primarily in rocky habitats dominated by dense stands of sagebrush, often near intermittent streams and riparian areas (Clark and Stromberg 1987; Jameson and Peeters 1988). Limited pockets of dense sagebrush habitat occur in the project area (JBR 1996e).

Preble's shrew is a USFWS species of concern known to occur in the northern Great Basin. Very little is known about Preble's shrew throughout its range, but it can occur in habitats ranging from sagebrush and grasslands to subalpine forest and alpine tundra (Clark and Stromberg 1987; Fitzgerald et al. 1994) and is also thought to occupy wetlands or marshy areas with emergent and woody vegetation (BLM 1996b). It is currently unknown whether this species occurs on or in the vicinity of the project area.

Eight bat species (Yuma myotis, cave myotis, long-eared myotis, fringed myotis, long-legged myotis, small-footed myotis, spotted bat, and Townsend's big-eared bat) identified by the USFWS and/or NDOW as species of concern may occur in the project area (Gebhart 1996; Mendoza 1996) (see Table 3.5). Individuals of at least two of these species were positively identified within the project area during 1995 surveys (JBR 1995e). Townsend's big-eared bat was the species most frequently observed and captured in the project area. Several sites appear to be used as bachelor roosts by individual males of this species. In addition, one suspected maternity roost is located in a shaft within the existing placer pit south and southeast of Green Hill, and a second maternity roost is suspected to occur in an adit south of Green Hill and west of the placer pit (JBR 1995e). Townsend's big-eared bat is listed by the USFWS as a species of concern, and two subspecies, pale Townsend's big-eared bat and Pacific Townsend's big-eared bat, are also listed by NDOW as species of concern. A single Yuma myotis, a USFWS and NDOW species of concern, was also captured within the project area (JBR 1995e). Identification of other possible myotis bats observed in flight could not be made to the species level. Therefore, additional species in the genus *Myotis*, including some of the other five abovementioned myotis species of concern, may inhabit the project area (see Table 3.5).

Birds. Seven avian species identified as species of concern by USFWS and/or NDOW may occur in the area, including ferruginous hawk, western burrowing owl, western least bittern, white-faced ibis, black tern, mountain quail, and tri-colored blackbird (JBR 1996e; BLM 1996b; Clemmer 1996; Gebhart 1996).

The mountain quail is a game species which currently has no special management status (JBR 1996e); however, NDOW has proposed that the mountain quail population found in western Nevada east of the Sierra Nevada Range may represent a distinct population. This western Nevada population exists in low numbers and may be considered for future listing (JBR 1996e). A few mountain quail occur in the higher parts of the Pah Rah Range (JBR 1996e), and some individuals utilize the pockets of mountain brush on the east slopes in the western portion of the project area.

The tri-colored blackbird, a USFWS species of concern, is a rare transient in Nevada that is known to migrate through the Reno and Truckee areas in the spring (Clemmer 1996). Its preferred habitat includes riparian marshes, meadows, rangelands, and pastures (Scott 1987).

No suitable habitat occurs on the project area for ferruginous hawk, western least bittern, white-faced ibis, or black tern--all USFWS species of concern. The western burrowing owl, a USFWS and Nevada state species of concern, was not observed during nocturnal baseline bat surveys on the project area (JBR 1996e). Therefore, none of these species are discussed further in this EIS (JBR 1996e; Nevada Natural Heritage Program 1996).

Reptiles and Amphibians. No reptiles and only one species of amphibian are identified as species of concern potentially occurring in the vicinity of the project area. The northwestern pond turtle, a USFWS species of concern, is known to occur in the Truckee and Parson River drainages. It inhabits the aquatic riverine and overflow areas (Clemmer 1996). No suitable habitat for this species occurs within the project area; therefore, it is not discussed further in this document.

Invertebrates. The California floater, a USFWS species of concern, is a freshwater mussel that typically occurs in small permanent streams with pools ranging from 1.5 to 3.0 ft deep and characterized by silt, sand, or small gravel substrates (BLM 1996b). This habitat does not occur on the project area; therefore, this species is not discussed further.

3.8.3 Threatened, Endangered, and Candidate/Sensitive Plant Species

No TE&C plant species are known to occur in the project area; however, five sensitive plant species were noted by the USFWS (Mendoza 1996) as potentially occurring in the area. These five species of concern include: altered andesite buckwheat, Sierra Valley ivesia, Webber's ivesia, Nevada oryctes, and Williams combleaf. These species have no protection under the Endangered Species Act, but they are Nevada BLM sensitive species. BLM's objective for sensitive species is to ensure that actions authorized, funded, or carried out by the federal government do not contribute to the need to list any of these species as threatened or endangered. However, none of these species occur on the project area, primarily due to a lack of suitable habitat (Morefield and Knight 1992; Morefield 1995; BLM 1996a; Ramakka 1997).

3.9 RANGE RESOURCES

Two grazing allotments occur in the project area--the Olinghouse allotment and the White Hills allotment (Figure 3.12). The Olinghouse allotment includes approximately 3,704 acres (71%) of the southern portion of the project area, and the White Hills allotment approximately 1,505 acres (29%) of the northern portion. Neither allotment supports wild horses.

The Olinghouse allotment encompasses 30,502 acres, of which approximately 17,000 acres are federal surface. This federal surface provides 800 animal unit months (AUMs--the amount of forage required to support one cow and calf for 1 month) of grazing, an average of 21 acres/AUM. Two grazing permittees run cattle between November 1 and May 15.

The White Hills allotment includes approximately 27,000 acres, of which 16,634 acres are federal surface, and provides 1,210 AUMs on federal surface, an average of 14 acres/AUM. Recently, most of the nonfederal land in the White Hills allotment has been acquired by BLM, and future management options are currently under discussion in cooperation with Washoe County (see Section 3.11.1). Two permittees run cattle in the White Hills allotment from April 1 through October 31.

Both allotments are in the "custodial" category, which defines an allotment whose present vegetation has stabilized, whose vegetative production is low, and whose potential for improved productivity is limited by economic criteria, where resource conflicts are limited or cannot be controlled due to land ownership patterns, and where there is no likelihood of positive economic return on public investment.

There are five range improvements in the Olinghouse allotment--two fences, one spring development, one well, and one aerial seeding of a burned area--all completed by the BLM, and seven range improvements in the White Hills allotment--one fence, one exclosure, one corral, and four water developments--all of which, with the exception of the fence and exclosure, were installed by the permittee.

3.10 RECREATION

The primary recreational use of lands in the vicinity of the proposed mine is dispersed

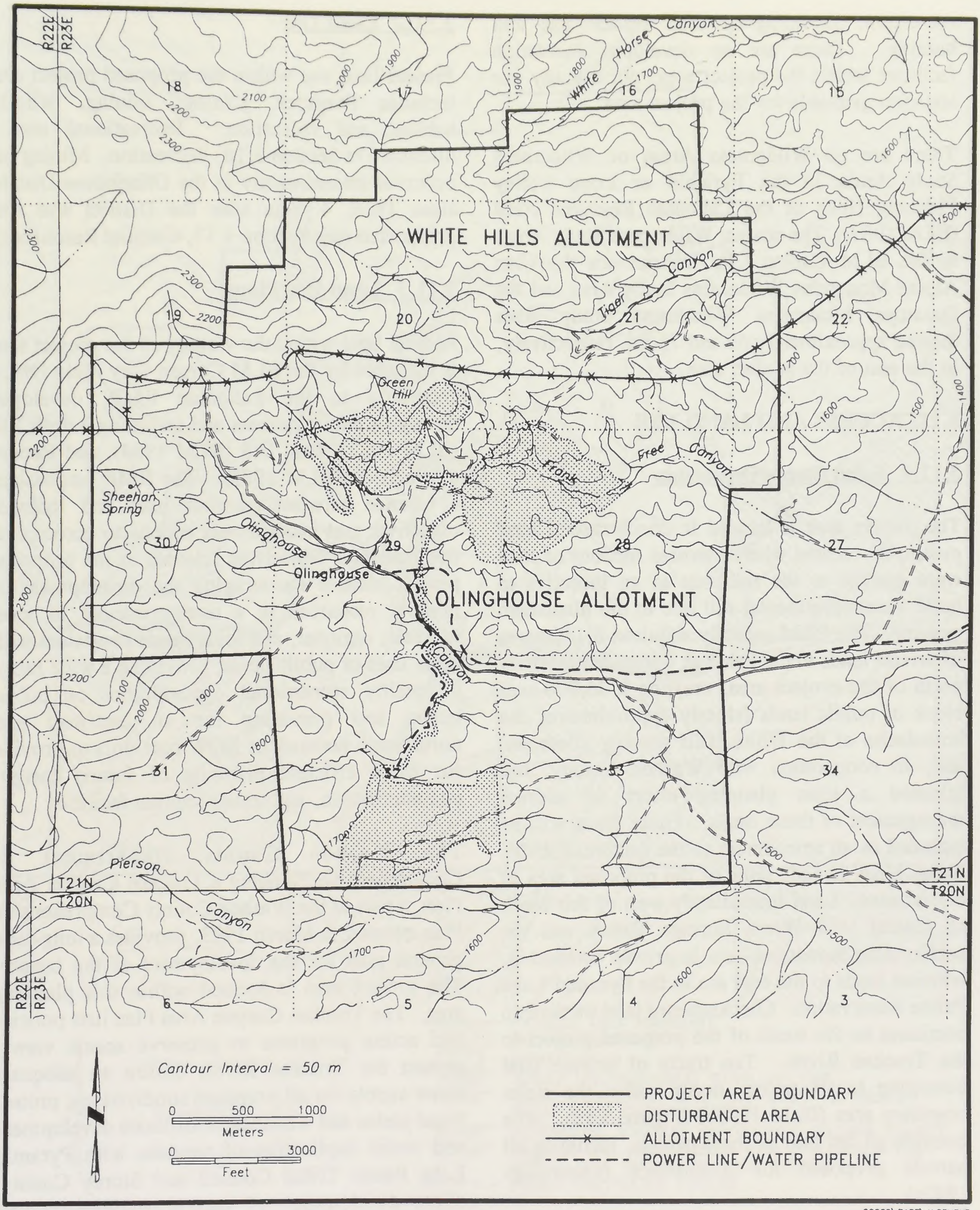


Figure 3.12 Grazing Allotments in the Project Area (Excluding Access Corridor) (Gianola 1996).

recreation, including off-road vehicle use and hunting. There are no developed recreation facilities within the project area, nor are any use statistics available for the project area.

There are no Wilderness Areas or Wilderness Study Areas in the Pyramid or Long Valley Planning Units of the Lahontan Resource Area (BLM 1987). The nearest Wilderness Study Areas in the BLM Carson City District are the Clan Alpine Mountains Wilderness Study Area and the Desatoya Mountains Wilderness Study Area located approximately 65 and 75 mi, respectively, to the east of the project area.

3.11 ACCESS AND LAND USE

3.11.1 Land Status/Ownership

The project area is located in *checkerboard land ownership* created when alternate sections of land were granted to the railroads as an incentive to build a transcontinental rail line in the nineteenth century. The BLM recently acquired 8,136 acres of private lands in the Pah Rah Range immediately north of the project area, creating a 26,000-acre block of public lands (closely approximating the boundaries of the White Hills grazing allotment) and, in cooperation with Washoe County, has initiated a joint planning effort to address management of these lands. These plans will be included as an amendment to the Lahontan RMP. These lands include none of the proposed area of disturbance. Land immediately west of this block of federal land--Warm Springs Valley and the surrounding mountains--are in private ownership, whereas lands to the east are in the Pyramid Lake Paiute Reservation. Checkerboard land ownership continues to the south of the proposed project to the Truckee River. Ten tracts of private land belonging to six parties occur within the claim boundary area (BLM 1995b) (Figure 3.13). Alta controls all but four of these parcels, including all parcels proposed for disturbance (Cummings 1997a).

3.11.2 Land Use

Present land use within the proposed project area includes livestock grazing, mining, wildlife habitat, and recreation. Recreational use is discussed in Section 3.10, Recreation. Mining has occurred intermittently in the Olinghouse District since 1864, 4 years after the District was first prospected (see Section 3.13, Cultural Resources).

3.11.3 Land Use Plans

Federal land within the vicinity of the project area is managed by the BLM Carson City Field Office according to the Lahontan RMP, developed through a public process and including a draft EIS (BLM 1983), final EIS (BLM 1984), and Record of Decision (BLM 1985). The RMP emphasizes a balance between resource uses and includes objectives and management actions to accomplish this balance. Objectives relevant to the proposed project include encouraging the development of mineral resources in a timely manner to meet national, regional, and local needs consistent with other uses of public lands; providing a wide range of quality recreational opportunities on public lands; and providing for an east/west and north/south network of ROW corridors to provide for more efficient planning of future energy, communication, and transportation facilities.

The Washoe County Department of Comprehensive Planning's Truckee Canyon Area Plan, a part of the Washoe County Comprehensive Plan adopted in March 1993, provides a long-term general plan for the development of the county. The project area is located within this planning area. The Truckee Canyon Area Plan lists policies and action programs to preserve scenic views; protect the Truckee River; ensure an adequate water supply for all proposed subdivisions; protect flood plains and wetlands; coordinate development and avoid duplication of services with Pyramid Lake Paiute Tribal Council and Storey County; allow development of natural resources under

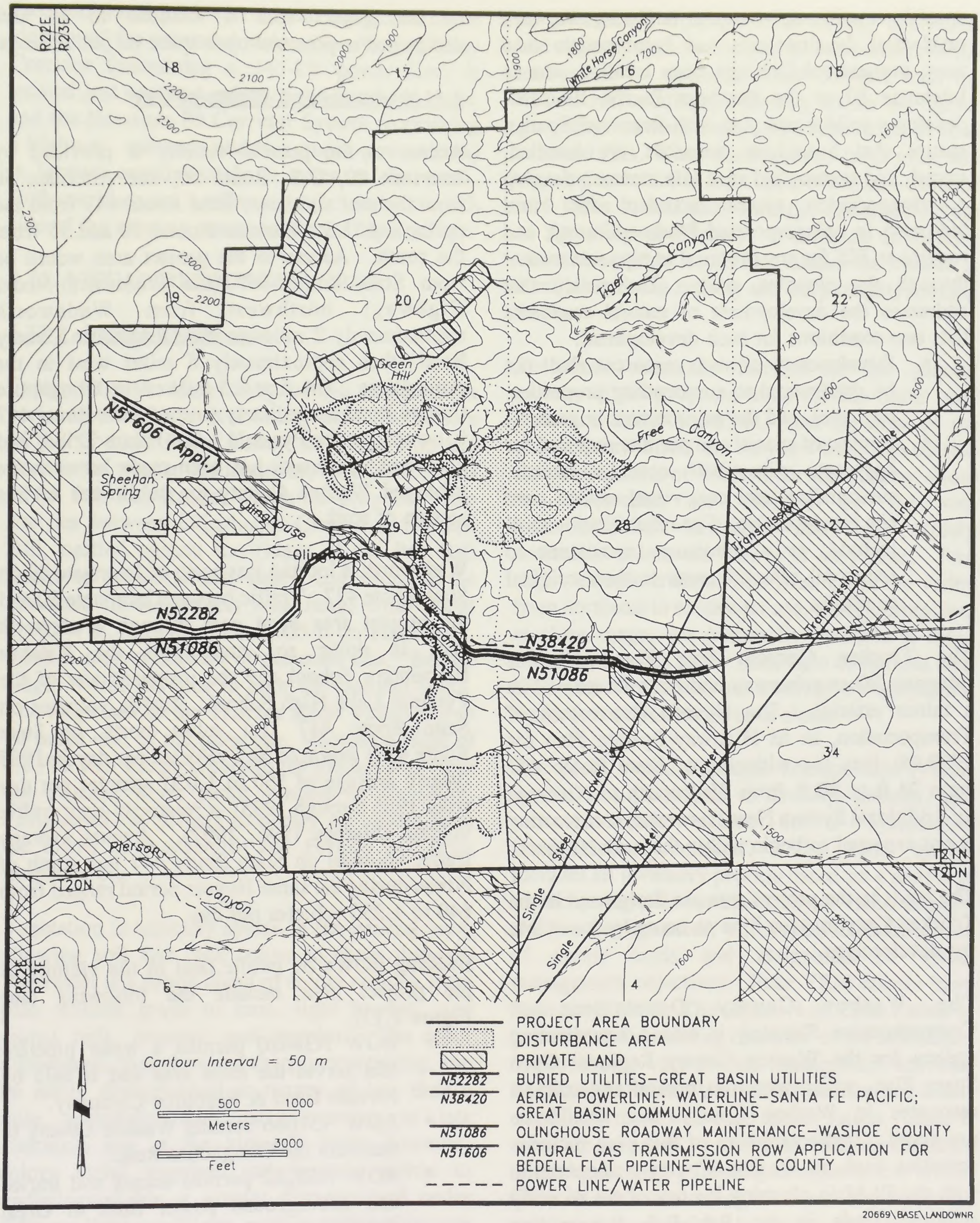


Figure 3.13 Land Ownership and Rights-of-way on the Project Area (Excluding Access Corridor) (Hufnagle 1996; BLM 1995b).

special conditions; provide buffering between residential developments and incompatible land uses; prevent subdivisions from locating next to Interstate 80 or the Southern Pacific Railroad; develop a solid waste plan with Reno and Sparks; ensure that hazardous materials are handled, stored, and transported in a safe manner; develop a transportation system standard for rural highways in unincorporated Washoe County; and require an EIS for any proposal to pipe wastewater through the planning area. The policy that addresses the development of natural resources lists two conditions for such development.

- Development of such resources shall not be detrimental to surrounding properties, land uses, and the environment in general.
- Review of special use permits required for aggregate pits shall consider access, surrounding land use, visual aspects, and site rehabilitation. Site rehabilitation shall include, as a minimum, provisions to return all affected areas to their original condition.

The Truckee Canyon Area Plan identifies Interstate 80 as a freeway and State Route 447 as a minor arterial. The Nevada Department of Transportation, in its Highway System Plan for 1989-98, lists the widening of State Route 447 from 24 ft to 30 ft from Wadsworth to Nixon as an Additional System Need; however, construction is not expected to begin within the next 10 years.

The lands in the project area are designated in the Truckee Canyon Area Plan as being least suitable for development.

The Washoe County Department of Comprehensive Planning is also a coordinating agency for the Washoe County Regional Open Space Plan, which identifies natural and cultural resources in Washoe County that should be preserved. Implementation of this plan includes activities such as Washoe County's cooperation with the BLM in planning for use of the recently acquired lands in the Pah Rah Range (see Section 3.11.1). Much of the land in the vicinity of the project area is included in an area designated as potential open space on public lands.

3.11.4 Access and Rights-of-way

Access to the general vicinity is provided by Interstate 80, U.S. Route 50, and Alternate 50 from the east and west; State Route 447 from the north; and U.S. Alternate Routes 50 and 95 from the south. Access to the project area would be from State Route 447 (the Wadsworth-Nixon Highway) northwest from Wadsworth approximately 2 miles to the Olinghouse County Road, then approximately 5 miles west to the project area. The first 0.5 mile of the Olinghouse County Road immediately west of State Route 447 is owned by the Pyramid Lake Paiute Tribe, and no access agreement has been made between the tribe and Washoe County for public use of this section of road.

Wadsworth is located just north of Interstate 80 on State Route 427. Traffic between Interstate 80 and the project area must pass through Wadsworth and, in doing so, must pass the Natchez Elementary School and the proposed site of the Pyramid Lake High School. Traffic volumes on State Route 447 (1.1 miles north of State Route 427) averaged 865 vehicles per day in 1995 (yearly average of 550 to 1,050 vehicles per day from 1986 through 1995)--a relatively light traffic volume (Starnes 1996, 1997). Annual average traffic volumes on State Route 447 just south of Nixon during the same 10-year period ranged from 640 to 1,250 vehicles per day.

Existing ROWs on public land in the vicinity of the project area include the following (see Figure 3.13).

- ROW N38420 permits a water pipeline that serves the mine area and is held by Nevada Land & Resource Company.
- ROW N51086 permits Washoe County to maintain the Olinghouse Road.
- ROW N52282 permits access and buried and aboveground power lines to Great Basin Communications for the Pond Peak communications site.

Two additional ROWs have been designated in the vicinity of the proposed mine. The Valmy-Tracy Corridor (containing a 345-kV power line) is located just east and south of the proposed mine, and the Interstate 80 Corridor System (containing a highway, railroad, and two major power lines) is located approximately 6 miles to the south. Both corridors are 3 miles wide (1.5 miles on each side of the existing transportation/utility facility).

3.12 VISUAL RESOURCES/NOISE

3.12.1 Visual Resources

Topography in the vicinity of the project area varies considerably. It is nearly flat in the bottom of the Truckee River Valley at Dodge Flat and rises to the west to the irregular, rounded foothills of the Pah Rah Range, where the proposed mine site lies between Olinghouse Canyon and Green Hill, nestled against the ridges of the Pah Rah Range to the north and west. Elevations in the viewshed of the project area range from about 4,100 ft at Wadsworth to 8,035 ft on Pond Peak, 2 miles west-southwest of the mine site. Barrier ridges define the area to both the east and south. The ridge east of the Truckee River Valley is 9 to 10 miles east of the mine site, whereas a ridge of the Pah Rah Range separates the project area from the Truckee River about 4 miles to the south. Portions of the project area may be visible from the towns of Wadsworth and Fernley and from Interstate 80.

Vegetation is typically sparse in the general area, allowing soil and rock colors to show through. The result is a subtle blend of colors ranging from pale whitish grays to tans, light browns, and muted reds, oranges, and purples. The color differences, though never sharply contrasting, can be easily distinguished at ranges of less than a mile, especially with early morning or late afternoon sun at the viewer's back; however, colors blend together and become subtle to undistinguishable at greater distances and under different light conditions, such as high midday sun or in the light haze often seen in the area. Areas of disturbance from previous mining operations and ongoing exploration exhibit some line *contrast* and minor to moderate color contrast with the natural surroundings, primarily where the lighter gray rock has been exposed by excavation or road cuts and fills. The visual contrast from prior and ongoing activities is most apparent from a distance of 2 miles or less and, although discernable from as far away as Fernley, is difficult to identify under most light conditions unless the viewer is familiar with the activity and purposefully looking for it.

Prominent manmade features in the general vicinity of the proposed mine include linear road scars and utility corridors, most apparent on the valley floor. There are very few buildings outside the communities of Wadsworth and Fernley; those that do exist are dwarfed by the vast mountain/desert landscape and are scarcely noticeable unless the viewer is very near. Two major electric transmission lines cross the valley from northeast to southwest and, though prominent at close range, are practically invisible at more than 2 to 3 miles under most light conditions and, like other structures, are dwarfed by the natural landscape unless a viewer is close.

The BLM Visual Resource Management (VRM) system was developed to identify, classify, and protect scenic values in a systematic, interdisciplinary manner. The VRM system includes an inventory process based on a matrix of scenic quality, viewer sensitivity to visual change, and viewing distances, which leads to classification of public lands and assignment of visual management objectives. Four VRM classes have been established. The objective of Class I areas is to preserve the existing character of the landscape. It allows only very limited management activities and is used to identify relatively undisturbed areas--especially those with high scenic values. Class II areas are managed to retain the existing character of the landscape by limiting changes to low levels. Class III areas are managed to partially retain the existing character of the landscape while providing for moderate changes. Finally, Class IV areas provide for management activities that require major modifications to the existing character of the landscape.

Under the VRM system, Scenic Quality Rating Units were identified by the BLM Carson City District for the Pah Rah Range. The units correspond to portions of the landscape displaying similar visual characteristics or qualities. Letter values--A (highest), B, or C--were assigned to each unit based on the scenic quality of the unit relative to other units in the area. Generally, the more mountainous portions and the Truckee River corridor were considered to have moderately high scenic values and rated B, whereas the remainder of the area, including mostly the flat land and some lower foothills, was considered common and rated C. Viewer sensitivity of the project area ranked high because of the large number of viewers from Interstate 80 and State Route 447, the long duration of views from residential areas of Wadsworth and Fernley, and the relatively high sensitivity to visual quality attributed to people driving to Pyramid Lake for recreation. Viewing distances from public viewpoints to the project area range from 3 to 6 mi, which is considered "middleground" to "background" under the VRM System. Combining the scenic quality, sensitivity, and distance data results in much of the general vicinity of the project area being classified as Class III, whereas the areas that have been disturbed by previous mining are Class IV.

Three *key observation points (KOPs)* were selected for evaluating visual contrast ratings. These KOPs were selected to represent high-sensitivity and high-volume viewing perspectives of the proposed project: 1) on State Route 447 approximately 1 mile north of Olinghouse County Road; 2) at the intersection of State Route 447 and Olinghouse County Road; and 3) on Interstate 80 at the State Route 427 overpass (Figure 3.14).

KOP #1 is located on State Route 447 approximately 1 mile north of the intersection with the Olinghouse Road and represents views from motorists traveling between Wadsworth and Pyramid Lake (Figure 3.15). Although views to the proposed mine site are at right angles to the direction of travel, this viewpoint provides an easterly perspective that other viewpoints do not and is closer to the project site than other high-use vantage points.

KOP #2 is located at the intersection of State Route 447 and the Olinghouse Road. Like KOP #1, it presents views to motorists from the state highway (Figure 3.16). Unlike KOP #1, however, it presents nearly straight-on view to motorists traveling northwesterly from Wadsworth. It also presents the view from the town of Wadsworth, although from a closer vantage point.

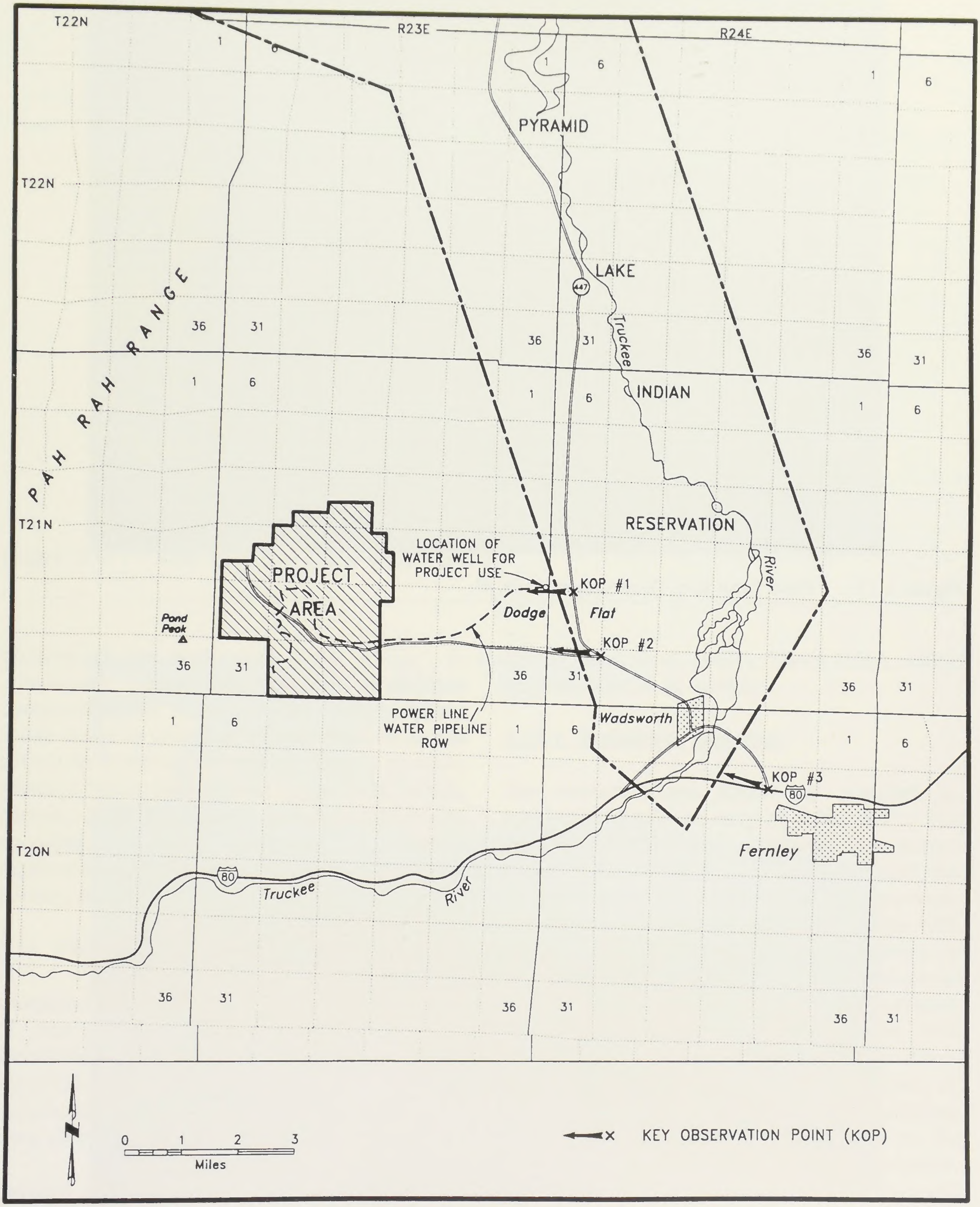
KOP #3 is located at the Interstate 80 overpass over State Route 427 and is the most distant of the three views--about 9.5 miles from the proposed mine site (Figure 3.17). However, it does present the most open view of the proposed mine site to the largest number of people. More than 5 million people pass this location on Interstate 80 every year. In addition, KOP #3 represents the view that Fernley residents would have of the proposed mine site.

3.12.2 Noise

The area of potential influence for noise effects from the proposed project is generally limited to within 3 to 5 miles of the project area. The nearest occupied residences are about 4.5 miles east-southeast of the proposed location of the main pit, and 3 miles from the nearest major project facility--the waste rock dump.

The principal sources of noise near the project area are natural, including wind, insects, and birds. Ranching- and recreation-related traffic generate occasional vehicular noise; however, traffic is very light. Exploration activity related to the proposed project currently generates noise from heavy equipment operation.

Existing noise levels likely range from 20 to 50 *dBA (A-weighted decibels)* in the more remote



20669\CUMULTIV\KOP

Figure 3.14 Location of Key Observation Points.

Figure 3.15 View from Key Observation Point #1.

Figure 3.16 View from Key Observation Point #2.

Figure 3.17 View from Key Observation Point #3.

portions of the study area (EPA 1971). In comparison, typical noise levels in small rural communities fall in the 40 dBA range. Lower levels would be typical of the area when no human activity is occurring and there is little or no wind, whereas higher levels would occur during windy periods. Noise levels could exceed 50 dBA during operation of heavy equipment for ongoing exploration activities or in the event of low-flying military aircraft.

3.13 CULTURAL RESOURCES

Cultural resources are the nonrenewable remains of past human activity, occupation, or use identifiable through ground reconnaissance, historical documentation, or oral evidence and include archaeological, historic, or architectural sites, structures, places, objects, and artifacts.

Detailed prehistoric, *ethnographic*, and historic overviews of Nevada have been written by Hester (1973), Bard et al. (1981), Elston (1982, 1986), and Pendleton et al. (1982).

3.13.1 Prehistoric Overview

The western Great Basin was occupied by prehistoric people as early as 9,000 B.C. The extensive marshes and grasslands that existed following the recession of the Pleistocene age Lake Lahontan provided a dependable resource base, and there is evidence of large base camps with shelters and storage facilities. Prehistoric fluctuations in climate resulted in variations in artifact types and changes in geographic habitations. Within the Great Basin, this variability seems to have occurred for thousands of years and tended to depend on the location of dependable water sources (Weide 1976; Madsen 1988). Because of its location relative to the Truckee River, Pyramid Lake, numerous intermittent drainages, and numerous springs and seeps, the project area likely served as a habitable location for prehistoric people.

3.13.2 Historic Overview

General overviews of Nevada history can be found in Elliott (1987) and Hulse (1991). Historic information for the general project area is presented in the cultural resource overview for the Carson City District (Paher 1970; Lincoln 1982; Pendleton et al. 1982).

The Olinghouse Mining District, originally known as White Horse, was located immediately north of the historic town of Olinghouse. In 1980, Olinghouse was recorded as an historic site (Pendleton et al. 1982).

Mining in the project area began on a small scale about 1874 with the establishment of the Green Mountain Mines by Frank Free. The Green Mountain area subsequently became the center of production within the district. According to Hill (1911), ore production reached its peak from 1901 to 1903, when three separate mills were operating. A post office was established in 1903, and a teamster-turned-sheepman named Elias Olinghouse gave his name to the burgeoning community. Prior to 1900, placer deposits located in several tributaries of Olinghouse Canyon were of considerable importance, producing gold valued at many thousands of dollars (Vanderburg 1936).

The Nevada Railroad Company constructed a standard-gauge railroad between Olinghouse and Wadsworth in 1906 to haul gold ore from the Buster Mines to a 50-stamp mill at Wadsworth (Bonham 1969). Despite the optimistic outlook for the Olinghouse District, ore from the district assayed at less than $1.00 per ton (Myrick 1962). During the ensuing panic caused by this information, both the railroad company and the mill went into receivership and, in 1907, were purchased for about $40,000 by the wife of one of the company's investors. The shock of the low ore assays and the "Panic of 1907" dealt Olinghouse a blow from which it did not recover. Other factors that contributed to the downfall of Olinghouse revolved around the limited use of organized production methods for obtaining the ore. Most of the early mining used a variety of methods including placer, sluice boxes, plowing the rock, etc. At about this same time, mining at Tonopah and Gold Fields, Nevada, was proving more profitable than at Olinghouse and attracted miners from Olinghouse. Although small-scale mining continued intermittently until the gold embargo of World War II, Olinghouse would become another Nevada ghost town with a short but colorful history.

As early as the 1860s, sheep ranching was established in the region, and cattle ranching was introduced in 1905-1910 when the Garaventa family established their ranch at the upper end of Olinghouse Canyon. Later, Joe Petersen established a dude ranch at this same site. Prior to World War II, this same ranch also served as a Civil Conservation Corps facility.

3.13.3 Management of Cultural Resources

Seven archaeological Class III surveys have been conducted within the proposed project area (Ruscoe and Seelinger 1974; Hufnagle 1989a, 1989b, 1990; Kautz and Pinto 1990; JBR 1995f, 1995g; D'Angelo 1997). Based on these completed cultural resource surveys, 244 cultural resource properties have been identified, including 71 sites--46 historic, 19 prehistoric, and six multicomponent--101 rock cairns, 43 prospect pits, and 29 *isolated artifacts*. All areas of direct effects from the Olinghouse Mine Project have been subjected to a Class III survey. However, a Class III cultural resource survey remains to be completed for the Alternative A access road route. The results of six of the completed surveys from the project area have been reviewed by the Nevada State Historic Preservation Office (SHPO) in accordance with Section 106 of the National

Historic Preservation Act (NHPA). The survey from the southern portion of the project area (D'Angelo 1997) is still in the process of being reviewed by the BLM and SHPO. The cultural resource properties recorded in the northern portion of the project include five historic sites determined to be eligible for listing on the National Register of Historic Places (NRHP) and two sites which remain unevaluated. NRHP eligibility for the D'Angelo's (1997) survey in the southern portion of the project area include one historic site recommended as unevaluated, two multicomponent sites with both the historic and prehistoric components recommended as unevaluated, and one multicomponent site with the prehistoric component recommended as unevaluated. All remaining sites are recommended as not eligible. NRHP determinations will be made after final review by SHPO.

3.13.4 Ethnography

The proposed project area is in territory historically controlled by a group of the Northern Paiute called the Kamodokado (Stewart 1939; Smith et al. 1983; Fowler and Liljeblad 1986). Economic subsistence was based on the use of all available resources, a characteristic that began during the *Late Archaic* due to the harsh desert environment that existed. The Kamodokado pursued a seminomadic lifestyle, gathering foods as they became available within specific territories controlled by individual groups. Various parts of plants, including seeds, roots, tubers, berries, and greens, were collected and eaten fresh or processed for storage. Little emphasis was placed on hunting, as grasslands were limited and large game herds were rare. However, some individual and communal group hunting for antelope and bison occurred. Small game, reptiles, fish, and rodents comprised the largest percentage of the diet (Steward 1938).

The irregular and unpredictable cycles of food procurement constrained the establishment of permanent villages or encampments; therefore, habitations were based on locations where vegetable foods ripened, occurring at different times in different areas.

3.13.5 Native American Religious Concerns

The project area is within the traditional homeland of the descendants of the Northern Paiute and is very close to the generally accepted boundary between the Northern Paiute and the Washoe populations. Whether Washoe people entered or crossed the project area is unknown, although the joint use of land by Washoe and adjacent peoples was an established practice (d'Azevdo 1986).

In accordance with provisions of the NHPA, the American Indian Religious Freedom Act, and the Native American Graves Protection and Repatriation Act, the BLM has contacted the Pyramid Lake Paiute Tribe regarding their concerns related to traditional uses of the area. Native Americans who are most likely to be familiar with traditional uses of area and the potential related oral tradition are likely to reside in Wadsworth.

3.14 SOCIOECONOMICS

The social and economic study area for the proposed project includes Washoe and northern Lyon Counties and the communities of Reno, Sparks, Wadsworth, and Fernley. The unincorporated communities of Wadsworth and Fernley would most likely attract any new residents due to their proximity to the project area (see Figure 2.1). Wadsworth is located within the Pyramid Lake Paiute Reservation and administrative functions are provided jointly by Washoe County and the Pyramid Lake Paiute Tribal Council. Fernley, located in Lyon County, is administered by a town board. Other regional governing bodies include the county commissioners and planning commissions. Churchill and Storey Counties are also located close to the project area; however, few workers would be expected to live in these counties.

3.14.1 Population and Demography

The estimated 1995 population of Washoe County is 294,290, and that of Lyon County 26,580 (Table 3.7). Lyon County has grown at a faster annual rate (6%) than Washoe County (4%) over the past 3 years, and the communities of Wadsworth and Fernley have experienced substantial growth over the past 3 years (24% and 18%, respectively), which can be attributed to "quality of life" migration by Reno/Sparks commuters and retirees and new government housing being built for Tribal members who are moving back to the reservation. Rural lifestyles, natural environments, and moderate housing prices in these communities have contributed to this population growth.

The demographic composition of Washoe County is more than 86% Caucasian, 11% Hispanic, and 3% other races. Lyon County is more than 95% Caucasian, with other races comprising the remaining 5%. There is limited statistical information available on the town of Wadsworth. Wadsworth is the largest town on the Pyramid Lake Paiute Reservation, and most of the population is Native American. Non-Tribal fee lands exist within the town that are not part of the Reservation, and both Tribal and non-Tribal members own these lands and are residents of Wadsworth. Other principal communities on the Reservation include Sutcliffe and Nixon.

3.14.2 Economy, Employment, and Income

Washoe County's economy depends largely on the services and trade industries, especially as they relate to gaming in the Reno/Sparks area. Approximately 60% of total employment in Washoe County is concentrated in these two sectors. During 1995, the construction sector accounted for 6% of overall employment in Washoe County whereas the mining sector accounted for less than 1% of overall employment (Table 3.8). Mining employed 600 Washoe County workers in 1995, which is down from 700 workers during the previous 2 years.

Table 3.7 1995 Population and Labor Force Statistics[1].

Location	Population	Average Annual Growth[2]	Labor Force	Unemployment	Unemployment Rate
Washoe County	294,290	4%	163,100	7,800	4.8%
Reno/Sparks	210,500	3%	na[3]	na	na
Wadsworth	978	24%	na	na	na
Lyon County	26,580	6%	10,790	880	8.1%
Fernley	7,222[4]	18%	na	na	na

[1] From Nevada Department of Taxation and Nevada State Demographer (1996), Nevada Small Business Development Center, University of Nevada, Reno, and Nevada Department of Employment, Training, and Rehabilitation, Employment by Place of Residence.

[2] Averaged over 1993-1995.

[3] na = Not available.

[4] The Nevada Commission on Economic Development's (1996) population estimate for the Canal Township, which includes Fernley, is 9,357.

Table 3.8 Employment by Sector, Washoe and Lyon Counties, 1993-1995[1].

Employment Sector	1995	
	Washoe County	Lyon County
Mining	600	180
Construction	10,200	530
Manufacturing	12,300	1,650
Transportation and public utilities	11,100	270
Trade	37,100	1,220
Finance, insurance, and real estate	7,500	160
Services	65,700	1,350
Government	21,500	1,260
Total	166,000	6,620

[1] From Nevada Department of Employment, Training, and Rehabilitation (1996).

Lyon County's economy is driven about equally by manufacturing, trade, services, and government. The construction and mining sectors accounted for less than 12% of the total employment in Lyon County in 1995. Mining employed 180 Lyon County workers in 1995 (140 in 1994, and 160 in 1993). The average annual employment growth is 5.1% in Washoe County and is 8.5% in Lyon County. Lyon County also derives a significant portion of its income from workers who commute to other counties and transfer payments such as retirement pensions.

The Nevada Department of Employment, Training, and Rehabilitation's Employment by Place of Residence reports that the unemployment rates in Washoe and Lyon Counties in 1995 were 4.8% and 8.1%, respectively. Unemployment among the potential workforce on the Pyramid Lake Paiute Reservation averages approximately 34.5%. This indicates an availability of local labor for certain types of jobs; however, the skill levels represented in this unemployed workforce are unknown.

Employment in Lyon County is increasing at a faster rate (9%) than the labor force (3%), indicating that new jobs are being filled by local residents rather than by newcomers.

Wages are considerably lower in Lyon County than statewide. In 1994, average weekly wages in Lyon County were $428, compared to $501 statewide. Lyon County mining wages were also estimated at $581 per week versus $868 per week for the state.

The 1996 per capita and median household income estimate for Washoe County is $19,629 and $40,933, respectively. The corresponding income statistics on the Pyramid Lake Paiute Reservation are $8,550 and $18,111 (University of Nevada, Reno 1997). These figures represent the high level of unemployment and low income on the

Reservation as compared to the rest of Washoe County.

3.14.3 Housing

New home construction is very active in Washoe and Lyon Counties: the population is growing at a pace that absorbs new housing rapidly, and the housing market in both Washoe and Lyon Counties--particularly in Reno, Fernley, and Wadsworth--is considered very tight. Home vacancy rates in both counties are 2 to 4%. Housing in Lyon County is more moderately priced than in neighboring counties. In 1996, the average value of owner-occupied housing in Fernley was $95,000, compared to more than $150,000 in the Reno/Sparks area. Existing housing is primarily single family; however, demand for mobile homes is increasing and may soon surpass demand for single family homes in Lyon County. The Lyon County Building Department reports there were 1,574 building permit applications received in 1994, a 20% increase from 1993, and the greatest number of permits were for mobile homes.

The rental housing/apartment market in Fernley is very tight, with vacancies estimated at less than 2%. Two- and three-bedroom apartments rent for $450 to $550 per month, whereas three-bedroom homes rent for $700 per month, and rents are generally rising. A number of new housing projects are currently under construction in the Fernley area, including several apartment complexes and two golf course communities.

Temporary housing in Fernley includes five motels with a total of 190 rooms, some of which are rented on a monthly basis. In addition, there are four recreational vehicle (RV) parks with 176 spaces and two mobile home parks with more than 200 permanent spaces.

Rental units are very difficult to find in the Reno/Sparks area, where vacancy rates are 2 to 5% (Apartment Finders 1996; Premier Properties 1996). Two- to three-bedroom apartments rent for $650 to $850 per month, and two- and three-bedroom homes rent for $1,200 to $1,300 per month. Housing starts in Reno are proceeding at lower rates than in other areas, and the housing situation is not anticipated to improve in the near future.

Wadsworth has approximately 200 housing units, most of which are occupied by Tribal members (Toby 1997). The Stamp Mill development just outside of Wadsworth provides privately owned non-Tribal single family units. Other fee lands within Wadsworth are privately owned, and an estimated 50 privately owned housing units occur on these lands (Toby 1997). The area also has additional land available for development. The Pyramid Lake Housing Authority and Pyramid Lake Paiute Tribe are currently constructing a 25-unit housing project on State Route 477 just east of the access road to the mine site. The Tribe anticipates building additional housing in Wadsworth to accommodate the increased demand for housing by Tribal members wanting to move back to the Reservation.

3.14.4 Community Facilities and Services

Public services and facilities in the Reno/Sparks area are adequate to serve the population and could absorb a slightly increased population; therefore, the community facilities and services section of this EIS will concentrate on the Fernley and Wadsworth areas.

Fernley relies on Lyon County for the provision of police services, road maintenance, some general government services, schools, and social services. Wadsworth is located within the Pyramid Lake Paiute Reservation. There is some private fee land in Wadsworth, but the majority of services are provided by the Pyramid Lake Paiute Tribal Council. Washoe County does provide a sheriff, a water irrigation system, and road maintenance.

Residential water and sewer services in Fernley are provided primarily by Fernley Utilities. Fernley currently has four working wells, as well as some surface water rights. The water supply is adequate for the current and future anticipated population of the town, but Fernley is interested in developing additional water resources with the town of Wadsworth to ensure an adequate supply of quality water for future residential, commercial, and industrial development (Kramer 1996). The Pyramid Lake Paiute Tribe operates the water and sewer systems throughout most of the Reservation. The sewer system is adequate to serve the existing and anticipated future population. The water system is at capacity, and improvements are proposed for the future. Fernley's wastewater treatment system has a design capacity of 0.6 million gpd and is undergoing an expansion which will increase treatment capacity to 1.5 million gpd by the fall of 1997 (Kramer 1996). Fernley also operates a transfer station for solid wastes, which are then disposed of in a regional landfill at Lockwood, Nevada. Electricity is provided by Sierra Pacific Power Company, and adequate capacity exists for the anticipated increase in customers. Telephone Service is provided by Nevada Bell.

Law enforcement is provided by the Lyon County Sheriff's Department and the Nevada State Highway Patrol, both of which maintain substations in Fernley, and the Pyramid Lake Paiute Tribal police. The nearest jail is in Yerington (47 miles south) and calls are dispatched from Silver Springs (14 miles south). The Fernley substation has eight deputies and operates 24 hours per day, covering all of northern Lyon County (Lang 1996). The Tribal police have a substation in Wadsworth with a total force of seven officers serving the Reservation. The highway patrol has five patrolmen covering a service area halfway to Fallon, halfway to Lovelock, halfway to Reno, partway to Gerlach, and south to Silver Springs (Connelley 1996). The Washoe County Sheriff's Department provides 24-hour coverage to the Wadsworth and Gerlach areas, and resident deputies are stationed in both Wadsworth and Gerlach. Dispatch is located in Reno.

Fire protection is provided by the North Lyon County Fire Protection District, which has approximately 35 volunteers and covers an area of approximately 160 mi^2. Its equipment includes a rescue truck, three fire engines, three ambulances, one or two brush trucks, and a water tender (Harold 1996). In addition, the Truckee Meadows Volunteer Fire Protection District provides fire protection to Wadsworth and portions of rural Washoe County. The district has one fire engine, one water truck, and a brush truck (Harold 1996). The Pyramid Lake Paiute Reservation also has a volunteer fire department stationed in Nixon. Regional Emergency Medical Services in Wadsworth provides ambulance service to the area. Fire and ambulance services are dispatched out of Silver Springs.

Medical services in the area include one general practitioner, two pharmacists, and one dentist. The nearest hospital is located in Reno. The Community Health Clinic in Fernley handles family planning, immunization, and well child care.

Cultural and recreational services are provided/administered by the Town of Fernley. Lyon County owns two of the four parks within Fernley, but the town manages all of the facilities. There are four parks, with a combination of tennis courts, softball, and baseball fields; an indoor pool; and other playground and sports facilities.

The Washoe County School District operates the Natchez Elementary School in Wadsworth. Natchez Elementary School capacity is estimated at 368 students for grades kindergarten through 6th grade, and based on the 1996-97 enrollment of 169 the school has excess capacity of approximately 200 students. Tribal students in grades 7 through 12 can attend the intermediate and high schools in Nixon or Reno or transfer to the Lyon County School District and attend school in Fernley.

The Lyon County School District is headquartered in Yerington and operates two elementary schools, an intermediate school, and a senior high school in Fernley. Enrollment has generally increased at an average annual rate of 1.6% and is currently 1,527. An eight-room wing is being added to Cottonwood Elementary School to accommodate an additional 200 students, and Fernley High is enclosing a courtyard to add seven additional classrooms and a multi-purpose room with a stage. The schools in Fernley could accommodate an additional 400 students. Estimated excess capacities at the individual schools, as of January 1996, are 216 at Cottonwood Elementary, 68 at Fernley Intermediate, and 247 at Fernley High.

3.14.5 Public Finance

The assessed valuation of Washoe County in 1995-96 was $5.86 billion, an increase of more than 13% since 1993-94 (Table 3.9). Washoe County property taxes are estimated to be $81 million in fiscal year 1996-1997 and to account for about 30% of county-wide revenues. Property tax income related to mining is minimal, and most property tax revenues are generated from real property. Gaming revenues and supplemental city/county relief tax generates approximately 18% of the income for Washoe County. Other revenues (e.g., fees, fines, charges for services) represent about 24% of the total county-wide budget, and other financing sources represent 13% of all revenues utilized in county operations. The remaining 15% of the budget comes from intergovernmental transfers, account balancing, or operating funds.

All communities within Washoe County pay the same state, county, and school district rates for ad valorem taxes. There are additional rates levied for communities with special districts and indebtedness, such as fire protection districts, general improvement districts, etc. The overall ad valorem tax rate in Washoe County in 1995-96 was 2.5078% and generated revenues of approximately $147 million.

The assessed valuation of Fernley in 1995-96 was $91,104,000, an increase of more than 14% since 1993-94. Fernley (Lyon County) had an ad valorem tax rate of 2.8468% in 1995-96 that generated revenues of approximately $2.6 million.

Table 3.9 Assessed Valuation for Washoe County and Fernley.[1]

Source	Assessed Valuation ($1,000s) FY 1993-94	FY 1994-95	FY 1995-96	Percent Increase (Decrease)
Washoe County				
Assessed valuation	5,179,851	5,440,391	5,863,539	13.2
Net proceeds	3,155	2,500	1,894	(40.0)
Fernley				
Assessed valuation	79,729	88,407	91,104	14.3

[1] From the Nevada Department of Taxation (1996, 1997).

Other county-wide revenues include sales tax, motor vehicle fuel taxes, road tax, and payments-in-lieu-of taxes.

Revenues collected in both Washoe and Lyon Counties are used to provide public services, including general government functions (administration, assessor, planning, etc.), public safety, roads, social services, public works, and parks, to name a few.

3.14.6 Indian Trust Assets

Indian trust assets are legal interests in property held in trust by the U.S. for Indian tribes or individuals. The Secretary of the Interior is the trustee for the U.S. on behalf of the Indian tribes. All Department of the Interior agencies share the duty to protect and maintain trust assets.

The Pyramid Lake Paiute Reservation is approximately 4 miles to the east of the boundary of the proposed Olinghouse Mine Project. The town of Wadsworth has the largest population on the Reservation and is located 7 miles southeast of the proposed project.

3.14.6.1 Water Resources

Groundwater in the Dodge Flat area has been used for irrigation, water supply, stock watering, and mining and milling activities. Numerous wells exist around Dodge Flat, both on and off the Reservation. Additional descriptions of the groundwater resources are located in Section 3.4.2.

3.14.6.2 Fish and Wildlife

The Pyramid Lake Paiute Tribe maintains two fish hatcheries in Sutcliffe and Numana to raise threatened Lahontan cutthroat trout and endangered cui-ui. The Tribe is working cooperatively with federal, state, and private agencies to protect spawning areas and improve river access for spawning. A detailed description of fish and wildlife resources can be found in Sections 3.7 and 3.8.

The Pyramid Lake Paiute Tribe also manages and controls fishing and hunting rights on the Reservation.

3.14.6.3 Access and Transportation

Access to the general vicinity of the proposed project is provided by Interstate 80, then State Route 447 from Wadsworth and Olinghouse County Road to the project area. The first 0.5 mile of the county road from State Route 447 is owned by the Pyramid Lake Paiute Tribe. No access agreement has been made between the Tribe and Washoe County for public use of this section of the road.

All traffic between Interstate 80 and the project area currently must pass through Wadsworth and, in doing so, must pass the elementary school and the proposed site of Pyramid Lake High School. Additional information may be found in Section 3.11.4 of this document.

3.14.7 Environmental Justice

Under Executive Order 12898 (published in the Federal Register on February 11, 1994), federal agencies are required to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low income populations. Within the area potentially affected by the proposed project, the minority or low income populations are associated with the Pyramid Lake Paiute Reservation, including the community of Wadsworth. During the EIS process, particular efforts were made to ensure that members of the Pyramid Lake Paiute Tribe and residents of the Wadsworth community were informed of the proposed project, the EIS procedures, and the opportunity to provide comments.

According to 1996 data provided by the BIA (Williams 1997a, 1997b), unemployment among the potential work force on the Pyramid Lake Paiute Reservation averages approximately 34.5% compared to 5.2% for the state of Nevada and 4.1% for Washoe County. Among the employed residents of the Reservation, approximately 34% earn less than the poverty level threshold of $9,048 annually. Census data projected to 1996 estimates median household and per capita incomes on the Pyramid Census Tract of $18,111 and $8,550, respectively, compared with corresponding levels of $40,933 and $19,629 for Washoe County (University of Nevada, Reno 1996; U.S. Bureau of Census, Department of Commerce 1990).

3.15 HAZARDOUS AND SOLID WASTE

Past mining activities in the Olinghouse area have involved placer and underground operations. A variety of potentially hazardous materials were likely utilized by these historic mining operations. Several residential structures and mine-related buildings are located throughout the project area, and various solid wastes scattered around the project area include 55-gal drums, plastic buckets, wooden pallets, broken glass, plastic bottles, old vehicles, automobile batteries, coolers, abandoned ore sample bags, various types of hose and pipe, abandoned polyethylene liner material, old tanks, and abandoned mining equipment. Most of the 55-gal drums are rusted, empty, and riddled with bullet holes. Labels are either missing or illegible, so determination of past contents is not possible. Several of the abandoned automobile batteries are broken and may have caused some soil contamination. Fuel and vehicle maintenance wastes (e.g., gasoline, diesel, lubricating oil, solvents) may have been spilled or disposed of in the area, although there is no evidence that spills or releases of significance have occurred.

Current mineral exploration activities occurring in the project area are generating additional solid waste (i.e., pallets, boxes, and ore sample bags), and an unknown quantity of gasoline and diesel fuel is being utilized to power drilling rigs and vehicles.

4.0 ENVIRONMENTAL CONSEQUENCES

The potential environmental impacts of implementing the Proposed Action, Alternative A, and the No Action Alternative are discussed for each affected resource. An environmental impact is defined as a modification in the existing environment brought about by project-related development activities. Impacts can be beneficial or adverse, can be a primary result of an action (*direct*) or a secondary result (*indirect*), and can be long-lasting or permanent (long-term) or temporary and of short duration (short-term). For this project, short-term impacts are defined as those lasting only during the life of the project, whereas long-term impacts persist beyond the life of the project. Impacts can vary in degree from a slightly discernable change to a total change in the environment.

Sections discussing the potential environmental impacts to each resource include the following parts.

- Impacts. This section describes the intensity and duration of impacts that would occur as a result of the Proposed Action, Alternative A, and the No Action Alternative, assuming that the practices described in Chapter 2.0 would be followed to mitigate adverse impacts.
- Mitigation and Monitoring. This section describes mitigation and monitoring measures, in addition to those described in Chapter 2.0, that are recommended to avoid or further reduce adverse impacts.
- *Irreversible* and *Irretrievable* Commitment of Resources. This section describes permanent reductions or losses of resources that, once lost, cannot be regained.
- Unavoidable Adverse Impacts (Residual Effects). This section describes impacts that are unavoidable and cannot be completely mitigated.

Cumulative impacts and short-term use of the environment versus long-term productivity are discussed in separate sections following the discussions for each specific resource (Sections 4.16 and 4.17, respectively). Cumulative impacts are those which result from the incremental impacts of an action added to other past, present, and reasonably foreseeable actions, regardless of who is responsible for such actions. In comparing short-time use of the environment versus long-term productivity, short-term use of the environment is that use during the life of the project whereas long-term productivity refers to the period after the project is completed and the area is reclaimed.

4.1 GEOLOGY AND MINERALS

4.1.1 The Proposed Action

The Proposed Action would result in the direct disturbance and relocation of approximately 9,660,000 tons of ore and 43,385,000 tons of waste rock--a total of 53,045,000 tons of rock. Approximately 600,000 oz of gold would be extracted. Rock removal is a necessary part of the gold extraction process, and it would not be practical or economical to backfill the pit with waste rock or spent ore (see Section 2.2.2). Silver is the only other mineral resource known to occur within the proposed mine area, and approximately 600,000 oz of silver would be extracted during mining.

The project area is seismically active, and a large earthquake could cause extensive damage to structures and cause pit, waste rock, and leach pad slopes to fail. However, structural facilities would be constructed to Zone 4 Unified Building Code standards and would be expected to withstand earthquakes intensities of VIII to IX on the Modified Mercalli Scale, and such earthquakes are possible but not likely. An earthquake could trigger subsidence, but collapse along the narrow shafts, adits, or tunnels would not cause significant property damage or present a safety hazard.

Indirect impacts due to acid-bearing rock would not occur because of the low potential for rock in the project area to produce acid when exposed to water and oxygen (see Section 3.1.5).

4.1.2 Alternative A

Impacts to geology and minerals under Alternative A would be the same as for the Proposed Action.

4.1.3 No Action Alternative

Under the No Action Alternative, the project would not be implemented, and no direct or indirect impacts to geology and minerals would occur other than those associated with ongoing exploration. Approximately 600,000 oz each of gold and silver would not be recovered.

4.1.4 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.1.5 Irreversible and Irretrievable Commitment of Resources

Under the Proposed Action and Alternative A, there would be an irreversible and irretrievable commitment of approximately 600,000 oz each of silver and gold, as well as the commitment of manpower and energy required to mine.

4.1.6 Unavoidable Adverse Impacts

Unavoidable adverse effects would include the relocation of approximately 53,045,000 tons of rock and creation of a large pit. The area's topography would be permanently altered due to creation of the waste rock dump, the leach pad, and the pits.

4.2 PALEONTOLOGICAL RESOURCES

4.2.1 The Proposed Action

Because the potential for discovering significant fossils within the proposed mine area is very low, direct impacts to paleontological resources would be unlikely. Disruption of sedimentary beds of the Chlorophagus Formation could result in the destruction of some fossil plants. However, the Chlorophagus Formation has been extensively studied, and it is unlikely that significant fossil plants would be uncovered. In the event that significant paleontological resources would be discovered during mine development or operations, disturbance activities would cease in the vicinity of the discovery until a BLM-approved paleontologist evaluated the site and appropriate mitigation measures were implemented. Discovery and analysis of paleontological resources during project implementation would add to the scientific record for the area.

Indirect impacts could occur from the loss of important fossil materials due to unauthorized collection in newly exposed areas; however, it is unlikely that important fossils occur in the area, and impacts are not anticipated to be significant. Exclusion of the general public from the mine area would minimize such indirect impacts.

4.2.2 Alternative A

Alternative A would involve approximately 19 acres of additional disturbance to the Pyramid Sequence and Quaternary alluvium and lake deposits beyond the Proposed Action; therefore, there would be a slightly higher likelihood of disturbing paleontological resources. However, impacts would still likely be negligible.

4.2.3 No Action Alternative

Under the No Action Alternative, no impacts would occur to paleontological resources due to mine development or operations. Ongoing exploration activities could destroy fossils, although this is unlikely.

4.2.4 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.2.5 Irreversible and Irretrievable Commitment of Resources

Some fossils within the overburden and interburden would unknowingly be destroyed and lost from the fossil record.

4.2.6 Unavoidable Adverse Impacts

Unavoidable adverse impacts would include the loss of nonsignificant paleontological resources during mine development and operations. Because the potential for discovery of significant fossils is low, no unavoidable adverse impacts to significant fossils would be likely.

4.3 AIR RESOURCES

4.3.1 The Proposed Action

Emissions associated with the Proposed Action (JBR 1997a, 1997b) result from fugitive dust, combustion, and petroleum storage. The primary emissions are dust from processes including crushing, conveying, loading, and unloading and are quantified as PM_{10} emissions in accordance with ambient particulate standards. PM_{10}, NO_x, SO_x, CO, and volatile organic compounds (VOCs) would be emitted from fossil fuel combustion in the emergency generator, smelting furnace, carbon regeneration kiln, strip solution heater, and diesel engines. Petroleum storage emissions (VOCs) would be released from fuel oil storage tanks. Trace quantities of hazardous air pollutants (HAPs) may be released from the mercury retort and gold melting furnace due to the volatilization of metals and are accounted for as PM_{10} emissions.

Several sources were considered to have negligible emissions and were not modeled, including: the emergency generator (because it is used only during emergency situations rather than on a continuous basis); PM_{10} emissions from the lab assay furnace, drying oven, and strip solution heater (because they were considered negligible); and emissions of CO, NO_x, SO_2, and VOC from all sources (because they were considered to be minimal--below 10 tons per year). Therefore, only PM_{10} emissions were modeled.

Table 4.1 summarizes the sources, pollutants, emission rates, and stack parameters used in the dispersion modeling. Results of dispersion modeling for the Proposed Action demonstrate that maximum predicted PM_{10} concentrations would be well below the Nevada/Washoe County standards and NAAQS (JBR 1997a, 1997b). Therefore, the Proposed Action would be in compliance with federal, state, and county ambient air quality standards for PM_{10}.

Total point source criteria pollutant emissions from the Proposed Action are expected to be less than 250 tons per year. Therefore, the project is classified as a minor source under PSD regulations as described in 40 CFR Section 52.21(b)(a) and adopted by reference in NAC 445B.221. Criteria pollutants are defined as regulated pollutants for which a NAAQS has been established and include TSP, PM_{10}, CO, NO_x, SO_2, and VOC. Because the project will be classified as a minor source, the following regulations apply: (1) NAAQS; (2) Nevada and federal New Source Performance Standards, and (3) ozone nonattainment requirements under Part D (Truckee Meadows) of the Nevada State Implementation Plan.

The Olinghouse Mine Project would be located within the Truckee Meadows area of the Northwest Nevada Intrastate Air Quality Control Region. The Truckee Meadows area is currently

Table 4.1 Modeled Sources and Stack Parameters.[1]

Source	PM_{10} Emission Rate (lb/hr)	Stack Height (ft)	Exit Temp. (°F)	Exit Velocity	Stack Diameter (ft)
Primary Crusher	1.00	16.4	ambient	0.1 m/s	10.00
Secondary Crusher #1	1.60	16.4	ambient	0.1 m/s	10.00
Secondary Crusher #2	1.60	16.4	ambient	0.1 m/s	10.00
Lime/Cement Silo Loading	0.22	20.0	ambient	0.1 m/s	1.60
Lime/Cement Silo Unloading	0.02	10.0	ambient	0.1 m/s	10.00
Prill Silo	0.14	20.0	ambient	0.1 m/s	1.60
Drop Points	1.60	16.4	ambient	0.1 m/s	10.00
Assay Furnace	0.00	20.0	700	20.0 ft/s	0.66
Mercury Retort	0.68	25.0	80	20.0 ft/s	0.16
Gold Melting Furnace	0.11	25.0	700	20.0 ft/s	0.52
Carbon Regeneration Kiln	0.45	35.0	1,400	61.6 ft/s	2.72
Strip Solution Heater	0.00	35.0	700	20.0 ft/s	1.35

[1] Source: JBR (1997a, 1997b).

designated as "nonattainment" for ozone (O_3), regulated as VOCs. The Truckee Meadows area is presently in the process of being redesignated as "attainment" for O_3. VOC emissions from the Proposed Action would be minimal (less than 2 tons per year); therefore, it is not anticipated that the Proposed Action would be required to conform with the ozone portion of the Nevada State Implementation Plan.

Fugitive dust emissions on roads would be controllable by the application of water and/or chemical dust suppressants.

4.3.2 Alternative A

Under Alternative A, an alternative access road would require an additional 19 acres of surface disturbance beyond that required under the Proposed Action. Once the access road was constructed, fugitive dust emissions would be controlled by the application of water and chemical dust suppressant. Other impacts to air quality as a result of Alternative A would be similar to those in the Proposed Action.

4.3.3 No Action Alternative

Under the No Action Alternative, the Olinghouse Mine Project would not be constructed or operated. Therefore, no air emissions would be added to the current background in the project area.

4.3.4 Mitigation and Monitoring

No additional mitigation or monitoring is recommended beyond that required by existing regulations and proposed in Chapter 2.0.

4.3.5 Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of resources is anticipated regarding air resources.

4.3.6 Unavoidable Adverse Impacts

An additional quantity of particulates would be added to the atmosphere at and downwind from the proposed mine.

4.4 WATER RESOURCES

4.4.1 The Proposed Action

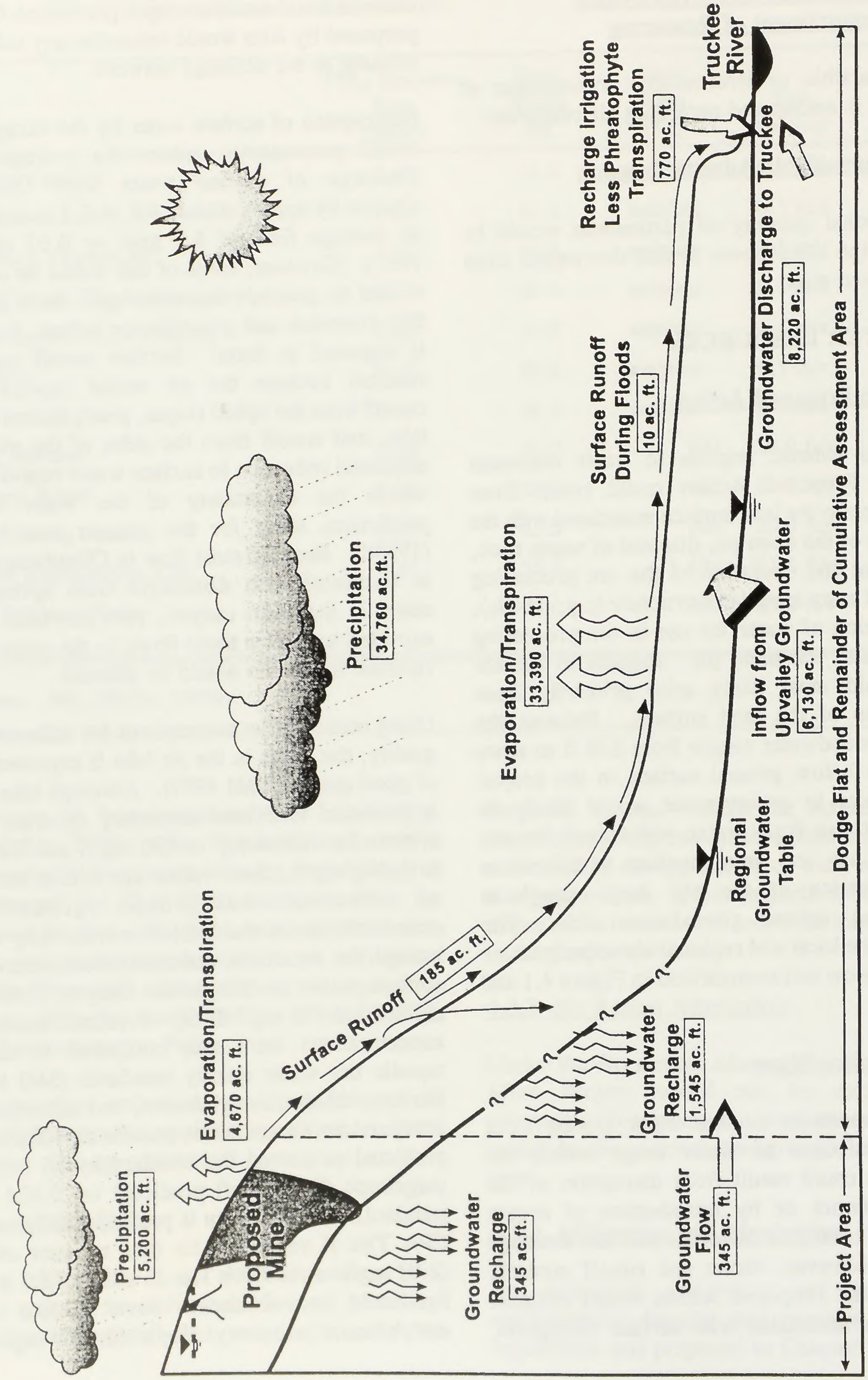
Direct and indirect impacts to water resources from the Proposed Action could result from modification to the land surface associated with the excavation of the open pit, disposal of waste rock, construction and operation of the ore processing facility and associated *infrastructure* (e.g., roads), and extraction of water for use in ore processing or to dewater the mine pit. Impacts to surface water would most likely arise primarily from modification of the land surface. Because the depth to groundwater ranges from 270 ft to more than 500 ft below ground surface in the project area, impacts to groundwater would likely be limited to those from water withdrawal for ore processing use and from surface modifications (i.e., excavation of the pit) deep enough to intercept the regional groundwater table. The impacts to the local and regional water budgets are discussed below and summarized in Figure 4.1 and Table 4.2.

4.4.1.1 Surface Water

Potential impacts to surface water arising from surface disturbance or water usage within the project area could result from disruption of the drainage network or by introduction of excess sediment or hazardous materials into the drainage network. However, runon and runoff controls included in the Proposed Action would mitigate most impacts associated with surface disruption, and erosion controls and spill prevention measures proposed by Alta would minimize any subsequent releases to the drainage network.

Interception of surface water by the excavated pit would permanently reduce the average annual discharge of surface water from Olinghouse Canyon by approximately 4% or 7.3 acre-ft/year--an average flow of 4.5 gpm or 0.01 cfs (SMI 1997). However, some of this would be expected to add to groundwater recharge. As a result of this diversion and groundwater inflow, a pit lake is expected to form. Surface runoff would be reduced because the pit would capture storm runoff from the uphill slopes, precipitation into the lake, and runoff from the sides of the pit. The estimated reduction in surface water runoff is well within the uncertainty of the water balance predictions made for the process area by JBR (1995d). Because most flow in Olinghouse Creek is associated with discharges from springs and seeps in the main canyon, pit excavation is not expected to reduce these flows to the point where riparian vegetation would be affected.

Using conservative assumptions for influent water quality, the water in the pit lake is expected to be of good quality (SMI 1997). Although lake water is predicted to exceed secondary drinking water criteria for sulfate (up to 490 mg/l) and TDS (up to 1,400 mg/l), these values are within the range of observed background groundwater concentrations at the site; however, they would exceed the maximum concentrations observed in surface water in Olinghouse Canyon (140 mg/l sulfate and 470 mg/l TDS). Predicted constituent concentrations were also compared to chronic aquatic life water quality standards (SMI 1997). Barium, lithium, molybdenum, and strontium are predicted to exceed these standards. Barium is predicted to exceed the standard by an order of magnitude (0.066 mg/l predicted vs. 0.004 mg/l standard), and strontium is predicted to exceed an EPA Tier II value by less than a factor of two (2.83 mg/l vs. an EPA Tier II value of 1.5 mg/l). Predicted exceedances for lithium and molybdenum are very slight (0.017 mg/l vs.



Note: vertical exaggeration is 10 times.

Figure 4.1 Annual Water Balance in the Vicinity of the Proposed Action.

Table 4.2 Annual Water Balance With and Without the Proposed Action.[1]

Component	Project Area (Pre-mining)	Cumulative Analysis Area (Pre-mining)	Project Area with Proposed Action[2]	Cumulative Analysis Area with Proposed Action[2]
Surface Water Balance				
Precipitation	5,200	39,960	5,200	39,960
Surface Water Runoff	195[3]	10[4]	185[3]	10[4]
Evaporation/Transpiration	4,655	38,045	4,670	38,060
Areal Recharge	350	1,900	345	1,890
Groundwater Balance				
Areal Recharge	350	1,900	345	1,890
Transpiration Losses from Phreatophytes	--	35	--	30
Recharge from Applied Irrigation	--	805	--	800
Regional Groundwater Inflow	--	5,905	--	6,130
Consumptive Water Use by Mine	--	--	580	580
Regional Groundwater Outflow	350	--[5]	345	--[5]
Groundwater Discharge to Truckee River below Wadsworth	--	8,575	--	8,220

1 Volume of water in acre-ft/year. Values were rounded to the nearest 5 acre-ft/year. -- = not applicable.
2 Will not balance exactly because during- and post-mining actions are combined. See text for details.
3 Indicates runoff leaving project area, much of which is either evaporated or becomes portion of areal recharge.
4 Indicates runoff discharging to Truckee River, which occurs during flows equal to or greater than the 9-year flood.
5 Not calculated. Groundwater model assumes no flow at northern (downvalley) boundary (PTI 1997).

0.014 mg/l and 0.020 mg/l vs. 0.019 mg/l, respectively) and are well within the range of analytical uncertainty.

Construction, operation, maintenance, and reclamation of the waste rock dump would disrupt drainage patterns in upper Frank Free Canyon. The dump would fill the head of the canyon and cover a small (<2 gpm) seep. There could be a slight permanent modification of runoff volumes (either an increase or a decrease, depending on the details of the reclaimed surface) at the mouth of Frank Free Canyon; however, this impact would be minor because flows in the canyon are generally ephemeral and do not support riparian vegetation. Based on the results of acid-base accounting, MWMP, and kinetic testing, infiltration of water into the dump is not expected to degrade surface water quality. As described in Section 4.1.1, ARD is highly unlikely. Expected concentrations of sulfate in seepage would be at or below the 400 mg/l baseline concentration of seepage in Frank Free Canyon.

Sediment discharge from Frank Free Canyon is not anticipated to increase substantially. Dump geometry and the porous materials favor infiltration, rather than runoff, of all but the most intense precipitation. The highest probability of elevated sediment release is during and immediately after reclamation--after grading and placement of topsoil/fine material on the surface but prior to establishment of plant cover. Soil erosion modeling using the Revised Universal Soil Loss Equation indicates that annual soil erosion from the sides of the dump would range from approximately 8 tons/acre immediately after reclamation grading to <1 ton/acre following establishment of shrub and ground cover. However, because soil erosion from the flat top of the dump is unlikely, total soil discharge at the mouth of Frank Free Canyon should be at or near background levels, even immediately after reclamation grading. Long-term soil loss in the canyon would be a function of reclamation success. Suggested mitigation (discussed below) would control or eliminate sediment discharge.

Process area construction, operation, maintenance, detoxification, and reclamation were evaluated for their potential to impact surface water. These impacts are likely to result from ground disturbance alone (i.e., runoff and sediment) or from a failure of the spill containment system. Only minor impacts to surface water are expected from runoff leaving the process area because the facilities are designed to meet zero discharge standards for surface water or groundwater. The event pond is designed to handle the runoff from a 25-yr, 24-hr precipitation event plus a 24-hr drain down of the leach pad. Access to cyanide solution for wildlife has been minimized during project design. Effective agglomeration of ore and drip emitters would minimize puddling of cyanide solution on the pad surface, and water in the containment trench and collection ditch would be isolated from the environment by containment within buried pipes or other coverings. Areas where solutions are exposed to the surface (i.e., inlet to pregnant solution pipe and the working pond) would be covered with netting systems to prevent access to birds.

During the construction and operation of the process area, surface water runoff pathways would be altered to route surface water around the facility. This has the potential to increase erosion and sedimentation in existing drainages, particularly in the ravine north of the process area. During project operations, standard erosion control structures and maintenance practices would be used to reduce potential loading from disturbed ground to this ravine and other portions of the drainage network. Without additional stabilization, however, bank and bed erosion in this ravine may be exacerbated in the event of intense precipitation by the disturbance associated with the process area.

Failures of primary engineering controls are the only mechanisms that could release hazardous chemicals to the environment. A major tear in the HDPE liner would have to be coupled with fracturing in the compacted underliner could allow process solution to be released without being detected by the leak detection system. In the unlikely event that the event pond is breached or its capacity is exceeded, storage on the pad and the event pond would be increased by diking exit weirs or constructing temporary containment berms and dikes. If these measures fail, there would be a potential for metals and cyanide to be released to the environment. Heavy metals (e.g., cadmium, lead, silver) and other compounds (e.g., selenium- or tellurium-bearing complexes) would likely be bound by iron and carbonates in the alluvial soils downhill from the process area. Cyanide would degrade naturally in oxidized alluvial sediments (Chatwin 1990), but would not degrade in fractured bedrock.

Spills of other hazardous chemicals in the process area would be controlled by creating containment berms if those constructed as proposed by Alta are breached. Because surface water runoff in the channels around the process area is intermittent and (except in floods) small, there is negligible potential for transport of these materials downstream as far as Olinghouse Creek.

A catastrophic failure of the heap leach pad (as during a seismic event in excess of the design magnitude, coupled with a full or excess charge of water) is considered highly unlikely, but would have the potential to release more than 7 million gal of water contained in the pad and ponds. However, such a release would be directed onto alluvial fill and ephemeral drainages downhill from the pile, and both cyanide and heavy metals would be diluted by surface water or made non-bioavailable through reactions with oxygen, iron, and carbonate in the soil, as previously described.

Construction of the haul road and upgrading of the access roads could result in a slight increase in runoff and a localized increase in soil erosion. The increase in sediment load from 16 acres of new road surface is estimated to be approximately 3.75 tons/acre/year and increases the overall sediment discharge by 0.03 tons/acre/year throughout the watershed. Dust suppression activities would minimize sediment production associated with increased traffic. Where the main access road lies within approximately 20 ft of Olinghouse Creek, current road grading sidecasts soil directly to the channel. To the extent that grading would occur more frequently with continuous use of the road, sediment loading to the creek would increase; however, riparian management practices proposed by Alta (see Section 2.1.9) would minimize such sediment loading in Olinghouse Creek.

Stormwater controls would route runoff around facilities, and channel designs proposed by Alta are capable of handling extreme events. Best Management Practices proposed by Alta would control erosion and minimize sediment discharge.

Earthmoving associated with reclamation activities would result in short-term releases of sediment, but these are not anticipated to have any lasting impacts. Soil erosion would be reduced due to grading proposed by Alta to reduce the length of overland flow.

4.4.1.2 Groundwater

Potential impacts to groundwater would be associated with excavation of Mine Pit #1, the operation of the heap leach pad, and extraction of groundwater from Dodge Flats. Impacts of the Proposed Action to groundwater are expected to be minimal.

Mine Pit #1 is anticipated to intercept the groundwater table. Dewatering of the pit, at a rate between 10 and 100 gpm, would temporarily depress the groundwater table 86 ft at the bottom of the pit. Based on observed aquifer characteristics, the 10-ft *drawdown* contour is expected to extend approximately 1,000 ft downgradient and 4,000 ft upgradient. Therefore, dewatering is not expected to influence any operating wells--all of which are located outside of the project area. Dewatering is not anticipated to have any noticeable effects on springs and seeps in Olinghouse Canyon because pumping would be from the regional aquifer whereas the seeps and springs appear to be part of a perched system (SMI 1997).

Once dewatering ceases, a pit lake would form. The equilibrium lake surface elevation is expected to be approximately 5,500 ft and attained within 5 years of the cessation of dewatering. The pit lake would be 90 ft deep and have a surface area of 3.4 acres (SMI 1997). Long-term evaporative loss from the pit surface is expected to be approximately 8.1 gpm, or 13 acre-ft/year. The presence of a pit lake would likely reduce recharge from the project area to the Dodge Flat alluvial aquifer by <4% and reduce the total recharge to the aquifer by 0.7%. This is not expected to have a detectable effect on the aquifer (PTI 1997).

Pit-lake water quality is expected to be good, with exceedances of secondary drinking water standards for sulfate and TDS predicted using conservative assumptions of influent water quality. Equilibrium concentrations of these constituents are projected to be at the high end of background concentrations in groundwater, but not in excess of background. Groundwater flow through the lake is expected to occur at rates (100 gpm [161 acre-ft/year]) that would limit evaporative concentration of constituents that could contaminate the regional aquifer. Therefore, groundwater quality would not be degraded by the pit lake (SMI 1997).

Construction of the waste rock dump is not expected to affect groundwater quality. Influent water would leach through the dump and may eventually reach groundwater, possibly combining with regional or perched systems to emerge as a seep at the toe long after mining. There is considerable buffering capacity in the waste rock leaching, and data from leaching (MWMP) tests on the waste rock indicate that the discharge would be equivalent to background water quality, as described above.

Process operations would require the use of hazardous chemicals. However, design controls and spill contaminant procedures should prevent releases. The groundwater table is 270 ft below the process area. Therefore, releases to groundwater are not expected, and any hazardous constituents that are released would likely be bound by iron and carbonates in the soil or (as with cyanide) oxidized and degraded in the alluvial materials where alluvium is present in sufficient thickness. A catastrophic release of all the cyanide solution on-site might not degrade fully before reaching groundwater, however. In addition, spills of gasoline or solvents may result in releases that exceed NDEP cleanup levels (e.g., 100 mg/kg total petroleum hydrocarbons). While it is not likely, it is possible that these compounds could reach groundwater without being significantly degraded.

The potential impacts to groundwater from the process water well are associated with aquifer drawdown and subsidence in Dodge Flat. The well is anticipated to pump at an average rate of 357 gpm (580 acre-ft/year) over the life of the project. Without accounting for groundwater inflows to Dodge Flat from downvalley transport of groundwater and recharge from the Pah Rah Range and the Truckee River, maximum drawdown at the well is calculated to be 16.4 ft after 3 years of pumping (PTI 1997). Maximum groundwater drawdown in the vicinity of the Truckee River is estimated to be neglible.

The most important location for evaluating groundwater withdrawal for process water use is the Truckee River, because reductions in river flows could affect habitat or spawning success for the cui-ui or Lahontan cutthroat trout. As a consequence of the proposed pumping, groundwater discharge from Dodge Flat into the Truckee River is predicted to decrease by no more than approximately 0.49 cfs during active mining, and 0.35 cfs during reclamation and detoxification (PTI 1997). This reduction is equivalent to 1% of the long-term baseflow of 40 cfs in the river, and 3.3 to 2.3% of the average daily minimum flow for the period of record at the Wadsworth stream gauge (14.9 cfs). The reduction in groundwater inflow to the Truckee associated with the proposed action will reduce the total annual flow volume in the river by 0.1%. Additionally, the predicted cumulative reduction in groundwater discharge from Dodge Flat into the Truckee River is approximately 2,300 acre-ft over 9 years, representing 0.1% of the inflow to Pyramid Lake over that period. During the period of maximum pumping, the regional groundwater inflow to Dodge Flat is predicted to increase by 225 acre-ft. This inflow will likely come from groundwater flowing under the Truckee River from the south and southeast. The predicted flow volume represents only 2% of the groundwater outflow to Dodge Flat and the Tracy segment of the Truckee River from the Fernley area estimated by VanDenburgh and Arteaga (1985).

Because drawdown is expected to be minor and because much of the Dodge Flat alluvial aquifer consists of sand or more coarse-grained material that is not subject to permanent subsidence, worst-case estimates of permanent subsidence are slightly less than 1 ft.

4.4.2 Alternative A

Alternative A includes an access road that completely bypasses Wadsworth by upgrading an existing pipeline service road. Because this ROW is already disturbed and because it crosses alluvial fans with only small ephemeral drainages, no additional long-term impacts to water resources are anticipated from this alternative. Assuming that best management practices are followed during construction, there should be no impacts during this phase.

4.4.3 No Action Alternative

Under the No Action Alternative there would be no further modifications to surface drainage networks from the excavation of Mine Pit #1 nor from placement of waste rock dumps. Dewatering and potential discharge to surface waters would not occur, nor would evaporative water losses from an eventual pit lake. There would be no potential releases of hazardous substances beyond those that could occur now as a result of a spill along the existing Olinghouse County Road.

4.4.4 Monitoring and Mitigation Measures

Monitoring measures currently included in Alta's Plan of Operations and Water Pollution Control Permit Application include geochemical testing of waste rock as it is generated, daily observations of the pad and pond leak detection system, periodic analysis of the process make-up water, and meteorological monitoring to assist in determining water application rates to meet the heap and dust suppression requirements. In order to protect waters of the state, surface water and groundwater should be monitored periodically, and selected mitigation measures should be undertaken as described below.

Additional monitoring of surface water, groundwater, and meteorology should build on the existing baseline monitoring program conducted by Alta. This program should include the following.

- A new monitoring well should be installed directly downgradient of the ultimate pit footprint.
- Groundwater monitoring of all wells should continue on at least a semi-annual basis (i.e., at expected minima and maxima of groundwater levels). Monitoring should focus on improved characterization of the physical hydrology of the regional aquifer, on documentation of water quality trends as dewatering occurs, and on improving the certainty of the pit-lake water quality model. Analytes should include those evaluated in detail in the ecological risk assessment (excluding methyl mercury), those likely to exceed water quality standards, and suitable anions and cations (e.g., sodium vs. calcium, bicarbonate vs. sulfate) to determine the source(s) of groundwater.
- Detailed investigations should be undertaken during drilling, development, and use of the process-water well to improve estimates of Dodge Flat aquifer properties.
- Surface water monitoring should continue on a quarterly (flow) to semiannual

(quality) basis. Flow should be monitored at selected springs and seeps in Olinghouse, Tiger, and Frank Free Canyons, in drainage channels downstream from the mine and process area, and from the waste rock dump if water is flowing. Observations of stormwater flows from disturbed areas should also be recorded, to the extent possible, by mine personnel. Water quality should be monitored in the same drainage channels. This monitoring should include field parameters (e.g., pH, electrical conductivity, temperature), suspended sediment, TDS, sulfate, hardness, and manganese. Dewatering water, if discharged to surface water, should be monitored as well. Finally, channels in areas adjacent to active portions of the Proposed Action (e.g., along Olinghouse Creek and the drainage north of the process area) should be visually monitored after each storm, and in the spring during snowmelt runoff, for sedimentation impacts. Modifications to the sediment control facilities should be made quickly if such impacts occur.

- Meteorological monitoring should also be sufficient to provide data in support of water balance calculations and modeling and for evaluation of pit lake water quality.

Additional mitigation measures are recommended to further ensure that no adverse impacts occur. These measures fall into two categories: improved leak detection and reduction of erosion and sedimentation.

The current leak detection system does not fully ensure detection of a leak through both the HDPE and underliner for the leach pad. Three monitoring wells should be installed and monitored downgradient of the process area. These wells should be located to provide information on groundwater gradient and velocity, as well as groundwater quality. Incorporation of a composite sample into the semi-annual groundwater monitoring program (with the inclusion of weak acid-dissociated cyanide as an analyte) is appropriate, unless cyanide is detected above background levels or a reportable spill occurs on the soil surface that cannot be fully remediated. If either of these occur, monitoring should be more frequent (e.g., quarterly or monthly).

Limited erosion and sedimentation impacts are predicted, but are readily mitigated. Four areas explicitly require discussion.

- Runon/runoff controls for the upgradient portion of the waste rock dump should be addressed in the design documents.
- A sedimentation/evaporation pond downstream from the waste rock dump should be located beyond the ultimate toe of the dump. It should be designed to hold a 25-year runoff event and be able to withstand a 100-year runoff event. This would ensure that neither sediment nor seepage from the toe of the dump would leave the project area.
- Engineered grade control, coupled with bank stabilization (vegetative where possible), is expected to be required in the ravine north of the process area. These measures should be designed to complement the stormwater diversions and downstream silt fence proposed by Alta. Further evaluation of this need should be based on the response to stormwater flows in the ravine over the next year.

4.4.5 Irreversible and Irretrievable Committment of Resources

Under the Proposed Action and Alternative A, groundwater would be pumped and ultimately consumed in evaporation from the heap leach and storage facilities at an average rate of 356 gpm throughout the life of the operation. Following closure of the facilities, evaporation would occur from the 3.4-acre pit lake surface, resulting in a minor loss of groundwater that would otherwise flow downgradient towards Dodge Flat.

4.4.6 Unavoidable Adverse Impacts

The only residual effects at the end of mining would be the alteration to the surface water drainage network associated with the waste rock dump and pit and the net evaporative water loss associated with the presence of a pit lake. Modification to the surface water drainage network associated with the waste rock dump is localized within the area of the dump and immediately up- and downgradient. There are no anticipated effects outside of the project area. The pit would permanently intercept surface water (approximately 6.6 gpm), which would no longer flow to Dodge Flat. However, this intercepted runoff would recharge the regional aquifer, which eventually recharges the Dodge Flat aquifer. Pit-lake evaporation loss is anticipated to be 8.1 gpm (13 acre-ft/year) and would continue in perpetuity.

4.5 SOILS

4.5.1 The Proposed Action

The Proposed Action would result in disturbance of approximately 502 acres of soils. Soil disturbance would occur due to pit excavation, leach pad development, waste rock dump development, and construction of roads and support facilities. Most disturbance would occur within the Mizel-Skedaddle-Rock outcrop (348 acres or 69%) and Indiano-Duco-Skedaddle (130 acres or 26%) associations (Table 4.3) which have high water erosion potential and poor suitability for use as topsoil during reclamation. Direct impacts would include the modification of chemical and physical characteristics, loss of soil to wind and water erosion, and a reduction in soil biological activity. Soil compaction would not likely be a major problem due to the arid environment and the coarse fragment content of the soils.

Excavation, transportation, stockpiling, and replacement activities would result in soil loss through erosion and mixing with parent material or rock. Exposed soils would be prone to accelerated water and wind erosion that could result in permanent soil loss, relocation, and sedimentation in nearby drainages. The volume of soil lost due to disturbance would be site-specific and would depend on factors including soil type, slope gradient and length, timing and intensity of precipitation, and numerous other factors. Soil loss and sedimentation in streams would be minimized using erosion control, stabilization, and revegetation techniques. Sedimentation in streams would also be minimized due to low precipitation and a scarcity of perennial streams in the project area. Erosion control measures are detailed in the POO/Reclamation Plan and the Stormwater Pollution Prevention Plan (both available at the BLM office in Carson City) and include such practices as:

- minimizing soil disturbance;
- avoiding steep slopes, where feasible;
- using best management practices on all construction sites;
- constructing roads to BLM specifications, which includes placement of culverts and roadside ditches to control surface water flows;
- regrading slopes to 3:1 or lower and contouring reclaimed areas to blend with the surrounding landscape; and
- reseeding all reclaimed areas with a BLM-approved seed mix.

Loss of soil fertility and soil structure would occur during soil salvage and stockpiling. Activities of soil microorganisms and plant roots--the two major factors in the generation and cycling of nutrients--would be disrupted, resulting in a reduction in biological activity and a resultant reduction in soil productivity. Soil structure (e.g., soil horizons and other physical properties) would also be disrupted during salvage and stockpiling. Biological activity in soils would gradually increase after reclamation, and revegetation and new soil profiles and other structural features would evolve on reclaimed areas. Temporary subsoil compaction along roads and in the facilities area could be caused by heavy equipment traffic, although this would likely be minimal due to the

Table 4.3 Disturbance Acreage for Soils Under the Proposed Action and Alternative A.

Soil Type	Proposed Action	Alternative A
Mizel-Skedaddle-Rock outcrop	348	348
Indiano-Duco-Skedaddle	130	130
Indian Creek extremely stony sandy loam	24	24
Bluewing-Biddleman-Bundorf	0	8
Pirouette-Osobb-Rock outcrop	0	5
Bluewing	0	3
Patna Sand	0	1
Tipperary Sand	0	2
Total	502	521

arid environment and coarse fragment content of the soils.

Although none of the soils within the proposed mine area are well-suited for use during reclamation, salvage of what little soil is available would provide an important source of plant growth material to assist with reclamation. Table 4.4 provides estimated volumes of topsoil available for salvage for each soil type within the disturbance area, assuming that the full disturbance area within each soil association can be salvaged. It was also assumed that the maximum amount of soil would be salvaged from each area of disturbance (i.e., the entire soil profile, from surface to hardpan or bedrock) and stockpiled for use during reclamation. Soils along the access road are typically more than 60 inches deep, and it was assumed that a maximum of 24 inches would be salvaged.

Approximately 269,200 to 1,182,900 yd^3 of plant growth material would be available for salvage under the Proposed Action (see Table 4.4). Assuming that 402 acres would be reclaimed, topsoil replacement depth would be approximately 5 to 22 inches. However, the 402-acre estimate was based on actual ground disturbance and does not account for the increased surface area on the sides of the waste dumps and leach pad. Also, since the proportion of each soil type within a given association varies considerably depending on location, the depth of soil will also vary. The estimate also does not account for soils that may have physical or chemical characteristics that render them unsuitable for use as a plant growth medium or for the steep slopes and rock outcrops that may prevent salvage in some areas.

4.5.2 Alternative A

Impacts to soils under Alternative A would be similar to the Proposed Action except that an additional 19 acres of soil disturbance would occur due to the widening of the alternative access road. This additional disturbance would occur primarily in the Bluewing-Biddleman-Bundorf and Pirouett-Osobb-Rock outcrop associations, both of which

Table 4.4 Estimated Volume of Topsoil Available Under the Proposed Action and Alternative A.[1]

Soil Type	Proposed Action Acres	Proposed Action Depth (inches)	Proposed Action Volume (yd^3)	Alternative A Acres	Alternative A Depth (inches)	Alternative A Volume (yd^3)
Mizel-Skedaddle-Rock outcrop	348	3-12	138,700-554,900	348	3-12	138,700-554,900
Indiano-Duco-Skedaddle	130	5-33	85,400-563,500	130	5-33	85,400-563,500
Indian Creek extremely stony sandy loam	24	14-20	45,100-64,500	24	14-20	45,100-64,500
Bluewing-Biddleman-Bundorf	0			8	14-24	15,058-25,813
Pirouette-Osobb-Rock outcrop	0			5	8-20	5,378-13,444
Trocken-Stumble-Bluewing	0			3	24	9,680
Patna Sand	0			1	20	2,689
Tipperary Sand	0			2	24	6,453
Total	502		269,200-1,182,900	521		308,458-1,240,979

[1] Salvage depths presented in this table represent the total soil depth or, for very deep soils, the top 24 inches only. However, many of these soils may have poor potential for reclamation; therefore, there may be limited value in salvaging these soils. Soil testing may be conducted to determine suitability for use as a plant growth medium.

have severe limitations for road construction including shallow depth to rock, cemented pans, and presence of large stones. Reclamation potential of these soils is poor. This road would be left in place as a service road for the existing pipeline, but would be narrowed upon reclamation to a 2-lane configuration.

4.5.3 No Action Alternative

Under the No Action Alternative, soils would not be disturbed and no impacts would occur. Erosion would continue at present levels unless disturbance from other sources would occur.

4.5.4 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.5.5 Irreversible and Irretrievable Commitment of Resources

Under the Proposed Action and Alternative A, there would be a minimal irreversible and irretrievable loss of soil due to erosion and a loss of soil productivity due to mixing soil horizons.

4.5.6 Unavoidable Adverse Impacts

The action alternatives would result in some soil loss due to erosion, interruption of natural soil development and structure, decreased water-holding capacity, and a loss of organic matter. If reclamation is not successful, the action alternatives would have long-term adverse impacts. There would be a loss of soil in the unreclaimed pit area.

4.6 VEGETATION AND WETLANDS

4.6.1 The Proposed Action

The Proposed Action would directly disturb 502 acres including: 143 acres (28%) of Wyoming big sagebrush-bottlebrush squirreltail vegetation type; 123 acres (24%) of Wyoming big sagebrush-Utah juniper vegetation type; 50 acres (10%) of Wyoming big sagebrush-desert needlegrass vegetation type; 20 acres (4%) of shadscale-bud sagebrush vegetation type; and less than 1 acre of Utah juniper-desert needlegrass (Table 4.5). Approximately 165 acres (33%) of disturbance would occur in areas previously disturbed--"disturbed areas"--that are vegetated primarily with cheatgrass brome. No unusual or unique vegetation types would be disturbed, and similar vegetation is common in the vicinity of the project area. All disturbed areas would be reclaimed with the exception of the approximately 100 acres of mine pit. Adherence to the BLM's *Interim Standards for Successful Reclamation* would ensure that revegetation was complete prior to bond release.

Disturbed areas and recently revegetated areas are susceptible to invasion by undesired plant species, such as Russian thistle, cheatgrass, and halogeton, which would compete with native species and result in a deterioration of ecological conditions as compared to undisturbed areas.

Fugitive dust from the project would collect on vegetation adjacent to unpaved roadways and reduce productivity of that vegetation. Alta would use water and/or chemical binders to reduce fugitive dust emissions, but some additional dust would be generated (see Section 4.3).

One ephemeral seep not accompanied by riparian vegetation would be affected by the waste rock dump. No springs or other wetlands are anticipated to be affected by the Proposed Action. If such disturbance would occur, procedures in Section 404 of the *Clean Water Act* would be followed to mitigate any disturbance.

4.6.2 Alternative A

Impacts under Alternative A would be similar to those for the Proposed Action; however, an additional 19 acres would be disturbed in association with the access road around Wadsworth. Most of this additional disturbance would be to the shadscale-Bailey greasewood and shadscale-bud sagebrush vegetation types (see Table 4.5).

4.6.3 No Action Alternative

Under the No Action Alternative, there would be no additional disturbance of vegetation as a result of mining.

4.6.4 Mitigation and Monitoring

Reclamation success would be enhanced if livestock would be prevented from grazing revegetated areas for a minimum of three growing seasons following reseeding.

Reclaimed areas should be monitored to determine if undesired plant species are becoming established and to control such species should they invade. Alta would monitor disturbed and reclaimed areas for invasion of noxious weed species. If such invasions occur, appropriate control measures (as recommended by the BLM and Nevada Division of Agriculture) would be implemented.

4.6.5 Irreversible and Irretrievable Commitment of Resources

Approximately 100 acres in the pit area would not be reclaimed, resulting in an irretrievable loss of vegetation. An irreversible loss of vegetative productivity could occur on reclaimed areas if revegetation would not be successful.

4.6.6 Unavoidable Adverse Impacts

Vegetation production would be lost on disturbed areas until reclamation and revegetation were successful.

4.7 WILDLIFE

4.7.1 The Proposed Action

Under the Proposed Action, approximately 502 acres of habitat would be disturbed, most of which would be in the Wyoming big sagebrush-bottlebrush squirreltail and Wyoming sagebrush-Utah juniper vegetation types and in previously disturbed habitat. Impacts to wildlife would include direct loss of habitat due to surface disturbance, displacement of wildlife due to disturbance, and direct mortality due to construction activities and the higher likelihood of animal/vehicle collisions due to increased traffic. In addition to direct loss of habitat due to surface disturbance, noise and human activity associated with mining and traffic would affect utilization of habitats immediately adjacent to these areas. Pronghorn and mule deer would likely habituate to increased traffic volumes and heavy machinery as long as the machines moved in a predictable manner; however, some unquantifiable amount of displacement of pronghorn and mule deer would undoubtedly occur. Suitable habitat for both species occurs in adjacent areas, and mine activities are unlikely to result in a reduced population of pronghorn or mule deer. No crucial ranges for any big game species occur on the project area.

Table 4.5 Estimated Disturbance to Vegetation Resulting from the Proposed Action and Alternative A.

Alternative	WBS-BS[1]	UJ-N[1]	BS-AB[1]	WBS-UJ[1]	WBS-DN[1]	S-BS[1]	D[1]	S-BG[1]	Total
Proposed Action	143	1	0	123	50	20	165	0	502
Alternative A	143	1	0	123	50	26	165	13	521

[1] WBS-BS = Wyoming big sagebrush-bottlebrush squirreltail
UJ-N = Utah juniper-needlegrass
BS-AB = Big sagebrush-antelope bitterbrush
WBS-UJ = Wyoming big sagebrush-Utah juniper
WBS-DN = Wyoming big sagebrush-desert needlegrass
S-BS = Shadscale-bud sagebrush
D = Disturbed
S-BG = Shadscale-Bailey greasewood

Bighorn sheep may occasionally occur in the project area, although the population in the general vicinity is small and tends to remain at higher elevations. Sheep would likely avoid the project area due to human activity, and the sheep population would not be affected.

Direct impacts to nongame and small mammals would include minor direct loss of animals during construction and mining--particularly ground-dwelling species and relatively immobile species--and a potential increase in mortality due to animal/vehicle collisions. Because important habitats, such as wetlands and riparian areas, would be avoided and because the area of surface disturbance is relatively limited, impacts on these populations are expected to be minimal. Bats would be evacuated from two shafts and nine adits that would be disturbed by mining operations, and most would likely find suitable adjacent habitat.

No raptors are known to nest within the project area, although it is likely that the area is used for foraging; however, adequate foraging is available on areas adjacent to the project area. Sage grouse do occur on the project area, and any removal of sagebrush habitat would be detrimental to that species. However, the sagebrush habitat removed by the proposed project would be small compared to the amount of similar habitat on adjacent areas. No sage grouse leks occur in the vicinity of the disturbed areas. Neither chukars, mountain quail, nor California quail would be likely to be impacted by the project, since all prefer habitats unlike those in the proposed area of disturbance.

Nongame birds and reptiles and amphibians would be affected primarily because of habitat disturbance and destruction. Nongame birds would seek unoccupied habitats. Some would be successful, although increased competition in the adjoining habitats may lead to temporarily elevated mortality levels from predation. Reptiles and amphibians are less mobile, and it is likely that a higher percentage would be unable to relocate successfully, leading to some direct mortality from clearing and earthmoving operations during project construction. There are no fisheries on the project area, no silt or toxic substances would be discharged to perennial streams, and impacts to flows in downstream areas would be minimal; therefore, there would be no impacts to fisheries.

The construction of the pit would provide habitat that could prove desirable to wildlife species preferring steep rocky areas. Some potential raptor nesting habitat could be created, and the water in the abandoned mine pit may be beneficial to selected wildlife species able to access it within the confines of the abandoned pit.

Potential impacts to wildlife from chemical constituents in pit lake water (see Section 4.4.1.2), as well as methyl mercury, were evaluated using a screening-level ecological risk assessment (SMI 1997). Receptor species used in the assessment were Townsend big-eared bat, mule deer, cliff swallow, chukar, mallard, and bald eagle. Using worst-case exposure assumptions, no risks were found.

<u>4.7.2 Alternative A</u>

Impacts to wildlife under Alternative A would be similar to those for the Proposed Action. Approximately 19 acres of additional habitat--shadscale-Bailey greasewood and shadscale-bud sagebrush--would be disturbed and left unreclaimed as part of the upgraded road surface.

<u>4.7.3 No Action Alternative</u>

Under the No Action Alternative, there would be no additional impacts to wildlife resources other than from continued exploration activities.

<u>4.7.4 Mitigation and Monitoring</u>

Selected tunnels and adits that provide habitat for bats outside the proposed disturbance area would be modified to protect and enhance entry for bats by clearing debris from the entrances and by reinforcing the entrances using culverts or other suitable methods.

Any potential nesting habitat for migratory birds that is proposed for disturbance during the nesting season would be surveyed to determine the occurrence of nests. If nests are found, disturbance would be delayed until the young birds have left the nest, unless otherwise authorized by the USFWS.

4.7.5 Irreversible and Irretrievable Commitment of Resources

There would be no irreversible or irretrievable commitment of resources as a result of the Proposed Action or Alternative A. The unreclaimed pit would provide a different type of habitat than the premining land that would likely be utilized by species preferring steep, rocky habitat.

4.7.6 Unavoidable Adverse Impacts

Some animals, primarily small mammals and reptiles, would be killed during construction and mining activities, and others would be displaced to adjacent habitats where they would survive or succumb to competition with existing populations on these adjacent habitats. Some additional vehicle/animal collisions are likely to occur.

4.8 THREATENED, ENDANGERED, AND CANDIDATE/SENSITIVE SPECIES

4.8.1 The Proposed Action

There would be no toxic discharges to either the Truckee River or Pyramid Lake because of spill control precautions to be taken at the mine and because flows from the project area seldom reach the Truckee River (see Section 4.4.1.1). Reductions in flows to the Truckee River, if they occurred at all, would not exceed an average of 47 acre-ft/month (356 gpm x 30 days) or 0.08% of the 60,000 acre-ft/month considered the minimum managed spawning flow during April and May (USFWS 1992). Therefore, the Proposed Action would not adversely affect cui-ui.

Adverse impacts to Lahontan cutthroat trout could potentially result from the same factors as those for cui-ui--toxic discharges to the Truckee River or Pyramid Lake or reductions in flow in the Truckee River. For the reasons previously stated for cui-ui, the Proposed Action would not adversely affect Lahontan cutthroat trout.

None of the sensitive animal species are likely to be adversely impacted by the Proposed Action. California bighorn sheep inhabit the vicinity of the project area in relatively small numbers. They would avoid the area of active mining, but this amounts to a very small portion of available habitat in the Pah Rah Range and would not impact populations. Suitable habitat for the pygmy rabbit is limited on the project area, and there is little potential for Preble's shrew to occur on the area to be disturbed. All of the adits and shafts that would be affected by proposed project activities have been cleared of bats and sealed to prevent their re-entry. Bats evacuated from these habitats have likely found suitable adjacent habitat outside the disturbance area. Mountain quail habitat would not be disturbed, and it is likely that the tri-colored blackbird, a rare transient in Nevada, would avoid areas of disturbance on its spring migration. The habitat preferred by this bird is abundant elsewhere in the vicinity of the project.

No sensitive plant species would be affected by the Proposed Action.

4.8.2 Alternative A

Impacts to TE&C and sensitive species under Alternative A would be similar to those for the Proposed Action.

4.8.3 No Action Alternative

Under the No Action Alternative, there would be no additional impacts to TE&C and sensitive species due to mining activities. Impacts would continue at present levels associated with mineral exploration activities.

4.8.4 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.8.5 Irreversible and Irretrievable Commitment of Resources

The Proposed Action and Alternative A would result in no irreversible or irretrievable commitment of resources that would affect TE&C and sensitive animal and plant species.

4.8.6 Unavoidable Adverse Impacts

Project development would result in the loss of 29 shafts and adits that could provide habitat for roosting and hibernating bats.

4.9 RANGE RESOURCES

4.9.1 The Proposed Action

Implementation of the Proposed Action would result in an annual loss of approximately 23 AUMs in the Olinghouse allotment. This represents a loss of less than 3% of the AUMs in the allotment. There would be no loss of grazing opportunity in the White Hills allotment. Forage would be re-established following successful reclamation, and the preponderance of grass and forbs on reclaimed lands could result in increased forage production on those lands as compared to premining conditions; however, approximately 100 acres (4 AUMs) of open pit would be unavailable for grazing in future years. A berm would be constructed around the pit to discourage cattle from wandering near the pit edge.

Some additional vehicle/livestock collisions could occur as a result of increased traffic in the project area; however, such collisions are rare now and would likely continue so. Interviews with the two grazing permittees (Bassett 1996; Depaoli 1996) indicate that benefits would be realized from the proposed project if a small amount of water from the proposed water pipeline would be made available for livestock. Such an arrangement was made during some previous mining operations. At the present time, water for livestock is a limiting factor, and permittees have to haul water to some locations, especially in the Olinghouse allotment. Proper placement of watering facilities would also attract livestock away from roads travelled by mine-related traffic.

Grazing management would likely remain the same on the White Hills allotment even with the acquisition of land by BLM in the Pah Rah Range. Such plans are being formulated at this time. No change in range management or the allocation of AUMs is anticipated as a result of the Proposed Action.

4.9.2 Alternative A

Impacts to range resources under Alternative A would be similar to those for the Proposed Action.

4.9.3 No Action Alternative

Under the No Action Alternative, grazing would remain unchanged in the Olinghouse allotment. Management of the White Hills allotment would be modified based upon decisions as to how to manage the recently acquired lands in the Pah Rah Range, where the BLM has blocked up approximately 26,000 acres that were previously in checkerboard ownership.

4.9.4 Mitigation and Monitoring

Taps on the proposed water pipeline to the mine could provide water for livestock, especially in the Olinghouse allotment. Watering facilities could be located so as to attract livestock away from roads heavily travelled by mine-related traffic.

4.9.5 Irreversible and Irretrievable Commitment of Resources

Approximately 100 acres of livestock grazing (4 AUMs annually) would be permanently lost due to the mine pit.

4.9.6 Unavoidable Adverse Impacts

Approximately 21 AUMs of grazing opportunity would be lost annually for the life of the mine and until successful reclamation occurred, and approximately 100 acres (4 AUMs) of grazing lands would be permanently lost due to the mine pit.

4.10 RECREATION

4.10.1 The Proposed Action

The project area includes no developed recreational facilities and receives only light to moderate recreational use at the present time. Temporary losses in open space recreational opportunities due to mine operations would be minimal. The population increase of approximately 122 persons due to the Proposed Action would result in a commensurate increase in demand for recreational opportunities. The steep pit slopes and pit lake may attract rock climbers and other recreationists. The pit would pose a hazard to careless recreational users; however, it would be surrounded by a 5-ft high safety berm and signed at strategic locations, so any reasonable person would be aware of the steep topography.

4.10.2 Alternative A

Impacts to recreation as a result of Alternative A would be essentially the same as for the Proposed Action.

4.10.3 No Action Alternative

Implementation of the No Action Alternative would leave recreational supply unchanged on the project area.

4.10.4 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.10.5 Irreversible and Irretrievable Commitment of Resources

There would be no irreversible or irretrievable commitment of recreational resources due to implementation of the Proposed Action or Alternative A.

4.10.6 Unavoidable Adverse Impacts

A small amount of recreational opportunity would be lost during the life of the project.

4.11 ACCESS AND LAND USE

4.11.1 The Proposed Action

Under the Proposed Action there would be no change in land ownership except that Alta would likely purchase some private lands within the project area. Land use would remain much the same except 502 acres would be used exclusively for mining, which is a historic and legitimate use of the area. Other historic and legitimate uses of the area, such as grazing and dispersed recreation, would continue to occur on adjacent lands without interruption. These activities would be available on the mined lands once the mine is abandoned and reclamation occurs. The Proposed Action would be in conformance with the Lahontan RMP, which includes provisions for the timely development of mineral resources to meet national, regional, and local needs consistent with other uses of public lands, as well as with the Truckee Canyon Area Plan portion of the Washoe County Comprehensive Plan, which also provides for the development of natural resources (Kilgore 1997). The Truckee Canyon Area Plan states that mineral development shall not be detrimental to surrounding properties, land uses, and the environment in general and that factors such as visual resources and proper reclamation must be considered. These conditions would be met by the Proposed Action. In addition, the Proposed Action would occur on lands designated by the Truckee Canyon Area Plan as being least suitable for development.

Impacts to the Washoe County Regional Open Space Plan would involve a small loss of open space due to mine activities. The mine area, exclusive of the pit, would be available for open space after mining ends and reclamation is successful. The pit area would pose a hazard to careless area users, but would be bermed and signed to discourage access (see Section 4.10.1).

There would be no impacts to existing ROWs in the project area or vicinity of the project area. The Interstate 80 corridor system would not be affected; however, much of the proposed mine would occur within the Valmy-Tracy corridor.

Traffic on the Olinghouse County Road (including that portion that crosses the Pyramid Lake Paiute Reservation) and State Routes 447 and 427 between the mine and Interstate 80 would increase due to mine activities. An estimated 120 additional cars (60 round trips) and 2 to 12 additional trucks (1 to 6 round trips) would use the road each day during construction, representing an increase of 14 to 15% in the number of vehicles per day on State Route 447 at Wadsworth compared to use in 1995. During operations, an estimated 228 additional cars (114 round trips) and 2 to 12 additional trucks (1 to 6 round trips) would use the road each day, representing an increase of 27 to 28% in the number of vehicles per day at Wadsworth. The impacts of increased traffic would depend upon the time that shifts at the mine would begin and end and whether or not peaks in mine traffic would correspond with student activity in the vicinity of the Natchez School. Traffic on the Olinghouse County Road, especially heavy truck traffic, could discourage recreation-related traffic and would add to the possibility of accidents on all roads. There would be an increased probability of traffic accidents at the crossing of the Olinghouse County Road by the mine haul road. Increased traffic past the Natchez Elementary School would likewise increase the probability of vehicle collisions with pedestrians.

The Olinghouse County Road would be maintained by Alta in association with Washoe County, thus freeing county crews and equipment for maintenance elsewhere. State Routes 447 and 427 are both structurally adequate to handle mine-related traffic (Deroes 1996).

Impacts to surface and groundwater use are discussed in Section 4.4.1.

4.11.2 Alternative A

Impacts resulting from implementation of Alternative A would be similar to those for the Proposed Action except for traffic patterns. Under Alternative A, all mine traffic would be routed around Wadsworth so as to avoid the town and particularly the Natchez School.

4.11.3 No Action Alternative

Under the No Action Alternative, the mine would not be developed and land use/ownership and traffic patterns would remain unchanged. Management plans would determine the use of new public lands in the Pah Rah Range, and there would be no loss of lands for open space.

4.11.4 Mitigation and Monitoring

Impacts of increased traffic volume on all roads in the vicinity of the project area could be partially mitigated by requiring all mine workers to access the mine using a bus provided by Alta. Adequate parking in the Fernley-Wadsworth area would also need to be provided.

The likelihood of an increase in the number of traffic accidents associated with increased traffic volumes could be reduced by extensive signing and enforcement of speed limits on roads traversed by mine-related traffic.

The probability of increased traffic accidents where the mine haul road crosses the Olinghouse County Road could be completely mitigated by installing an overpass, or partially mitigated by installing traffic signals.

Impacts of increased traffic volume on State Route 447 in Wadsworth, and especially in the vicinity of the Natchez Elementary School, could be completely mitigated by the construction of an alternative road that would bypass the school (Alternative A), assuming that all mine-related traffic (both delivery trucks and commuting workers) would use this route.

Traffic impacts in Wadsworth could also be mitigated by construction of a paved bypass route around the town. This approach is currently being discussed by the Pyramid Lake Paiute Tribe, BIA, Alta, and other industrial users of State Route 447.

4.11.5 Irreversible and Irretrievable Commitment of Resources

There would be no irreversible or irretrievable commitment of resources as a result of implementation of the Proposed Action or Alternative A.

4.11.6 Unavoidable Adverse Impacts

A small amount of open space would be lost to public use for the life of the mine.

4.12 VISUAL RESOURCES/NOISE

4.12.1 Visual Resources

4.12.1.1 The Proposed Action

Development of the proposed project facilities would expand the scope and intensity of the visual contrast between historic mine-related activities and the character of the natural landscape. As noted in Section 3.12.1, existing mining features exhibit some line contrast and minor to moderate color contrast, visible primarily from distances of 2 miles or less.

The Proposed Action includes three major elements with the potential for producing significant visual effects: a mine pit area encompassing approximately 100 acres; a 208-acre waste rock dump at the head of Frank Free Canyon; and a process area of approximately 140 acres that would contain the crusher and mill, a heap leach pad, and related ore processing facilities. Ancillary facilities would include a 3.0-mile haul road, access road improvements, and an existing 12.5-kV overhead power line from the Wadsworth substation. Mine Pit #2, the smaller pit, would take the top off of the Green Hill, and Mine Pit #1, the larger pit, would be located just to the southwest. The two pits would eventually merge into one pit. The waste rock dump would exhibit a 500-ft high face topping out at approximately 5,900 ft. Final height of the heap would be approximately 280 ft at an elevation of 5,585 ft. Although each of the major facilities would be visible to some extent, the waste rock dump would cause the greatest concern from a visual standpoint because it would be located closest to public viewpoints and would benefit the least from topographic screening.

Visual effects from the pit would include landform modification and exposure of lighter, brighter colors as vegetation and weathered surface soil would be removed. The pit excavation would have a smoother texture than the existing terrain, but at viewing distances of more than 4 miles texture changes would be difficult to discern. Mine Pit #2 would disturb less than 20 acres and, though visible, would appear very small from public viewing points. Mine Pit #1 would become progressively less visible from public viewing points as the excavation worked into a south-facing slope. The east wall of the pit would ultimately function as a screen, with the open face of the pit highwall facing south-southwest, away from public viewing locations.

The waste rock dump would be the most visually obtrusive feature. Its flat-topped, 500-ft dump face would introduce a manmade landform that would be visible from public viewpoints. The scale of the rock dump would be somewhat subservient to natural landforms in the vicinity because it would be surrounded by higher, larger forms. Consequently, the key consideration in determining the visual effects of the dump would be the color of the waste rock. Existing excavations in the project area suggest that waste rock would be medium to light shades of gray and tan and would be apparent, but not dominant, in comparison with the natural landscape. The degree of apparent color contrast would vary somewhat with light and atmospheric conditions. It would be greatest in clear weather under low, early morning sun reflected off its east face and least under hazy conditions with higher sun angles or under overcast skies. The generally moderate color contrast, combined with the flat top of the dump face, would introduce a straight, horizontal line element that would be more geometric than natural line features in the area. However, it would be relatively small in the context of the natural mountain landscape. Texture of the waste rock dump would be smoother than existing natural textures, but viewing distances in excess of 4 miles would minimize the perception of textural contrast.

The proposed process area is partially screened from public viewpoints by existing topography. The most visible feature would be the heap, which would be partially screened during the early years of the project, but would become more visible with time as it increased in height. Its geometric form, accentuated by relatively light hues in a mid- to dark-range background, would be noticeable, but its scale would be relatively small compared to surrounding terrain. Light and weather conditions would affect color contrast of the heap in the same ways as it would for the waste rock dump.

The existing power line would be visible from public viewing locations, but would be visually unobtrusive because of the existing network of small and large transmission lines in the foreground between Wadsworth and the project site. Project access and haul roads would generally not be seen from public viewpoints.

The proposed project would be visually prominent from KOP #1, the closest sensitive public viewing point; however, most viewers would be travelling at highway speeds of 55 mph or more, so views would be brief. In addition, the viewing angle is perpendicular to the direction of travel, so most travelers would get only glimpses of the project. The face of the waste rock dump is approximately 4 miles from KOP #1 with minimal topographic screening and nothing of interest in the foreground to distract a viewer's attention. The pits would be visible primarily in the early months of pit excavation and would be barely visible after excavation drops below the east rim, assuming there would be minimal disturbance beyond the perimeter of the pits. The heap, almost 5 miles from KOP #1, would be partially screened from view in the early years, but would gradually increase in visibility as it increased to its ultimate height over the life of the project. As a landform, it would be small in the context of surrounding terrain. Color and line contrast would be moderate at this distance and angle of view. As seen from KOP #1, the Proposed Action would meet the standards of VRM Class IV where the pits would be located. The Proposed Action would also achieve the standards of VRM Class III, as contrasts with the characteristic landscape would be moderate and the scale of project facilities, combined with distances from sensitive viewpoints, would prevent the project from dominating views of casual observers.

The visual effects of the Proposed Action would be reduced after completion of reclamation activities. Reducing the steepness of the slopes of the waste rock dump and the heap would improve the consistency of the landforms with existing landforms in the vicinity, and revegetation efforts would reduce the color contrast between the project and the natural landscape. Both efforts would lead to reduced line and texture contrast, and compliance with VRM class standards would be improved for the long term.

The proposed project would be most visually prominent from KOP #2. Although KOP #2 is almost 5 miles from the nearest major project facility--the waste rock dump--most viewers would be travelling northbound from Wadsworth and would have nearly direct forward views lasting more than 2 minutes at highway speeds. Figures 4.2 and 4.3 illustrate the existing view from KOP #2 and simulated views of mining and post-reclamation conditions. Visual effects would be essentially the same as those described for KOP #1, except that the face of the waste rock dump would appear slightly larger and more prominent because there would be less screening from the foothills to the northeast. Compliance with VRM Class III standards would be marginal for the waste rock dump at the height of mining, but should be readily achievable after reclamation. Views of the mine pits from KOP #2 would be virtually the same as from KOP #1 except for the more direct viewing angle. Visual effects would be the same. Views of the heap would also be similar to those from KOP #1, except that low foothills in the foreground would screen the lower two-thirds of the heap and, to some degree, would distract the viewer with intervening terrain. Because of the these mitigating factors, the heap would be difficult for casual viewers to discern after completion of reclamation.

KOP #3, representing westbound travelers on Interstate 80, has the highest number of viewers; however, the viewing distance would be more than 8 miles to the nearest project facilities, almost twice the distance from KOP #1. Although views would be fairly direct to the project site for about 1 mile along Interstate 80, motorists would be travelling at 70 mph or more and would face the distraction of traffic entering and exiting the highway, as well as the mill operations just off the interchange to the north. Because of the distance from KOP #3 to the proposed project, facilities would appear quite small in the mountain backdrop, and the muting effect of desert haze would be notably greater. The visual effects, as viewed from KOP #3, would be much the same as described for the two previous KOPs, but the contrast would be reduced by distance and haze effects. Much of the heap would be visible from KOP #3, but the increased distance would reduce its visual impact. The Proposed Action would meet VRM objectives as viewed from KOP #3, and after completion of reclamation most casual viewers would find it difficult to discern the project facilities from that viewpoint.

4.12.1.2 Alternative A

Alternative A would involve constructing a new mine access road from the Interstate 80 frontage road about 2 miles southwest of Wadsworth and would be compatible with the Proposed Action. Alternative A would have only minimal effects on the visual environment. There is an existing network of manmade linear disturbance features on the lower eastern slope of the Pah Rah Range, including transmission lines, roads, and pipelines, that can be traced by patterns of vegetative change. The proposed road in Alterative A would follow existing transmission line and pipeline corridors for its entire route. It would be morevisible than the existing corridor, but would not be visually obtrusive and would not dominate public views. It would meet the VRM objectives for Classes III and IV.

4.12.1.3 No Action Alternative

Under the No Action Alternative, there would be no project-related visual impacts. Exploration scars in the project area would be reclaimed according to permit stipulations, slightly reducing existing visual disturbance.

4.12.1.4 Mitigation and Monitoring

Recommended mitigation includes varying the geometric footprint of the proposed facilities to more nearly mimic natural lines and forms. Long, straight lines and overly simple geometric forms should be avoided, and emphasis placed on horizontally and vertically irregular massing to repeat the *basic elements* of the natural landscape to the extent possible. Constructing the dump faces with an irregular, curvilinear footprint to

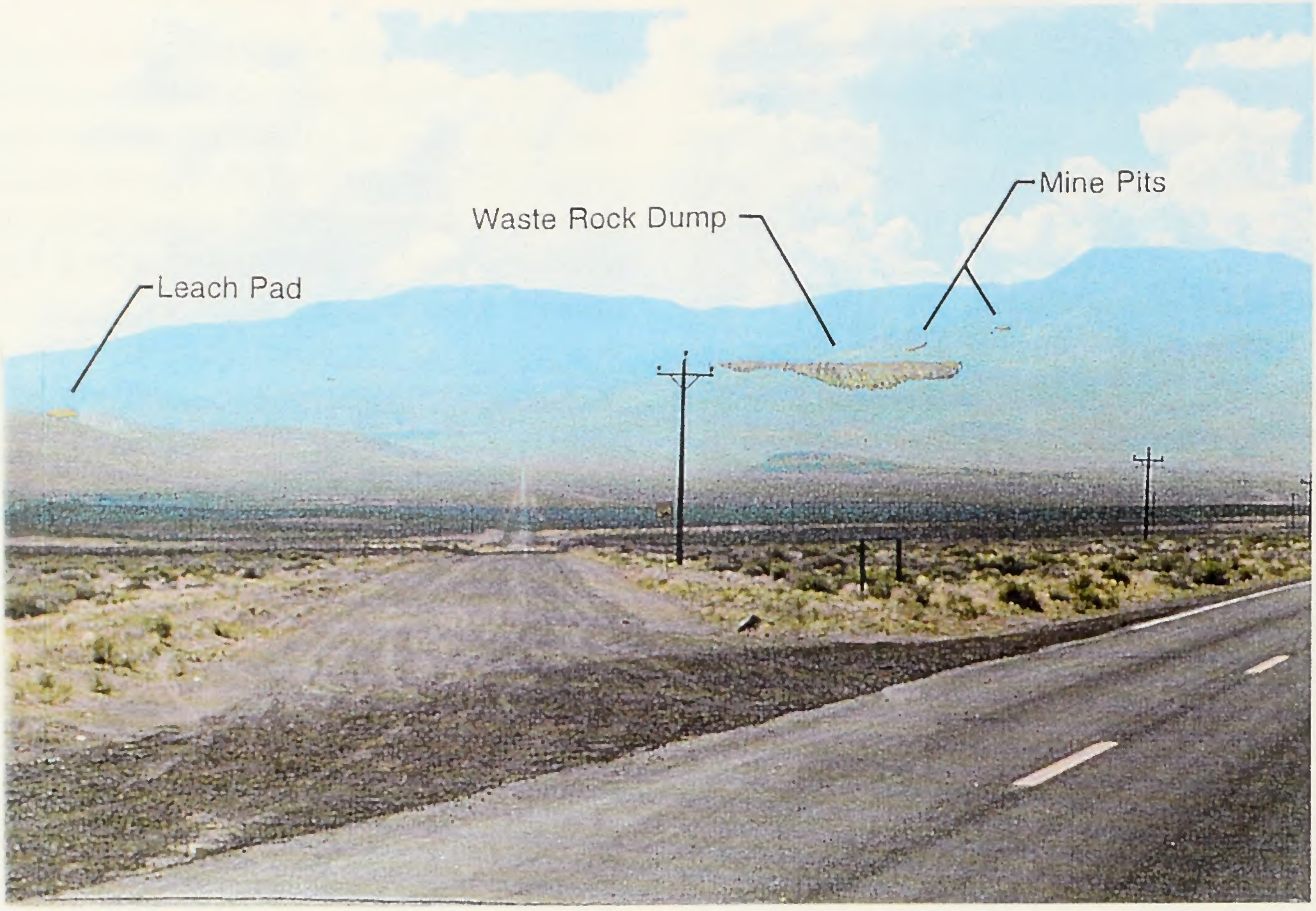


Figure 4.2 View of Project Area From KOP #2 During Mining Under Proposed Action.

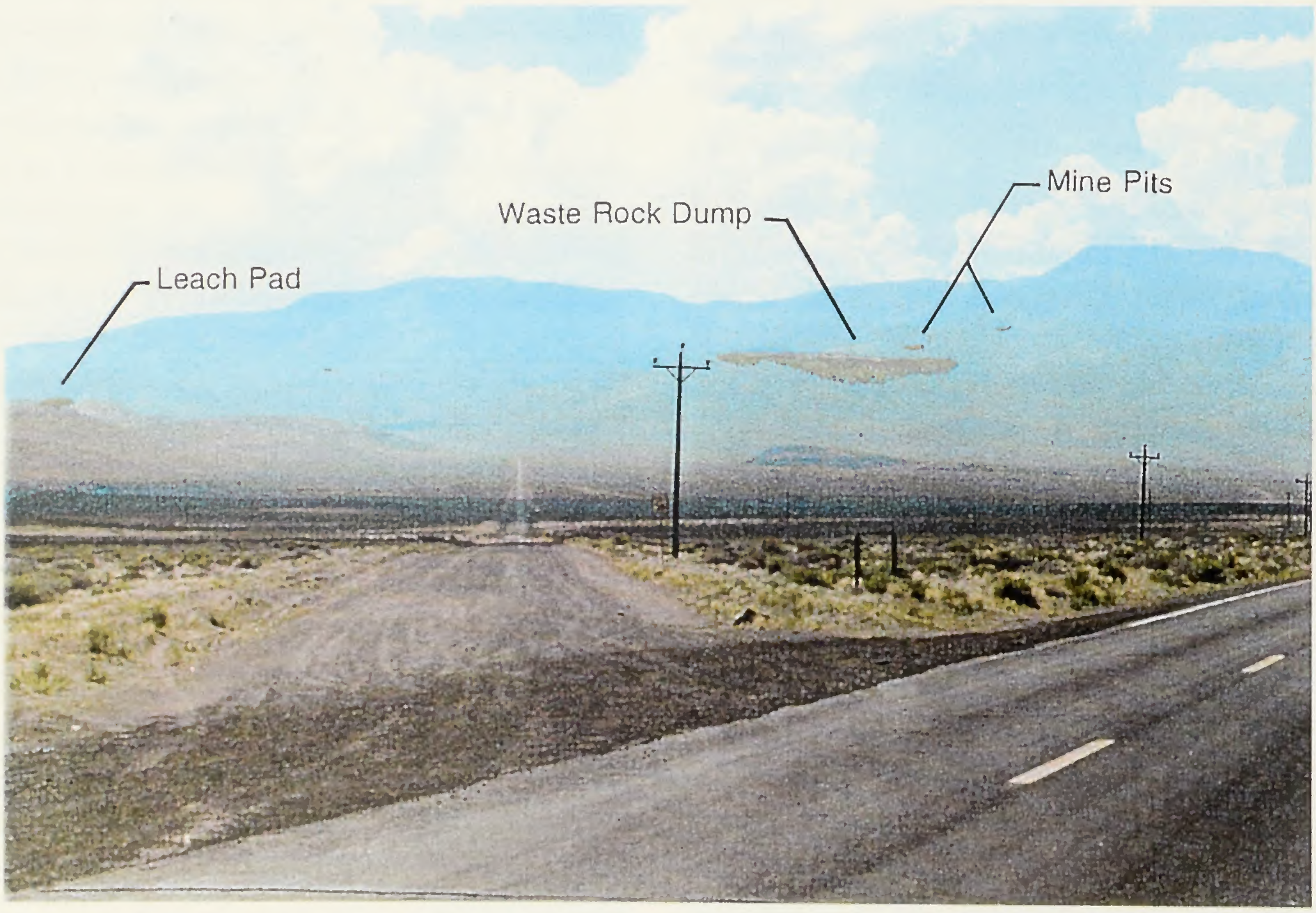


Figure 4.3 View of Project Area From KOP #2 After Reclamation Under Proposed Action.

mimic nearby natural hillslopes would be especially effective in reducing visual effects in the long term.

4.12.1.5 Irreversible and Irretrievable Commitment of Resources

The natural topographic features in the areas of the pit, waste rock dump(s), and heap would be permanently altered.

4.12.1.6 Unavoidable Adverse Effects

The project would permanently modify the existing landscape in the project area. The pits would remain permanently, as would the waste rock dumps and leach heap. Color and texture modifications would be substantially reduced by proposed reclamation measures, but landform modifications would be permanent.

4.12.2 Noise

4.12.2.1 Proposed Action

Major sources of noise from mining and processing operations of the proposed project would include rock drilling, blasting, loading or rock and ore, truck hauling, ore crushing, and crushed ore handling and distribution. Project construction would also include road building activities. Detailed equipment rosters have not been prepared, but noise generation estimates were drawn from experience with similar mining projects in Nevada.

The Proposed Action would be spread over an area about 2 miles north to south and 1 mile east to west. There would be several focal points of activity within that area that would generate noise. The residences south of the Olinghouse County Road and about 2 miles west of State Route 447 would be the nearest sensitive receptors to the proposed waste rock dump, where major activity would include large haul trucks dumping rock, as well as some dozer activity. Estimated worst-case noise levels from these activities would be approximately 96.6 dBA at the 50-ft reference distance. Conservatively assuming attenuation of the noise only as a result of noise spreading over distance, the noise level experienced at the ranch buildings would be less than 49 dBA. Mining activity in the pits could generate somewhat higher noise levels at the source than the dump activities, but because of the greater intervening distance, noise levels at the ranch would be about the same or slightly higher than those estimated from the waste rock dump. As the project proceeds, pit noise reaching the ranch area would decline because the pit wall would form its own noise barrier, becoming more effective as the pit is deepened. The noise levels estimated at the ranch would be higher than existing levels or levels normally experienced in an undeveloped rural environment, but less than the 65-dBA level that is generally considered acceptable for exterior noise at a residential area.

Residents of Wadsworth would not be likely to experience perceptible changes in ambient noise levels from development and operation of the proposed project due the their increased distances. At worst, they may perceive activities as a low-level hum at times of extremely low background noise when there is no wind and little or no traffic noise.

Blasting noise is not included in the noise level estimates discussed above, primarily because mine blasting is typically an extremely brief event occurring once per day. With modern blasting techniques, the blasting would be experienced by people at the nearest residences and, perhaps, in Wadsworth, as a very brief and muted clap of thunder preceded by a warning whistle or siren. Public acceptance would be improved by scheduling the blasting at the same time every day to reduce the "startle factor."

4.12.2.2 Alternative A

Alternative A would change the pattern of traffic accessing the project site in the vicinity of the ranch. Whereas the time period that traffic noise would be perceived at the ranch would increase, the noise levels from traffic would be low and would not notably increase the total noise effect at the ranch.

4.12.2.3 No Action Alternative

The No Action Alternative would result in a very slight reduction in noise levels generated from the project site as exploration and associated reclamation activities are completed.

4.12.2.4 Mitigation and Monitoring

It is recommended that blasting for the project be scheduled at the same time each day to minimize adverse impacts by reducing the startle factor. All project-related equipment should be maintained in good condition with appropriate mufflers installed at all times.

4.12.2.5 Irreversible and Irretrievable Commitment of Resources

There would be no irreversible or irretrievable commitment of resources related to noise generated by the proposed project.

4.12.2.6 Unavoidable Adverse Effects

The proposed project would generate noise during construction, operation, and reclamation. Estimated levels would be noticeable, but would not exceed normal standards.

4.13 CULTURAL RESOURCES

4.13.1 The Proposed Action

Five of the sites that have been determined to be eligible for the NRHP, and two additional sites that remain unevaluated occur within the northern portion of the project area but not within the area of disturbance. Prior to disturbance, a determination would be made as to whether project activities would affect these sites, and if they would, appropriate mitigation would be determined and implemented. Some unauthorized collection of artifacts could occur. The proposed process area was included in the recent cultural resources survey for the southern portions of the project (D'Angelo 1997). This survey identified eight sites within the proposed disturbance area. These sites include *lithic scatter* sites, a historic campsite, and historic road segments. They have been recommended as not eligible under the NRHP criteria, but actual determination of NRHP eligibility will be made after final review by the BLM and SHPO.

Formal consultation with the Pyramid Lake Paiute Tribe regarding Native American religious concerns associated with the Proposed Action is ongoing.

4.13.2 Alternative A

Impacts to cultural resources and Native American concerns resulting from the implementation of Alternative A are not known at this time since the Class III survey of the access route has not been completed. Most of the area associated with this alternative access route has been previously disturbed for construction of a pipeline and associated service road.

4.13.3 No Action Alternative

There would be no additional impacts to cultural resources or Native American religious concerns under the No Action Alternative. Unauthorized collection would likely continue at existing levels.

4.13.4 Mitigation and Monitoring

Mitigation plans would be developed and implemented, as appropriate, for cultural sites identified in the project area which would be directly or indirectly affected.

4.13.5 Irreversible and Irretrievable Commitment of Resources

Some cultural resources or Native American religious concerns could be irreversibly or irretrievably committed by the Proposed Action or Alternative A.

4.13.6 Unavoidable Adverse Impacts

Eligible sites within the project area, but outside of the area of disturbance, could be adversely affected because of increased visitation and increased unauthorized collection.

4.14 SOCIOECONOMICS

4.14.1 The Proposed Action

4.14.1.1 Population and Demography

During construction, the proposed project is anticipated to employ an average workforce of 40, with a peak workforce of 60 in the fourth and fifth months of construction (Cummings 1996d). The effect of the construction workforce depends primarily on the number of in-migrating workers and the demographic characteristics of their families. It is estimated that the local direct workforce (new workers at the mine hired from the local workforce) would be approximately 48 (80% of the peak direct construction workforce) (Table 4.6) and would commute to and from their place of residence on a daily basis and would not affect growth in the local population. These workers could come from labor forces in Wadsworth, Fernley, Reno/Sparks, Yerington, Fallon, Carson City, and Hawthorne. The remaining 12 workers (20% of the peak direct construction workforce) are expected to be nonlocal direct workforce (new workers at the mine hired from outside the local workforce) and would temporarily relocate in the area during construction. In addition, there would be indirect (nonmine) employment created for two workers--one each from the local workforce (local indirect) and from outside the local workforce (nonlocal indirect). The number of households is anticipated to temporarily increase by 13 (Table 4.7) and the population by 15 persons as a result of the nonlocal workers and their families that would temporarily relocate to the area. The population increase is projected to include 12 single persons and one family of three (Table 4.8). The majority of these in-migrants are expected to locate in the Fernley/Wadsworth area due to its proximity to the mine. Once construction ends the workers would either find other employment in the area or seek employment elsewhere.

Employment at the proposed mine during operations is projected to be 114 full-time workers for the 5-year operating period of the project. It is estimated that the local direct workforce would be approximately 80 (70% of the peak direct construction workforce) (Table 4.6), and these workers would commute to and from their place of residence on a daily basis and would not affect growth in the local population. As with construction workers, these workers could come from labor forces in Wadsworth, Fernley, Reno/Sparks, Yerington, Fallon, Carson City, and

Table 4.6 Projected Employment During the Construction and Operations Phases.

	Direct Employment[1]			Indirect Employment[2]			Total Employment		
Phase	Local	Nonlocal	Total	Local	Nonlocal	Total	Local	Nonlocal	Grand Total
Construction	48	12	60	1	1	2	49	13	62
Operations	80	34	114	12	5	17	92	39	131
Total	128	46	174	13	6	19	141	52	193

1 Employment at the mine.
2 Employment created away from the mine due to increased economic activity.

Table 4.7 Projected Increase in Number of Workers and Households.[1]

Phase	Non-local Direct[2]		Non-local Indirect[3]		Total	
	Workers	Households	Workers	Households	Workers	Households
Construction						
Single Workers	11	11	1	1	12	12
Married (1-worker)	1	1	0	0	1	1
Married (2-workers)	0	0	0	0	0	0
Subtotal	12	12	1	1	13	13
Operations						
Single Worker	7	7	2	2	9	9
Married (1-worker)	23	23	3	3	26	26
Married (2-workers)	4	2	0	0	4	2
Subtotal	34	32	5	5	39	37
Grand Total	46	44	6	6	52	50

1 The construction workforce is assumed to be 80% local and 20% nonlocal. Local workers would commute to and from their place of residence to work on a daily basis. Indirect construction employment is calculated using a construction employment multiplier of 1.2 based on 1978 employment location quotients and basic/nonbasic employment. It is assumed that 70% of the indirect labor force are second persons in the direct labor households or current residents of the study area. The construction workforce is composed of 90% single workers or married without family and 10% married workers with a family. For indirect workers, it is assumed 50% are single or without family present, and 50% are married with family present. Both husband and wife of 10% of the married direct workforce are assumed to work at the mine during construction; for indirect workers, 30% are assumed to be two-worker households. The new operations workforce is assumed to be 70% local and 30% inmigrants. Indirect operations employment is calculated using an operations employment multiplier of 1.74 (Dobra). It is assumed that 50% of the indirect labor force are second persons in the direct labor households or current residents of the project area. The operations workforce is composed of 20% single workers and 80% married workers. The indirect workforce is composed of 40% single workers and 60 percent married-with-family workers. Both husband and wife of 10% of the married workforce are assumed to work at the mine.

2 Employment at the mine.

3 Employment created away from the mine due to increased economic activity.

Table 4.8 Projected Increase in Total Population and School Age Population.[1]

Phase	No. of New Households	Population			New School Children		
		Single Households	Married Households	Total	Primary	Secondary	Total
Construction	13	12	3	15	1	0	1
Operations	37	9	98	107	23	5	28
Total	50	21	101	122	24	5	29

1 Population estimates are based on 1 person per household for single households with direct workers, 1 person per household for single households with indirect workers, and 3.5 persons per household for married households. School-age children are estimated at 1.0 per married household. 82% of school-age children are primary students, and 18% are secondary students.

Hawthorne. The remaining 34 workers (30% of the peak direct construction workforce) would be nonlocal direct workers and would establish households in the vicinity of the project area for the life of the mine. In addition, there would be indirect (nonmine) employment created for 17 additional workers, with 12 projected from the local workforce (local indirect) and five from outside the local workforce (nonlocal indirect). The number of households is anticipated to increase by 37 (Table 4.7) and the population by 104 persons as a result of nonlocal workers and their families that move into the area. The population increase is projected to include nine single persons and 28 families with a total of 98 persons (Table 4.8). The majority of these in-migrants are expected to locate in the Fernley/Wadsworth area due to its proximity to the mine. At the end of the project, these people would either find other employment in the area or seek employment elsewhere. Increased unemployment rates or welfare applicants are not anticipated for the area during either construction or operations phases.

The increase in population of 122 persons from both the construction and operations phases of the proposed project represents an increase of less than 2.0% in the population of Fernley/Wadsworth. Both towns have been growing rapidly the last few years--Fernley at 18% and Wadsworth at 24%.

4.14.1.2 Economy and Employment

Implementation of the proposed project would increase employment in the mining sector in Washoe County, as well as expand opportunities for indirect employment in the retail and service sectors. There would be a 19% increase in the mining sector workforce in Washoe County as a result of the 114 workers at the proposed project and a less than 1% increase in the construction workforce as a result of the 60 construction workers. There would be opportunities to hire qualified members of the Pyramid Lake Paiute Tribe, where the current overall unemployment rate is more than 34%.

Average income in the area would increase since the wage rate in the construction and mining sectors is higher than most other sectors of the economy. The hourly pay rate would be $8.75-$18.50 (Alta 1996). The annual payroll for the 114 employees during mine operations is estimated at $3.6 million plus benefits and taxes. Assuming that 85 to 90% of these wages represent disposable income (U.S. Department of Labor, Bureau of Labor Statistics 1993) and a local (Lyon or Washoe County) spending capture rate of 60% for operations employees, a total of $2.2 million in new local spending for goods and services would occur annually during the life of the project. Businesses in Fernley and surrounding towns would benefit from this local spending.

4.14.1.3 Housing

Demand for housing would result from 13 new households established during the construction phase and 37 new households established during the operations phase for both direct and indirect workers, a total of 50 new households. These households would likely require one mobile home, one multi-family unit, two motel rooms, and nine RV/other facilities for construction workers and 11 single family homes, four multi-family units, and 22 mobile homes for the operations workforce (Table 4.9). The existing housing market is generally tight due to the current high demand for rental and temporary housing; however, a number of new housing projects are under construction to provide such housing. Adequate land is available for development of additional housing, and adequate housing is available within commuting distance of the proposed project; therefore, adequate housing would be available for nonlocal workers and their families moving into the project area.

4.14.1.4 Community Facilities and Services

All public utilities including water and sewer, sewage treatment, solid waste, electricity, and telephone service are adequate within most of the area within which new households would likely be

Table 4.9 Housing Demand as a Result of In-Migration During the Construction and Operations Phases.[1]

Phase	Mobile Home	Housing Demand (Number of Units) Multi-family	Motel	RV/Other	Total
Construction	1	1	2	9	13
Operation	22	4	0	11[2]	37
Total	23	5	2	20	50

[1] Housing preferences are shown based on the following percentage distribution: mobile home 7.5%; multi-family 7.5%; RV/other 70%; motel 15%. Housing preferences shown are based on the following percentage distribution: single family 30%; multi-family 10%; mobile home 60%.
[2] Single family housing other than mobile homes.

established. However, the water system in Wadsworth is currently inadequate for the existing population, and new growth in Wadsworth as a result of the proposed mine would likely exacerbate this situation. Effect of groundwater drawdown on residential water supply wells does not appear to be of concern in the Fernley area, but minor effects may occur in residential wells within a 5-mile radius of the proposed mine well site. Wadsworth, Stamp Mill, some Tribal wells, and rural residences could experience a maximum of 4.5 ft of well drawdown. This level of drawdown is not anticipated to be significant or to cause water supply problems in the area.

Public safety services including police, sheriff, ambulance, and fire are adequate for the projected population increase due to the proposed mine. There could be some short-term impacts, such as increases in traffic infractions and alcohol-related problems during construction, for the sheriff's department.

Transportation issues related to car and truck traffic going to and from the mine site through Wadsworth, particularly passing the Natchez school on State Route 447, are discussed in Section 4.11. Increased traffic would create a potential safety hazard, particularly to the residences adjacent to the highway and to the school.

The cultural and recreational services in Fernley and the surrounding area would adequately accommodate the projected population increase.

Both the Washoe and Lyon County School Districts have adequate capacity to serve the estimated 29 new students who would be moving to the Wadsworth and Fernley educational facilities. The construction phase would likely result in the addition of 1 additional primary school student, whereas the operations phase is expected to add 28 new students--23 primary and 5 secondary (Table 4.8).

4.14.1.5 Public Finance

The proposed project would result in increased revenues to Washoe County from property, net proceeds, and sales taxes. Fernley would likely benefit from increased property taxes for residential property and increased sales tax receipts.

The principal revenue increase for Washoe County would result from an increase in assessed valuation attributable to the mine and its support facilities. The total estimated capital expenditures for 1998 would be $16.8 million, with total capital expenditures for the life of the mine totaling $19.2 million. Ad valorem tax (property) tax is estimated by multiplying the capital investment by the assessed valuation (35%) by the tax rate (2.5078%). This tax is paid annually based on capital expenditures depreciated at the rate of 1.5% per year. Receipt of property tax revenue on operations would lag one year behind installation of improvements because of conventional assessment and collection practices. The estimated ad valorem tax associated with the proposed mine development would range from about $147,000 in 1999 to about $166,000 in 2002 with an average annual tax of about $156,000 during the period of mine operations.

A net proceeds tax is collected on the production of gold at property tax rates. This tax is based on estimated mining profits, which depends on gold prices in the marketplace and the cost of production. Assuming a continuing market value for gold of $325/oz based on recent market prices, the estimated cost of mining ($200/oz) is approximately 61% of the value of production (Cummings 1996a). Under the proposed mine development scenario and production rates, the net proceeds tax would range from about $640,000 in 1999 to about $150,000 in 2004 and would total about $3 million during mining operations. Gold production and the net proceeds tax would drop to zero in 2005.

The mine would also generate sales and use tax to the state and local governments. Estimated expenditure figures for local or regional supplies such as diesel fuel, gasoline, and other motor oils are not available; however, since Reno is a major supplier in the area, sales tax revenues to Reno and Washoe County should be substantial. In addition, numerous supplies could be purchased in the Fernley area.

During construction and operations, there would be increased costs to provide services, including education, to Fernley, Lyon County, and Lyon County School District. These jurisdictions would not share in the property tax or net proceeds revenues from capital investments at the proposed mine, so they would experience increased expenditures and little increase in revenues during the construction and operation phases. The most significant increases in expenditures would likely occur in public safety, schools, and community support activities.

In summary, it is anticipated that the Proposed Action would result in relatively large increases in revenue to Washoe County, whereas Fernley, Lyon County, and the Lyon County School District would likely experience some increased expenditures without corresponding revenue increases. Upon completion of the project, Washoe County would experience reductions in ad valorem and net proceeds tax revenues equivalent to the increases experienced at the outset of the project.

4.14.1.6 Indian Trust Assets

The Proposed Action would affect land resources related to Indian Trust Assets by crossing Tribal lands for the access road connecting the Olinghouse County Road to State Route 447 and by increasing overall traffic volume and hazardous materials transport through Wadsworth adjacent to the Natchez Elementary School. Impacts to water resources and wildlife and fisheries related to Indian Trust Assets are discussed in Sections 4.4.1, 4.7.1, and 4.8.1.

4.14.1.7 Environmental Justice

The Proposed Action would affect the Pyramid Lake Paiute Tribe and its members by increasing local employment opportunities.

4.14.2 Alternative A

Increased local employment opportunities for Tribal members would continue as in the Proposed Action. However, safety hazards related to increased automobile and truck traffic passing through Wadsworth, particularly adjacent to the Natchez School, would be totally mitigated because mine traffic would bypass Wadsworth, and there would be no necessity of crossing Tribal lands from State Route 447 to access the Olinghouse Canyon Road.

4.14.3 No Action Alternative

The No Action Alternative would preclude the development of the Olinghouse Gold Mine as currently proposed. The socioeconomic impacts discussed in the action alternatives would not occur. There would be no increase in population as a result of the mine, nor would there be an increase in tax revenues as a result of construction and operations of the mine. Implementing the No Action Alternative would result in no change for the potentially affected minority population or the Indian Trust Assets.

4.14.4 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.14.5 Irreversible and Irretrievable Commitment of Resources

There would be no irreversible and irretrievable commitment of resources associated with socioeconomic resources.

4.14.6 Unavoidable Adverse Impacts

No unavoidable adverse impacts to socioeconomic resources would occur.

4.15 HAZARDOUS AND SOLID WASTE

4.15.1 The Proposed Action

Impacts to soils, surface and groundwater resources, and wildlife could result from accidental hazardous material spill or exposure to these materials. The relatively small amount of soil that could potentially be contaminated, coupled with appropriate and timely cleanup, would result in negligible impacts. Proper containment of hazardous material would limit potential surface and groundwater contamination to negligible levels. Solid wastes would be collected and disposed of in approved off-site disposal areas except for domestic sewage, which would be disposed of in an on-site NDEP-approved septic tank and leach field.

Project operations would comply with all relevant federal and state laws, regulations, and directives identified in the Monitoring Plan, Spill Prevention and Countermeasure Plan, Temporary Closure Plan, and inventories of hazardous chemical categories pursuant to Section 312 of SARA, as amended.

4.15.2 Alternative A

Impacts resulting from hazardous and solid wastes under Alternative A would be similar to those for the Proposed Action.

4.15.3 No Action Alternative

Under the No Action Alternative, there would be no increase in hazardous and solid wastes in the project area above existing levels.

4.15.4 Mitigation and Monitoring

The chance of a hazardous materials spill in Wadsworth would be completely mitigated by routing traffic carrying such materials around the town on an alternative access road (Alternative A).

4.15.5 Irreversible and Irretrievable Commitment of Resources

There would be no irreversible or irretrievable commitment of resources concerning hazardous and solid wastes.

4.15.6 Unavoidable Adverse Impacts

With implementation of the appropriate precautions, no unavoidable adverse impacts are anticipated.

4.16 CUMULATIVE IMPACTS

Cumulative impacts are those which result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. These actions may result solely from human activities or in combination with natural events and processes. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7). This EIS addresses the cumulative impacts that would result from the development of the Olinghouse Mine Project under the Proposed Action and Alternative A; however, because impacts from the various action alternatives are similar in both kind and quantity, they are not discussed separately. The No Action Alternative is not discussed because under that scenario the mine would not be developed and no project-related impacts would occur to the existing environment. The analysis of cumulative impacts for each resource includes an appropriate geographic area for that resource determined during scoping.

4.16.1 Related Development Actions

Related development actions are actions that have occurred, are occurring, or may conceivably occur in the vicinity of the Olinghouse Mine Project that impact environmental quality. These actions may have beneficial or adverse environmental impacts that, when considered in conjunction with impacts from the proposed project, would increase or decrease impacts on various resources. Related development actions have been divided into two categories: 1) past and present actions and 2) reasonably foreseeable development.

4.16.1.1 Past and Present Related Development Actions

Past and present actions are addressed together because many past actions continue today. The discussion is general in nature and focuses on recent history, since a detailed assessment of the impacts of human development in the Truckee River basin in Nevada is beyond the scope of this document and is not necessary to adequately address cumulative impacts under NEPA.

The history of the Truckee River basin includes a period of early exploitation of natural resources, including mining and lumbering. In addition, there was a sizeable commercial fishery for Lahontan cutthroat trout from Pyramid Lake. This was followed by settlement by homesteading and agricultural development and a modern era of increased urbanization. The following brief summary of activities within the Truckee River basin is from California Department of Water Resources (1991).

Mining in the Olinghouse Mining District began on a small scale in 1874, and ore production reached its peak from 1901-1903 (see Section 3.13.2). A post office was established in 1903, and the community of Olinghouse was born. The Nevada Railroad Company constructed a standard gauge railroad to haul gold ore from Olinghouse to Wadsworth.

The 1906 Newlands Reclamation Project diverted water from the Truckee and Carson Rivers for irrigation. Following the development of irrigated lands, the town of Fernley grew, later to be served by a railroad and two transcontinental highways. Military installations near Reno and Fallon also added to development of the area.

Today the Fernley/Wadsworth area is growing rapidly, both as a "bedroom community" for Reno/Sparks and as a location for light manufacturing facilities such as Stanley Tools, who recently completed a plant employing approximately 200. The fact that Fernley is located on a major east/west travel corridor and is serviced by both Interstate 80 and the Southern Pacific Railroad bodes well for prospects of future growth.

The Truckee River has always been an important factor in the development of this arid area. The first major development in the drainage occurred in conjunction with the mining and lumbering boom of the 1860s, and today the Truckee River basin provides a variety of benefits--municipal water supply, fish and wildlife habitat, hydroelectric power, river and reservoir recreational opportunities, and irrigation water. From its headwaters in California's Sierra Nevadas above Lake Tahoe, the river ultimately flows into Pyramid Lake, in Nevada, where water leaves only by evaporation.

Lake Tahoe is a large (approximately 192 mi^2) deep (average depth of 990 ft) natural lake that has been converted to a reservoir controlled by a small dam at its outlet and is the first place in the headwaters of the Truckee River where the it can be controlled. The dam controls the upper 6.1 ft of the lake--the amount of water stored for release to the Truckee River downstream. Other dams on tributaries of the Truckee River in California provide additional storage capacity for stream flow regulation and/or flood control, including Donner Lake, Prosser Creek Reservoir, Webber Lake, Stampede Reservoir, Boca Reservoir, and Martis Creek Reservoir. These reservoirs are operated according to procedures set forth in various agreements, legislation, and litigation, which are discussed in more detail in California Department of Water Resources (1991) and elsewhere. Lake Tahoe is the only reservoir from which California water users make diversions. All other upstream reservoirs are operated to serve only Nevada water users. The latest effort to resolve the water wars has been the enactment of Public Law (P.L.) 101-618, the Fallon Paiute Shoshone Tribal Settlement Act, and the Truckee-Carson-Pyramid Lake Water Rights Settlement Act, which was approved by the 101st Congress.

P.L. 101-618 includes in its goals providing better coordination of operation of existing reservoirs to meet existing water rights, improving instream flows in the Truckee River, and enhancing spawning flows for the cui-ui. The legislation formally dedicates the project water in Stampede Reservoir and a portion of the water in Prosser Creek Reservoir to the Pyramid Lake fishery. Negotiation of an operating agreement, as well as other contingencies, must be finalized prior to full implementation of P.L. 101-618.

Water diversions for Newlands Project agriculture in the Carson River basin still constitutes the largest water use--320,000 acre-ft, or just over half of the river's average annual flow at the state line. The Newlands Project also supplies irrigation water to about 6,000 acres in the Truckee River watershed in the vicinity of Fernley. Truckee Meadows is the other area with significant agricultural use of water for irrigation, and irrigation water use from Truckee Meadows downstream to Pyramid Lake ranged from about 64,000 to 77,000 acre-ft in the late 1980s and 1990. As agricultural lands in Truckee Meadows are converted to urban use, the water rights are acquired by developers who ultimately transfer the rights to local government agencies. About 6,000 acre-ft of Truckee water are diverted out of the basin in California for irrigation in the Feather River watershed.

Truckee River municipal diversions in Nevada have ranged from about 49,000 to 63,000 acre-ft in the late 1980s and 1990, and the Reno/Sparks area is the largest municipal user on the Truckee River.

One of the region's principal water supply problems is not so much the quantity of water but rather the time that it is needed. Peak municipal demands occur in summer when irrigation demands are also high, and to satisfy these needs additional upstream storage of municipal water is needed. Sierra Pacific Power Company and the Pyramid Lake Paiute Tribe have signed an agreement in which Sierra Pacific waived its rights to its single-purpose hydropower water and allowed that water to be used for Tribal fishery credit water. In exchange, the Pyramid Lake Paiute Tribe will allow Sierra Pacific to enter into contracts with the Bureau of Reclamation to store municipal credit water in the federal reservoirs. Other plans to increase the water supply in the region include importation of groundwater from other basins within Nevada and from out-of-state.

Truckee River water is also used to generate hydroelectric power at four Sierra Pacific Power Company turn-of-the-century hydropower plants along the river and at the Bureau of Reclamation's Stampede Dam. In addition, some power is generated incidental to operation of the Newlands Project. Truckee water is also used for cooling at Sierra Pacific's thermal power plant at Tracy, downstream from Sparks. Sierra Pacific Power Company meets its requirements by direct diversion from the river and by use of stored water primarily from Donner and Independence Lakes and has acquired former Truckee Meadows irrigation rights of about 35,000 acre-ft. Sierra Pacific also holds rights to about 48,000 acre-ft of groundwater, and other small water purveyors in the area also rely on groundwater.

The Truckee River Basin is well known for its water-based recreational opportunities. In the California portion of the drainage, Lake Tahoe is a nationally known recreational destination, and in Nevada the Truckee River and Pyramid lake are popular fishing areas. Water is an important component of the region's ecosystem providing fish and wildlife habitat. The major upstream reservoirs provide specified minimum releases to support instream flows, and some reservoirs are operated entirely or in substantial part to provide water for fishery needs. These needs include management of the cui-ui and the Lahontan cutthroat trout in Pyramid Lake because of their listing under the Endangered Species Act. Pyramid Lake is also the site of Anaho Island National Wildlife Refuge, home to a colony of American white pelicans.

<u>4.16.1.2 Reasonably Foreseeable Development</u>

<u>Expansion of the Olinghouse Mine</u>. Alta has presented, in its Plan of Operations for the Olinghouse Mine (Alta 1996) those activities that are likely to be initiated within a 7-year planning window (1997-2004). In addition, long-term mine planning has identified the following reasonably foreseeable development that may occur after this 7-year planning window. These activities are not currently proposed because of the uncertainty of economics, ore reserves, and processing techniques, but include:

- expansion of open pits outside of the projected footprints;
- development of new mine pit(s);
- an increase in the size or number of waste rock dumps;
- underground mining;
- pit dewatering operations;
- the hiring of additional personnel;
- expansion of ancillary facilities; and
- development of new processing technologies.

Reasonably foreseeable development could include the mining of additional ore-bearing structures within or adjacent to the pits proposed for this project. During preparation of this EIS, Alta's exploration program has identified sufficient reserves to extend the mine life from the proposed 5-year period to approximately 10 years. The exploration program may identify additional economically recoverable gold resources at the outer margins or lower depths of the proposed pits or outside the currently proposed pit areas, leading to expansion by the development of additional pits. Such development would likely involve the construction of additional process facilities and waste rock dumps and could provide opportunities for partial backfilling of the currently proposed pits. Waste rock dump capacity would have to be increased if existing pits were expanded or new pits were developed. This could be accomplished by constructing new dumps or increasing the size (footprint) of existing or proposed dumps.

Underground mining could be undertaken in the event that deep, high-grade deposits are discovered that would be amenable to underground techniques. Underground mining could take place within the proposed and/or reasonably foreseeable pit footprints and could be processed using existing and proposed facilities. Expansion or deepening of the proposed pits may require dewatering activities.

In the event that certain of the reasonably foreseeable future actions would occur, ancillary facilities such as power lines and other utilities, haul roads and access roads, and reagent storage areas may be required. Any such future actions would require NEPA compliance if a federal action would be involved.

Other Development. Additional reasonably foreseeable development not related to mineral development include the following:

- proposed recreational/tourist facility development on the Pyramid Lake Paiute Reservation;
- proposed agricultural development on the Pyramid Lake Paiute Reservation;
- proposed construction of a new high school in Wadsworth;
- proposed underground water storage in Dodge Flat area;
- proposed upgrade of State Route 447; and
- continued grazing by livestock on federal and private lands.

The Pyramid Lake Paiute Tribe is interested in pursuing a range of economic development projects on the Reservation, including a cogeneration power plant on the northern portion of the Reservation, gaming throughout the Reservation (contract negotiations with the State of Nevada are ongoing), and commercial development at the Wadsworth Interstate 80 interchange that would include a shopping center, small commercial business park, and expanded RV park (Toby 1997).

The BLM has recently acquired lands in the Pah Rah Range just north of the proposed mine. They have "blocked up" approximately 26,000 acres formerly in checkerboard ownership and have initiated a joint planning effort in cooperation with Washoe County.

Negotiation of the operating agreement implementing P.L. 101-618--the Fallon Paiute Shoshone Tribal Settlement Act--will establish an entity to oversee operation of the Truckee River and a method to administer water allocations.

In addition to these specific activities, it is reasonable to assume that the Fernley area will continue to grow and provide a bedroom community for the growing Reno/Sparks area, especially for people who prefer to reside in a smaller community. Some light manufacturing and other businesses will also be likely to locate in the Fernley/Wadsworth area for this same reason, as well as for financial considerations, especially regarding the cost of land. Such businesses are also encouraged by the transportation system provided by Interstate 80 and the Southern Pacific Railroad.

4.16.2 Cumulative Impacts

4.16.2.1 Geology and Minerals

The cumulative impacts area for geology and minerals is the watershed that includes the project area. It is likely that additional deposits of gold and other precious metals will be mined as they are discovered and as markets justify their recovery. In addition, advances in mineral extraction methods are likely to make recovery of now marginal deposits more attractive. Any minerals recovered by mining are obviously no longer available to future mining activities; rather, they are permanently removed from the geological formations in which they occur. However, they would prove useful to humanity in various capacities, as evidenced by their economic value that is above the cost of recovery. The proposed project would add to these cumulative impacts by removing gold resources in the Olinghouse District. Reasonably foreseeable development indicates the possibility that additional ore reserves may be discovered in the general vicinity of the project area.

4.16.2.2 Paleontological Resources

The cumulative impacts area for paleontological resources includes the public lands surrounding the proposed Olinghouse Mine Project. Additional construction activities, especially those impacting bedrock, would have the potential to impact paleontological resources. Those activities that involve federal actions would be subject to NEPA, and avoidance and mitigation measures would likely be required so as to protect paleontological resources. Private construction would be less likely to give such attention to fossils and could result in the loss of some resources. The proposed project would be operated in an area unlikely to contain valuable paleontological resources and would take all reasonable measures to protect such resources.

4.16.2.3 Air Resources

Cumulative impacts on air quality can be demonstrated by combining the Olinghouse Mine Project with other private or public facilities or activities which constitute pollutant sources in the Truckee River air basin. The project area is remote, and there are no known significant sources of pollutant emissions nearby. Based on modeling a worst-case scenario for mining operations, the cumulative impact of PM_{10} emissions from the Olinghouse Mine Project, expressed as an annual average concentration, would add 6.16 $\mu g/m^3$ to the background of 9.0 $\mu g/m^3$ to yield a cumulative annual average PM_{10} concentration of 15-16 $\mu g/m^3$. This modeled worst-case average annual PM_{10} concentration is less than the NAAQS of 50 $\mu g/m^3$ and the Class II PSD Increment of 17 $\mu g/m^3$.

Pollutant emissions from temporary road or highway construction and from travel along public and private unpaved roads are unquantifiable, as are emissions from future activities or facilities. These future activities would be subject to state and federal air quality laws to protect human health and aesthetics and may be the limiting factor to increased growth in the area.

4.16.2.4 Water Resources

The direct and indirect impacts described in Section 4.4 have been measured relative to the baseline condition, which includes the effects of past mining disturbance in Olinghouse Canyon and the area around Green Hill. Other than exploration activities (for which a Finding of No Significant Impact was issued [BLM 1995b]) and limited livestock grazing, no present activities in the project area have the potential to impact water resources.

Projects beyond the Proposed Action that must be considered to be reasonably foreseeable future actions include additional mine expansion beyond the Proposed Action. Although the Proposed Action covers a mine life of 5 years, verified reserves are now about twice the quantity on which the Plan of Operations is based. Furthermore, Alta is continuing exploration and has recently increased their land holdings in the Olinghouse area to 9,100 acres (Cummings 1997b). A total mine life of 10 years is likely, and a somewhat longer mine life may be possible.

Expansion of Alta's Olinghouse Mine Project beyond the Proposed Action would require increased ground disturbance to handle the additional ore and waste rock and a longer duration of water quantity modifications. Ground disturbance could cover approximately double the area associated with the Proposed Action. The pit would be expanded and deepened, and discharge of dewatering water would likely occur for a time period long enough to ensure the establishment of riparian vegetation, assuming that dewatering waters were discharged to surface waters. The permanent evaporative loss of water from the pit lake, which is a function of water surface area, would increase somewhat with further expansion, although the most losses would occur with the Proposed Action. Finally, use of water from the process water well would continue for the additional duration of mining. Drawdown of the Dodge Flat alluvial aquifer and decreases in groundwater outflows to the Truckee River would occur at no more than the maximum rates predicted by PTI (1997) for an additional 5 years. Use of dewatering water on-site could reduce water requirements from the well by up to 30% during the expansion period. While these water uses would occur over a prolonged period, there would likely be few or no cumulative impacts that could not be mitigated, and no additional unavoidable adverse impacts other than the loss of a small amount of recharge (e.g., <30 acre-ft/year out of nearly 2,000 acre-ft of annual recharge to the Dodge Flat aquifer).

The second project is the proposed Truckee River Operating Agreement (TROA), now in the planning stage. The agreement, minimally between the U.S., the Pyramid Lake Paiute Tribe, and Sierra Pacific, requires TROA to ensure that reservoirs fed by the Truckee River are operated to:

- satisfy dam safety and flood control requirements;
- enhance available spawning flows in lower Truckee River for the Pyramid Lake fisheries;
- carry out terms, conditions, and contingencies of the Preliminary Settlement Agreement between Sierra Pacific Power Company and the Pyramid Lake Paiute Tribe to improve fish spawning conditions and provide municipal and industrial water for Reno-Sparks during drought conditions;
- ensure water is stored in and released from reservoirs to satisfy and conform with existing water rights decrees; and
- minimize costs associated with operation and maintenance of Stampede Reservoir.

The preliminary environmental analysis for the TROA includes the following list of reasonably foreseeable future actions:

- water and water rights acquisition for Lahontan Valley wetlands;
- the adjusted 1988 OCAP;
- use of Fallon Naval Air Station water for fish and wildlife;
- USFS- and CDF-approved timber harvest plans;
- Storey County Industrial Park (Storey County Master Plan);
- upper Truckee River and Truckee Marsh restoration;
- Truckee Falls Golf Course;
- Big Chief Lodge;
- development in Placer and Nevada Counties, near the town of Truckee: Northstar Development, Gooseneck Ranch, Goldstream Project, and Tahoe Boca Estates;
- Route 267 bypass;
- bicycle trails;
- development of USFS land near the entrance to Tahoe City (Lake of the Sky facility);
- USFS habitat restoration projects;
- lower Truckee River restoration;
- replacement of the bridge over the Truckee River through Reno;
- livestock grazing;
- Olinghouse Gold Mine;
- restoration of properties damaged by the January 1997 flood;
- drought protection storage for the Truckee Division of the Newlands Project;
- municipal and industrial storage for the Town of Fernley; and
- storage of Truckee Carson Irrigation District's Donner Lake water in upstream reservoirs.

It is reasonably foreseeable that the TROA would benefit the Truckee River and, ultimately, Pyramid Lake, and these beneficial impacts would greatly outweight adverse impacts resulting from the proposed Olinghouse Mine Project.

The Truckee River Water Quality Agreement entered in to by Washoe County, the cities of Reno and Sparks, state and federal water quality regulators, and the Pyramid Lake Paiute Tribe in October 1996, is designed to improve water quality in the Truckee River by increasing streamflow to dilute municipal effluents discharged to the river. Currently, TDS loading to the Truckee River is at levels which result in elevated salinity and low dissolved oxygen in Pyramid Lake (Reuter et al. 1996), as well as poor water quality in the Truckee River. These water quality problems are detrimental to the endangered cui-ui and threatened Lahontan cutthroat trout. This agreement, The cities and county, along with the Department of Interior, are committed to spending $24 million to purchase water rights over 5 years. The water must be used to augment streamflow in the Truckee River, although there are some provisions regarding how this will be accomplished and what modifications can be made to discharge permits to allow increased discharges of municipal effluents.

Another major project anticipated within the cumulative effects area in the foreseeable future is a proposed groundwater storage project whereby surface water would be infiltrated into the Dodge Flat alluvial aquifer for long-term storage and withdrawn to meet the domestic and industrial demands of Wadsworth and Fernley during dry years. This project is intended to accommodate population growth in the Fernley-Wadsworth area. The Town of Fernley is currently beginning a feasibility study. Alta's proposed process water well may be in or near a likely infiltration basin site. Details on infiltration rates and overall modifications to the Dodge Flat water balance from Fernley's proposed project are not available. The anticipated timeline for this water bank is presently undefined. Within 15 years, the population of the Fernley-Wadsworth area is anticipated to be roughly 25,000. Assuming that this water source accounts for 25% of the domestic use of these towns, groundwater withdrawal for domestic and commercial use could be 1.5 times the quantity anticipated to be used by Alta.

4.16.2.5 Soils

The cumulative impacts area for soils is the watershed that includes the project area. Approximately 511 acres (9.8%) of Alta's 5,209-acre claim boundary area has been previously disturbed, as has 165 acres (33%) of the 495 acres proposed for disturbance under the Proposed Action. Additional mining in the area as a result of reasonably foreseeable development could add to this disturbance acreage; however, the area would still be small compared to adjacent undisturbed areas. All disturbed areas except pits would be reclaimed and provide for post-mining land uses similar to those available prior to mining. Outside of the project area watershed, soils will continue to be disturbed by construction of roads, homes, industrial operations, and agricultural activities.

4.16.2.6 Vegetation and Wetlands

The cumulative impacts area for vegetation and wetlands is the watershed that includes the project area. Approximately 511 acres (9.8%) of Alta's 5,209-acre claim boundary area has been previously disturbed, as has 165 acres (33%) of the 502 acres proposed for disturbance under the Proposed Action. Additional mining in the area as a result of reasonably foreseeable development could add to this disturbance acreage; however, the area would still be small compared to adjacent undisturbed areas. All disturbed areas except pits would be reclaimed and provide for post-mining land uses similar to those available prior to mining. Outside of the project area watershed, vegetation would continue to be disturbed by construction of roads, homes, industrial operations, and agricultural activities. Livestock grazing would continue and could be the primary source of damage to vegetation. The control of a 26,000-acre block of lands to the north of the project area, previously in checkerboard ownership but now managed by BLM, should provide improved vegetation management.

The Proposed Action is not anticipated to affect any wetland areas and does not contribute to cumulative impacts to wetlands. Reasonably foreseeable development such as mine expansion would be unlikely to disturb wetlands because of the relative scarcity of such communities in the project vicinity and the existing federal law that requires avoidance or mitigation.

4.16.2.7 Wildlife

The cumulative impacts area for wildlife includes the watershed that contains the proposed Olinghouse Mine Project. Any disturbance to wildlife habitat would in turn impact wildlife; however, areas proposed for disturbance by reasonably foreseeable development are relatively small compared to the total area, and especially valuable areas such as wetlands will likely be avoided. Some unknown number of bats could be displaced from adits and shafts as a result of additional exploration/mining. It is assumed, but not definitely known, that these bats would find suitable habitat elsewhere. The 26,000-acre area recently "blocked up" by BLM in the Pah Rah Range just north of the proposed Olinghouse Mine Project should benefit wildlife by simplifying management activities, such as the introduction of bighorn sheep.

4.16.2.8 Threatened, Endangered, and Candidate/Sensitive Species

The cumulative impacts area for TE&C and sensitive species includes the watershed that contains the proposed Olinghouse Mine Project; however, this area must logically be expanded for fish species since they are dependent upon flow in the Truckee River, and these flows are determined primarily by factors outside of the project area watershed. Some unknown number of bats, some of which are BLM-sensitive species likely have been and will be displaced from adits and shafts by past and future exploration/mining. Other nearby shafts and adits could provide suitable habitat to accommodate these bats. P.L. 101-618 has as a purpose the fulfilling of the goals of the Endangered Species Act by promoting the enhancement and recovery of the Pyramid Lake fishery, including the enhancement of spawning flows in the lower Truckee River, and establishes the Pyramid Lake Paiute Fisheries Fund to fund the attainment of these purposes. Therefore, P.L. 101-618 would be beneficial to cui-ui and Lahontan cutthroat trout, as would the Truckee River Water Quality Agreement (see Section 4.16.2.4).

4.16.2.9 Range Resources

None of the reasonably foreseeable development would be likely to significantly change the livestock grazing patterns in the cumulative impacts area that includes the Olinghouse and White Hills allotments. The acquisition by BLM of lands north of the proposed Olinghouse Mine Project in the Pah Rah Range would not effect livestock grazing allotments.

4.16.2.10 Recreation

Recreational opportunities in the cumulative impact area--the lands immediately surrounding the proposed Olinghouse Mine Project--are expected to increase with or without the proposed mine due to acquisition of additional lands in the Pah Rah Range by the BLM and a management plan developed by BLM and Washoe County. A growing population in the Truckee River Basin, including the Fernley and Wadsworth areas, would increase demand for recreational opportunities, some of which will be for the type provided by wildlands in the Pah Rah Range, and some of which would be provided by city parks, bowling alleys, etc.

4.16.2.11 Access and Land Use

The cumulative impact area for access and land use includes the lands immediately surrounding the proposed Olinghouse Mine Project. Additional exploration and mining in the Olinghouse District could add to traffic volumes in the Wadsworth and Fernley areas; however, it is likely that this activity would occur several years in the future as mining at the Olinghouse Mine Project would near its end, and the result would be a continuation of existing traffic volumes rather than an increase. Some additional mine pit area could result from additional mining, but this would occupy a relatively small area. Public access to the Pah Rah Range will be facilitated due to the acquisition of lands by BLM north of the Olinghouse Mine Project.

4.16.2.12 Visual Resources/Noise

There are no other reasonably foreseeable actions that are likely to affect the viewshed of the project area from KOPs. The entire Truckee River Basin has undergone a dramatic change in appearance during the last 150 years--from an essentially undisturbed wilderness to agricultural/rangeland use with major highways, railroad lines, and urbanization/ industrialization. This change is likely to continue with additional urbanization and industrialization. However, views of the Pah Rah Range from the Wadsworth, Fernley, and the Pyramid Lake Paiute Reservation are not likely to deteriorate. The recently acquired BLM control of lands north of the proposed Olinghouse Mine Project should add to the likelihood of preservation of this viewshed.

Reasonably foreseeable development would be unlikely to create any additional noise sources of significance. Additional exploration and mining would likely cause occasional noise from explosive charges and possibly additional traffic or changes in traffic patterns; however, when compared to other noise and traffic sources, these would be negligible. Traffic associated with Interstate 80 is probably the major source of noise in Fernley.

4.16.2.13 Cultural Resources

The cumulative impacts area for cultural resources is the project area. Reasonably forseeable development in the project area could impact cultural resources by disturbing sites during expanded mining exploration and operations, vandalism of sites, and increased access to sites. However, any additional exploration or mining on federal lands would require cultural surveys to identify cultural sites, as well as avoidance or mitigation of eligible sites. Activities outside the project area on private lands may not require cultural clearance, and sites could be destroyed.

4.16.2.14 Socioeconomics

The cumulative impacts area for socioeconomics includes Fernley and other potentially affected communities and surrounding rural areas in Washoe and Lyon Counties. Cumulative socioeconomic impacts would result from construction or operation of other projects which contribute to changes in local population, employment, housing, public services and facilities, the economy, and the transportation network. These include the items discussed in Section 4.16.1.2. The Olinghouse Mine Project would contribute to changes in the socioeconomic status of the Wadsworth-Fernley area and would add another tax base and revenue source that would contribute to growth in the Truckee River Basin in a relatively minor way. It would add to a business sector--mining--that is presently not dominant in Lyon or Washoe Counties.

4.16.2.15 Hazardous and Solid Wastes

The cumulative impacts area for hazardous and solid wastes is the watershed that contains the Olinghouse Mine Project. Reasonably foreseeable development in this area would likely include additional exploration and mining under authority of BLM. Project operations would have to comply with all relevant federal and state laws and with directives identified in the Spill Prevention and Countermeasure Plan and other appropriate plans. Proper containment of hazardous materials would limit potential surface and groundwater contamination, and solid wastes would be disposed of in approved off-site disposal areas. Domestic sewage would likely be disposed of on-site in a NDEP-approved septic tank and leach field. Hazardous materials are often transported via the Southern Pacific Railroad and Interstate 80, and the volume of such materials is likely to increase with time.

4.17 SHORT-TERM USE OF THE ENVIRONMENT VERSUS LONG-TERM PRODUCTIVITY

The short-term use of the project area for gold mining would have limited impacts on long-term productivity. The pit, leach pad, and waste rock dump areas would be altered for the long term, but most areas excluding the pit would be revegetated. Soil horizons would be destroyed; however, the post-mining land surface would be capable of producing forage in quantities similar to pre-mining levels. Long-term use of the project area for livestock grazing, wildlife, and recreation would be similar to pre-mining conditions.

5.0 CONSULTATION AND COORDINATION

This chapter summarizes the activities in the EIS process used to ensure an opportunity for participation by interested members of the public, public interest groups, affected minorities, and various governmental agencies.

5.1 PUBLIC PARTICIPATION SUMMARY

Public involvement in the preparation of this EIS includes several specific steps to identify and address public concerns and needs. The public involvement process assists in: 1) broadening the information base for decision making; 2) informing the public of the proposal and long-term impacts resulting from the action; and 3) ensuring that public needs and desires are understood by BLM.

Opportunities for public participation or notification have occurred or will occur at four specific points in the EIS process: 1) the scoping period; 2) review of the Draft EIS; 3) review of the Final EIS; and 4) receipt of the Record of Decision.

5.1.1 Scoping

BLM initiated the scoping process with publication of a Notice of Intent to prepare the EIS in the Federal Register on June 13, 1996. The scoping period between June 13 and August 23, 1996, allowed interested members of the public to identify potential issues associated with the Proposed Action that might warrant analysis during development of the Draft EIS. This scoping process included public meetings in Reno and Fernley on July 3 and August 8, 1996, respectively. BLM mailed scoping notices to 73 individuals, organizations, and agency offices and published similar announcements in the legal notices sections of three local and regional newspapers.

The initial mailing list for this EIS was assembled from previous mining-related EIS mailing lists with the addition of local organizations, agencies, and potentially affected individuals. The list was supplemented with the addition of interested individuals who attended the scoping meetings or expressed a desire to be included on the mailing list.

Written comments were received from 19 individuals, organizations, and agencies during the scoping period. These comments were summarized in the Scoping Report for the Olinghouse Mine Project which is available at the Carson City District BLM Office.

5.1.2 Draft EIS Review

The 60-day Draft EIS review is initiated by publication of a Notice of Availability for the Draft EIS in the Federal Register. During the review period, public hearings will be held to receive comments. The Federal Register notice will specify dates for the public comment period and include an announcement of hearing dates and locations. Similar announcements will be issued as news releases to local and regional newspapers and mailed to the addressees on the BLM mailing list for this EIS (see Section 5.4). Briefings on the Draft EIS will be offered for local and state government representatives and Congressional Representatives as requested. Letters received from interested parties concerning the Draft EIS will be acknowledged so that respondents will know their comments have been received by BLM. Letters and testimony concerning the Draft EIS will be reviewed and evaluated by BLM to determine if information is presented that requires a formal response or identifies deficiencies in the Draft EIS. Any deficiencies would be corrected and incorporated in the Final EIS. Responses to these public comments will be included in the Final EIS.

5.1.3 Final EIS Review

The 30-day Final EIS review is initiated by publication of a Notice of Availability for the Final EIS in the Federal Register. Similar notices will be issued as news releases to local and regional newspapers. Copies of the Final EIS will be sent to those on the updated mailing list.

5.1.4 Record of Decision

Subsequent to the 30-day review of the Final EIS, the Record of Decision will be prepared and a Notice of Availability for the Record of Decision published in the Federal Register. A news release will be issued to local and regional newspapers to announce availability of the Record of Decision, and copies of the Record of Decision will be mailed to individuals and organizations on the updated mailing list.

5.2 NATIVE AMERICAN CONSULTATION

Because of the proximity of the project location to Tribal lands owned by the Pyramid Lake Paiute Tribe, the Tribe and the BIA were included on BLM's mailing list for all announcements related to the project, and in July of 1996 were invited to participate in preparation of this EIS as Cooperating Agencies. On August 2, 1996, representatives of Alta and BLM attended a regular monthly Pyramid Lake Paiute Tribal Council meeting and presented a discussion of the proposed project and the associated EIS process. Representatives of the Pyramid Lake Paiute Tribe and BIA participated in the public scoping process and the regular BLM Interdisciplinary Team meetings for the EIS. Representatives of the Pyramid Lake Paiute Tribe also attended the field review of the proposed project coordinated by the BLM for cooperating agencies on November 5, 1996.

5.3 AGENCY CONSULTATIONS

During preparation of the EIS for the proposed Olinghouse Gold Mine, BLM communicated with and received input from various federal, state, and local agencies. The agencies consulted during preparation of the EIS are listed below:

Federal

- U.S. Fish and Wildlife Service
- U.S. Department of the Interior, Truckee-Carson Coordination Office
- Environmental Protection Agency, Region IX
- Bureau of Indian Affairs

State

- Nevada Department of Conservation and Natural Resources
  - Division of Environmental Protection
  - Division of Water Resources
  - Division of Wildlife
- Nevada State Historic Preservation Office
- Nevada Department of Transportation

Local

- Washoe County
- Lyon County
- Town of Fernley

5.4 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS RECEIVING DRAFT EIS

Karen Garaventa Baggett
Jack Bassett
David M. Baylis
Charles L. Billings
George Brown
Honorable Richard Bryan

Bureau of Land Management
Director (WO-480)
Office of Public Affairs
State Director (NV-932)
Nevada State Office
Attn: Calvin Robinson
Bureau of Indian Affairs
Western Nevada Agency
Attn: Patrick Williams
Western Nevada Agency
Attn: Lew Fry
Bureau of Reclamation
Michael Busick
Clyyne Cook
Pete Cox
Robert K. Curtis
Jack Daemen
UNR - Mining Engineering
Ken Dallimore
Ed Depaoli
Environmental Leadership
Attn: Patty Moen
Fernley Town Board
Fredericks, Pelcyger, Hester & White, L.L.C.
Attorneys at Law
Attn: Ann Amundson
Gary Garaventa
Don Gates
John Geddie
Honorable Jim Gibbons
Great Basin Communications
E. P. Haggerty
Rebecca Harold
Fernley Town Attorney
Jack Hayden
Rich Houts
Royce Keyes
Kurt Kramer
Lahontan Audubon Society
Attn: Ken Pulver
Lazer
John Williams
Library of Congress Madison Building
Exchange and Gift Division
Charles L. Lippert
Robert Lopes
Lyon County
Board of County Commissioners
Michelle McCahill
Frank McShane
McGill University
Dept. of Geography
Mine Development Associates
Attn: Cindy Moore
Mineral Policy Center
Pierre Mousset-Jones
National Park Service (2310)
Attn: Dale Morlock
Native American Heritage Commission
Natural Resource Defense Council
Attn: Johanna Wald
The Nature Conservancy
Attn: Jan Nachlinger
Nevada Conservation League
Attn: Glenn Miller
Nevada Division of Environmental Protection
Attn: Connie Davis
Nevada Division of Wildlife
Attn: John Gebhardt
Nevada Indian Environmental Coalition
Nevada Land and Resource Company
Attn: Ted Fitzpatrick
Nevada Mining Association
Nevada Outdoor Recreation Association
Attn: Charles Watson
Nevada State Clearinghouse
Department of Admin.
Attn: Julie Butler
Nevada Wilderness Association
Attn: Roger Scholl
Nevada Wildlife Federation
Vivian Olds

Palomino Valley Homeowners
 Association
 Attn: Don Hartry
Charles Parker
Parsons, Behle, Latimer
Claudia Poquoc
Public Resource Association
 Attn: Susan Lynn
Pyramid Lake Paiute Tribe
 Attn: Mervin Wright, Jr.,
 Chairman
 Attn: Monte Martin
Pyramid Lake Water
 Resources
 Attn: Director
John Rafter
Honorable Harry Reid
Rural Development Service
 Attn: Herb Shedd
Schwartz Radio, Inc.
Sierra Club Toiyabe Chapter
 Attn: Rose Strickland,
 Public Lands Committee
Sierra Pacific Power Co.
 Environmental Department
 Attn: Bob Edwards, Rights-of-Way
Frank Smith
George Smith
Lee Smith
Melissa Smith
Southwest Gas Corporation
 Attn: Art Trevino, Rights-of-Way
Roger Steininger
Debra Struhsacker
Edward S. Syrjala
Truckee-Carson Coordination
 Office
 Attn: Jeffrey Zippin
U.S. Army Corps of Engineers
 Sacramento District
 Attn: Nancy Kang
U.S. Dept. of the Interior
 MS-2340
 Office of Env. Policy and
 Compliance
 WO 320
U.S. Department of Energy
 Office of Env. Compliance
 EH-23
U.S. EPA, Region IX -
 Attn: Jeannie Geselbracht
 CMD-2
 Office of Federal
 Activities (A-104)
U.S. Fish & Wildlife Service
 Attn: Mary Jo Elpers
U.S. Forest Service
 Toiyabe National Forest
The Wilderness Society
Charles R. Wilson
Washoe County
 Department of Development
 Review
 Attn: Ron Kilgore

6.0 LIST OF PREPARERS AND REVIEWERS

The BLM's interdisciplinary team members are listed in Table 6.1; cooperating/participating agencies in Table 6.2; Alta in Table 6.3; and TRC Mariah and its subcontractors in Table 6.4.

Table 6.1 Bureau of Land Management Interdisciplinary Team.

Team Member	Technical Specialty
Terri Knutson, Project Manager	Reclamation, Noise
Carla James, Asst. Project Manager	Geology
Prill Mecham	Cultural Resources, Native American Consultation, Paleontology
Jim deLaureal	Soils, Revegetation
Jim Ramakka	Wildlife, TES Plants and Animals
Terry Knight	Recreation, Visual Resources
Bashir Sulahria	Water Resources, Air Quality, Hazardous Materials
Jo Ann Hufnagle	Land Use, Access
Jim Gianola	Range Resources
Dave Loomis	NEPA Coordination, Socioeconomics
Tom Olsen	Groundwater Resources
Craig Smith	BLM/State Liaison
Paul McNutt	BLM State Office Review

Table 6.2 Cooperating Agencies.

Team Member	Cooperating Agencies
Nancy Kang	U.S. Army Corps of Engineers
Patrick Williams	Bureau of Indian Affairs
Pam Repp, Mary Jo Elpers	U.S. Fish and Wildlife Service
Mervin Wright, Jr.	Pyramid Lake Paiute Tribe
Ron Kilgore	Washoe County, Department of Development Review
Rebecca Harold	Town of Fernley and Lyon County

Table 6.3 Participating Agencies.

Team Member	Agency
Bruce Holmgren	NDEP
John Gebhart	NDOW

Table 6.4 Alta Gold Company.

Team Member	Position
Gary Cummings	General Manager

Table 6.5 TRC Mariah (and its Subcontractors) Third-party EIS Preparation Contractor.

Team Member	Position/Technical Specialty	Education/Experience
Russell Moore, Ph.D.	Project Manager	Ph.D. Ecology 24 years experience
Roger Schoumacher	Assistant Project Manager Wildlife, Fisheries, Range, Land Use, Access, Recreation	M.S. Fisheries Science B.S. Wildlife Management 33 years experience
Peter Guernsey	Vegetation, TE&C and Sensitive Species	M.S. Range Ecology/Watershed B.S. Biology 15 years experience
Cliff Cole	Air Quality	M.E. Mechanical Engineering B.S. Mechanical Engineering 17 years experience
James Zapert	Air Quality	M.S. Atmospheric Sciences B.S. Meteorology 11 years experience
Karyn Classi	Geology, Minerals, Paleontology, Soils	M.S. Geology M.S. Botany B.A. Geology 9 years experience
Craig Smith	Cultural Resources, Native American Traditional Values	M.A. Anthropology B.A. Anthropology 21 years experience
Ed Schneider	Cultural Resources, Native American Traditional Values	M.A. Anthropology B.A. Anthropology 10 years experience
Scott Benson	Hazardous Materials	M.S. Environmental Engineering B.S. Wildlife Management 10 years experience
Diane Thomas	Wildlife, TE&C and Sensitive Species	M.S. Zoology & Physiology B.S. Wildlife Conserv. & Mgmt. B.A. English and Art 8 years experience
Tamara Linse	Technical Editing	5 years experience
Genial DeCastro	Document Production	B.S. Business Administration 15 years experience
Jim Beck, P.E.	Mine Engineering	B.S. Mining Engineering 20 years experience

Table 6.5 (Continued)

Team Member	Position/Technical Specialty	Education/Experience
PTI Environmental Services		
Anne MacDonald	Water Resources	B.S. Geological Sciences 19 years experience
Bill Locke	Hydrogeology	M.S. Civil Engineering B.S. Geology 10 years experience
Richard McDonald	Hydrology	M.S. Earth Science B.S. Earth Science 6 years experience
Larry Peterson	Geochemistry	M.S. Geochemistry B.S. Chemistry 8 years experience
Planera		
Bernhard Strom	Visual Resources, Noise	MCRP City and Regional Planning B.S. Urban Planning 20 years experience
Kathol and Associates		
Jennifer Kathol	Socioeconomics	B.S. Natural Resource Economics 17 years experience

7.0 LITERATURE CITED

Alta Gold Company. 1996. Olinghouse project plan of operation/reclamation plan. Prepared for U.S. Department of the Interior, Bureau of Land Management, Carson City, Nevada. Prepared by Alta Gold Company, Henderson, Nevada.

Apartment Finders. 1996. Reno, Nevada. Personal communication in July 1996. Contacted by Jennifer Kathol, Kathol & Company, Fort Collins, Colorado.

Axelrod, D.I. 1956. Mio-pliocene floras from west-central Nevada. California University Publications in Geological Sciences, vol. 33. 322 pp.

_____. 1958. The Pliocene verdi flora of western Nevada. California University Publications in Geological Sciences, vol. 34, No. 2. Pp. 91-160.

Bard, J.C., C.I. Busby, and J.M. Findlay. 1981. A cultural resources overview of the Carson and Humboldt Sinks, Nevada. U.S. Department of Interior, Bureau of Land Management, Reno, Nevada, Cultural Resources Series 2.

Bardwell, P.P. 1982. Habitat management plan, Pah Rah Range, Wildlife Habitat Management Area (N3-WHA-T12). Prepared for the U.S. Department of the Interior, Bureau of Land Management, Lahontan Resource Area, Carson City District.

Bassett, J. 1996. Grazing Permittee, Olinghouse Allotment, Reno, Nevada. Personal communication on July 23, 1996. Contacted by Roger Schoumacher, TRC Mariah Associates Inc., Laramie, Wyoming.

Bell, J.W. 1984. Quaternary fault map of Nevada, Reno Sheet. Nevada Bureau of Mines and Geology Map 79.

Behnke, R.J. 1992. Native trout of North America. American Fisheries Society Monograph 6. American Fisheries Society, Bethesda, Maryland. 275 pp.

Bonham, H.F. 1969. Geology and mineral deposits of Washoe and Storey Counties, Nevada. Nevada Bureau of Mines and Geology Bulletin 70. 140 pp.

Bratberg, D.L. 1980. Hydrogeology of Dodge Flat and its relation to flow and quality changes in the Truckee River. Masters Thesis, University of Nevada, Reno, Nevada.

Bureau of Land Management. 1982. Draft environmental impact statement, proposed domestic livestock grazing program for the Reno Environmental Impact Statement Area, Nevada. U.S. Department of the Interior, Bureau of Land Management, Carson City District, Carson City, Nevada.

_____. 1983. Draft resource management plan and environmental impact statement for the Lahontan Resource Area, Nevada. U.S. Department of the Interior, Bureau of Land Management, Carson City District, Carson City, Nevada. 187 pp.

_____. 1984. Proposed resource management plan and final environmental impact statement for the Lahontan Resource Area, Nevada. U.S. Department of the Interior, Bureau of Land Management, Carson City District, Carson City, Nevada. 178 pp.

_____. 1985. Lahontan resource management plan - record of decision and management decisions summary. U.S. Department of the Interior, Bureau of Land Management, Carson City District, Carson City, Nevada. 39 pp.

_____. 1986. BLM Manual handbook 8410-1. Visual resource inventory.

Bureau of Land Management. 1987. Lahontan wilderness recommendations final environmental impact statement. U.S. Department of the Interior, Bureau of Land Management, Carson City District, Carson City, Nevada.

_____. 1988. National Environmental Policy Act handbook, H-1790-1. U.S. Department of the Interior, Bureau of Land Management.

_____. 1995a. Draft environmental impact statement, Lone Tree mine expansion project. U.S. Department of the Interior, Bureau of Land Management, Winnemucca District Office, Winnemucca, Nevada. BLM/WN/PL-96/003 + 1610.

_____. 1995b. Environmental assessment EA #95022, Olinghouse Canyon exploration plan of operations. U.S. Department of the Interior, Bureau of Land Management, Carson City District, Carson City, Nevada. File N36-94-004P. 23 pp.

_____. 1996a. Draft environmental impact statement, Talapoosa Mining Inc.'s Talapoosa mine project. U.S. Department of the Interior, Bureau of Land Management, Carson City District, Carson City, Nevada. BLM/CC/PL-96/005 + 1791.

_____. 1996b. Twin Creeks mine final environmental impact statement. U.S. Department of the Interior, Bureau of Land Management, Winnemucca District Office.

California Department of Water Resources. 1991. Truckee River atlas. Prepared for State of California. Prepared by The Resource Agency. 128 pp.

Call, M.W. 1978. Nesting habitats and surveying techniques for common western raptors. U.S. Department of the Interior, Bureau of Land Management, Technical Note No. 316. 115 pp.

Case, J.C. 1986. Earthquakes and related geologic hazards in Wyoming. Geological Survey of Wyoming, Public Information Circular No. 26. 22 pp.

CH2M Hill. 1990. Investigations of potential groundwater recharge and rapid infiltration/extraction projects at Dodge Flat, a compilation of technical memorandums and presentations. Unpublished report. Prepared for the City of Reno, Nevada.

Chatwin, T.D. 1990. Cyanide attentuation/degradation in soil. Prepared by Resource Recovery & Conservation Company, Salt Lake City, Utah.

Clark, T.W., and M.R. Stromberg. 1987. Mammals in Wyoming. University of Kansas, Museum of Natural History. 314 pp.

Clearwater Consulting Corporation. 1997. Truckee-Carson River basin study, draft report. Prepared for U.S. Department of Interior, Bureau of Reclamation, Western Water Policy Review Advisory Commission, Denver, Colorado. Prepared by Clearwater Consulting Corporation, Petaluma, California.

Clemmer, G. 1996. Nevada Natural Heritage Program. Personal communication in 1996. Contacted by Scott Benson, TRC Mariah Associates Inc., Laramie, Wyoming.

Connelley, M. 1996. Nevada Highway Patrol. Personal communication in July 1996. Contacted by Jennifer Kathol, Kathol & Company, Fort Collins, Colorado.

Cooper, K. 1996. Data Manager, Nevada Natural Heritage Program. Personal communication on July 16, 1996. Contacted by Pete Guernsey, TRC Mariah Associates Inc., Laramie, Wyoming

Cummings, G. 1996a. General Manager, Alta Gold Company, Fernley, Nevada. Personal communication on July 22, 1996. Contacted by Todd Martin, PTI Environmental Services, Boulder, Colorado.

_____. 1996b. General Manager, Alta Gold Company, Fernley, Nevada. Personal communication on August 5, 1996. Contacted by Todd Martin, PTI Environmental Services, Boulder, Colorado.

_____. 1996c. General Manager, Alta Gold Company, Fernley, Nevada. Personal communication on August 6, 1996. Contacted by Anne MacDonald, PTI Environmental Services, Boulder, Colorado.

_____. 1996d. General Manager, Alta Gold Company, Fernley, Nevada. Personal communication on August 5, 1996. Contacted by Jennifer Kathol, Kathol & Company, Fort Collins, Colorado.

_____. 1997a. General Manager, Alta Gold Company, Fernley, Nevada. Personal communication on February 12, 1997. Contacted by Roger Schoumacher, TRC Mariah Associates Inc., Laramie, Wyoming.

_____. 1997b. General Manager, Alta Gold Company, Fernley, Nevada. Personal communication on June 9, 1997. Contacted by Roger Schoumacher, TRC Mariah Associates Inc., Laramie, Wyoming.

_____. 1997c. General Manager, Alta Gold Company, Fernley, Nevada. Personal communication on August 21, 1997. Contacted by Russell Moore, TRC Mariah Associates Inc., Laramie, Wyoming.

D'Angelo. 1997. In Press. Cultural Resource Report.

d'Azevdo, W.L. 1986. Washoe. Pp. 466-498 *In* W.C. Sturtevant, editors. Great Basin, vol. 11, Handbook of North American Indians. Smithsonian Institution, Washington, D.C.

Depaoli, E. 1996. Grazing Permittee, Olinghouse and White Hills Allotments, Fernley, Nevada. Personal communication on July 23, 1996. Contacted by Roger Schoumacher, TRC Mariah Associates Inc., Laramie, Wyoming.

Deroes, F. 1996. Road Design Engineer, Nevada Department of Transportation, Carson City, Nevada. Personal communication on August 6, 1996. Contacted by Roger Schoumacher, TRC Mariah Associates Inc., Laramie, Wyoming.

Desert Research Institute. 1996. Annual precipitation data, period of record, all stations in northwestern Nevada between Gerlach and Yerington (N-S) and Reno and Winnemucca (E-W). Electronic transmittal. Western Regional Climate Center, Desert Research Institute, Reno, Nevada.

Dobel, Mike. 1996. Wildlife Biologist, Nevada Division of Wildlife, Sparks, Nevada. Personal communication on July 11, 1996. Contacted by Roger Schoumacher, TRC Mariah Associates Inc., Laramie, Wyoming.

Domenico, P.A., and F.W. Schwartz. 1990. Physical and chemical hydrogeology. John Wiley & Sons, New York. 824 pp.

Edwards, C.C. 1969. Winter behavior and population dynamics of American eagles in Utah. Ph.D. dissertation, Brigham Young University, Provo, Utah. 156 pp.

Elliott, R.R. 1987. History of Nevada. Second edition, revised. University of Nebraska Press, Lincoln.

Elston, R.G. 1982. Good times, hard times: prehistoric culture change in the western Great Basin. Pp. 186-206 *In* D.B. Madsen and J.F. O'Connell, editors. Man and Environment in the Great Basin. Society for American Archaeology Papers 2. Washington, D.C.

_____. 1986. Prehistory of the western area. Pp. 135-148 *In* W.C. Sturtevant, editor. Great Basin, vol. 11, Handbook of North American Indians. Smithsonian Institution. Washington, D.C.

Environmental Protection Agency. 1971. Community noise. U.S. Environmental Protection Agency, Washington, D.C.

_____. 1990. New source review workshop manual: Prevention of significant deterioration and nonattainment area permitting. Environmental Protection Agency Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, Draft, October 1990.

Fitzgerald, J.P., C.S. Meaney, and D.M. Armstrong. 1994. Mammals of Colorado. Denver Museum of Natural History and University Press of Colorado.

Fowler, C.S., and S. Liljeblad. 1986. Northern Paiute. Pp. 435-465 *In* W.C. Sturtevant. Great Basin, vol. 11, Handbook of North American Indians. Smithsonian Institution. Washington, D.C.

Garside, L.J. 1973. Radioactive mineral occurrences in Nevada. Nevada Bureau of Mines and Geology Bulletin 81. 121 pp.

_____. 1996. Nevada Bureau of Mines and Geology, Reno, Nevada. Personal communication on July 26, 1996. Contacted by Karyn Classi, TRC Mariah Associates Inc., Laramie, Wyoming.

Garside, L.J., R.H. Hess, K.L. Fleming, and B.S. Weimer. 1988. Oil and gas developments in Nevada. Nevada Bureau of Mines and Geology Bulletin 104. 136 pp.

Gebhart, J. 1996. Regional Mining Biologist, Nevada Division of Wildlife, Fallon, Nevada. Personal communication on August 6, 1996. Contacted by Scott Benson, TRC Mariah Associates Inc., Laramie, Wyoming.

_____. 1997. Regional Mining Biologist, Nevada Division of Wildlife, Fallon, Nevada. Personal communication in June 1997. Contacted by Roger Schoumacher, TRC Mariah Associates Inc., Laramie, Wyoming.

Gianola, J. 1996. Bureau of Land Management, Carson City, Nevada. Personal communication on July 15, 1996. Contacted by Roger Schoumacher, TRC Mariah Associates Inc., Laramie, Wyoming.

Glancy, P.A., A.S. Van Denburgh, and S.M. Born. 1973. Runoff, erosion, and solutes in the lower Truckee River, Nevada, during 1969. Department of Conservation and Natural Resources, Division of Water Resources, Water Resources-Information Series, Report 18, Carson City, Nevada.

Gregory, D.I. 1982. Geomorphic study of the lower Truckee River, Washoe County, Nevada. Unpublished Masters thesis. Colorado State University, Fort Collins, Colorado.

Harold, R. 1996. Town Attorney, Town of Fernley, Nevada. Personal communication in July 1996. Contacted by Jennifer Kathol, Kathol & Company, Fort Collins Colorado.

Hester, T.R. 1973. Chronological ordering of Great Basin prehistory. University of California Archaeological Research Facility Contributions 17. Berkeley.

Hill, J.M. 1911. Notes on the economic geology of the Ramsey, Talapoosa, and White Horse Mining Districts in Lyon and Washoe Counties, Nevada. U.S. Geological Survey Bulletin 470. Pp. 99-108.

Hufnagle, J. 1989a. Pond Peak access road R/W N-52282. Cultural Resources Report 3-1334(N).

_____. 1989b. Olinghouse county road N-51086. Cultural Resources Report 3-1341(N).

_____. 1990. Pond Peak buried powerline R/W amendment N-52282. Cultural Resources Report 3-1368(N).

Hufnagle. 1996. Bureau of Land Management, Carson City, Nevada. Personal communication on July 15, 1996. Contacted by Roger Schoumacher, TRC Mariah Associates Inc., Laramie, Wyoming.

Hulse, J.W. 1991. The silver state: Nevada's heritage reinterpreted. University of Nevada Press, Reno.

James, C. 1996. Bureau of Land Management, Carson City, Nevada. Personal communication in July 1996. Contacted by Karyn Classi, TRC Mariah Associates Inc., Laramie, Wyoming.

Jameson, E.W., Jr., and H.J. Peeters. 1988. California mammals. University of California Press. 403 pp.

JBR Environmental Consultants, Inc. 1995a. Paleontological report, Alta Gold Company Olinghouse Canyon project. Prepared for Alta Gold Company, Ely, Nevada. 6 pp.

_____. 1995b. Spring and seep survey, Alta Gold Company Olinghouse Canyon project. Prepared for Alta Gold Company, Ely, Nevada. 11 pp + append.

_____. 1995c. Jurisdictional evaluation, Alta Gold Company Olinghouse exploration project. Prepared for Alta Gold Company, Sparks, Nevada. 12 pp.

_____. 1995d. Surface water baseline information, Alta Gold Company Olinghouse Canyon project. Prepared for Alta Gold Company, Ely, Nevada. 14 pp + append.

_____. 1995e. Bat surveys, Alta Gold Company Olinghouse exploration project. Prepared for Alta Gold Company, Olinghouse exploration project, Sparks, Nevada. 15 pp. + append.

_____. 1995f. An archaeological inventory and historical assessment of the Alta Gold Olinghouse project in the Pah Rah Range, Washoe County, Nevada. Prepared for Alta Gold Company. 91 pp.

_____. 1995g. An addendum to: An archaeological inventory and archaeological assessment of the Alta Gold Olinghouse project in the Pah Rah Range, Washoe County, Nevada. Prepared for Alta Gold Company. 13 pp. + append.

_____. 1996a. Addendum to the jurisdictional evaluation, Alta Gold Company Olinghouse Canyon project. Prepared for Alta Gold Company, Fernley, Nevada. 9 pp.

_____. 1996b. Changes to addendum to surface water baseline information. Prepared for Alta Gold Company, Fernley, Nevada.

_____. 1996c. Changes to surface water baseline information. Prepared for Alta Gold Company, Fernley, Nevada.

_____. 1996d. Soils and vegetation baseline report, Alta Gold Company Olinghouse Canyon project. Prepared for Alta Gold Company, Fernley, Nevada. 17 pp.

JBR Environmental Consultants, Inc. 1996e. Wildlife baseline report, Alta Gold Company Olinghouse Canyon project. Prepared for Alta Gold Company, Fernley, Nevada. 7 pp.

_____. 1996f. Addendum: Surface water baseline information, Alta Gold Company Olinghouse Canyon project. Prepared for Alta Gold Company, Fernley, Nevada. 5 pp. + append.

_____. 1997a. Alta Gold Company air quality permit application for Olinghouse project. Prepared for Alta Gold Company. February 26, 1997.

_____. 1997b. Air dispersion modeling report: Olinghouse project Alta Gold Company. Prepared for Alta Gold Company. February 1997.

_____. 1997c. Olinghouse Project Heap Leach Facilities Water Pollution Control Permit Application. Prepared for Alta Gold Company, Fernley, Nevada.

Jones, B. 1996. Alta Gold Company. Personal communication on July 25, 1996. Contacted by Karyn Classi, TRC Mariah Associates Inc., Laramie, Wyoming.

Kautz, R.R., and C. Pinto. 1990. A Class III cultural resources inventory of the proposed Truckee Meadows gas line project from Dodge Flat to Warm Springs Valley, Washoe County, Nevada. Report prepared for Western Water Development Company, Inc. by Mariah Associates, Inc., Reno, Nevada.

Kilgore, R. 1997. Washoe County Planner, Reno, Nevada. Personal communication on August 15, 1997. Contacted by Roger Schoumacher, TRC Mariah Associates Inc., Laramie, Wyoming.

Kramer, K. 1996. Public Utilities Director, Town of Fernley, Nevada. Personal communication in July 1996. Contacted by Jennifer Kathol, Kathol & Company, Fort Collins, Colorado.

Lang, M. 1996. Lyon County Sheriff's Department. Personal communication in July 1996. Contacted by Jennifer Kathol, Kathol & Company, Fort Collins, Colorado.

Lincoln, F.C. 1982. Mining districts and mineral resources of Nevada. Nevada Publications, Las Vegas.

Madsen, D.B. 1988. The prehistoric use of Great Basin marshes. Pp. 414-419 *In* C. Raven and R.G. Elston, editors. Preliminary investigations in Stillwater Marsh: Human prehistory and geoarchaeology, vols. I and II. Cultural Resources Series Number 1, U.S. Fish and Wildlife Service, Region 1. Portland, Oregon.

Maxey, G.B., and T.E. Eakin. 1949. Ground water in White River Valley, White Pine, Nye, and Lincoln Counties, Nevada. Nevada Department of Conservation and Natural Resources Water Resources Bulletin No. 8. 59 pp.

Mendoza, C. 1996. U.S. Fish and Wildlife Service, Nevada State Office, Reno, Nevada. Personal communication on July 15, 1996. Contacted by District Manager, U.S. Department of the Interior, Bureau of Land Management, Carson City, Nevada.

Miller, J.F., et al. 1973. Precipitation-frequency atlas of the western United States, vol. VII, Nevada. National Oceanic and Atmospheric Administration Atlas 2.

Morefield, J.D. 1997a. Botanist, Nevada Natural Heritage Program, Carson City, Nevada. Personal communication on May and June 1997. Contacted by Roger Schoumacher, TRC Mariah Associates Inc., Laramie, Wyoming.

_____. 1997b. Botanist, Nevada Natural Heritage Program, Carson City, Nevada. Personal communication on June 23, 1997. Contacted by Roger Schoumacher, TRC Mariah Associates Inc., Laramie, Wyoming.

_____. 1995. Updated supplement (alphabetic index) to J.D. Morefield and T.A. Knight, editors. Endangered, threatened, and sensitive vascular plants of Nevada. December 1991. 10 pp.

_____. and T.A. Knight, editors. 1992. Endangered, threatened, and sensitive vascular plants of Nevada, December 1991. U.S. Department of the Interior, Bureau of Land Management, Nevada State Office, Reno. 48 pp.

Mortenson, J. 1996. University of Nevada, Reno, Wadsworth, Nevada. Personal communication on August 26, 1996. Contacted by Anne MacDonald, PTI Environmental Services, Boulder, Colorado.

Myrick, D.F. 1962. Railroads of Nevada and Eastern California, vol. 1, The northern roads. Howell-North Books, Berkeley.

National Oceanic and Atmospheric Administration. 1992. Comparative climatic data for the United States through 1992. National Oceanic and Atmospheric Administration, National Climatic Data Center, Federal Building, Asheville, North Carolina.

Nevada Commission on Economic Development. 1996. Population estimates for Canal Township.

Nevada Department of Employment, Training, and Rehabilitation. 1996. Employment by sector. Employment Security Department, Labor Force Summary.

Nevada Department of Taxation. 1996. Ad valorem tax rates for Nevada local governments, 1993-1996.

_____. 1997. Personal communication in February 1997. Contacted by Jennifer Kathol, Kathol & Company, Fort Collins, Colorado.

Nevada Department of Taxation and Nevada State Demographer. 1996. Population of Nevada's counties and incorporated cities. Bureau of Business Research, College of Business Administration, University of Nevada, Reno.

Nevada Division of State Parks. 1992. Recreation in Nevada: 1992 statewide comprehensive outdoor recreation plan. Department of Conservation and Natural Resources, Nevada Division of State Parks, Carson City, Nevada.

Nevada Division of Wildlife. 1994. 1994 deer seasons and regulations.

_____. 1995. Upland game, furbearer, waterfowl, and mountain lion status and hunt season recommendations 1995-1996. Big game status and quota recommendations.

_____. 1996. Federal aid in wildlife restoration grant W-48-R-27, sub-grant I, survey and inventory project 1: Jobs 1, 2, 3, 4, and 5.

Paher, S.W. 1970. Nevada ghost towns and mining camps. Howell-north Books, Berkeley, California.

Papke, K.G. 1969. Industrial rock and mineral deposits. Pp. 108-130 *In* H.F. Bonham, editor. Geology and mineral deposits of Washoe and Storey Counties, Nevada. Nevada Bureau of Mines Bulletin No. 70. 140 pp.

_____. 1973. Industrial mineral deposits of Nevada. 1:1,000,000 scale map. Nevada Bureau of Mines and Geology Map 46.

Pendleton, L.S., A. McLane, and D.H. Thomas. 1982. Cultural resource overview Carson City District, west-central Nevada. Nevada Bureau of Land Management, Cultural Resource Series 5, Part 1 and 2. Reno.

Peterson, A. 1986. Habitat suitability index models: Bald eagle (breeding season). U.S. Fish and Wildlife Service Biological Report 82:(10.126). 25 pp.

Premier Properties. 1996. Reno, Nevada. Personal communication in July 1996. Contacted by Jennifer Kathol, Kathol & Company, Fort Collins, Colorado.

PTI Environmental Services. 1996. Transmittal of surface water and sediment sampling data. Letter to Gary Cummings, General Manager, Alta Gold Company, dated October 1, 1996, from Anne MacDonald, PTI Environmental Services. Prepared for U.S. Department of the Interior, Bureau of Land Management, Carson City District.

_____. 1997. Effects of pumping the Olinghouse Mine supply well on Dodge Flat and the Truckee River, Washoe County, Nevada. Prepared for Bureau of Land Management, Carson City Field Office, Carson City, Nevada.

Ramakka, J. 1997. Wildlife Biologist, Bureau of Land Management, Carson City District, Carson City, Nevada. Personal communication on April 14, 1997. Contacted by Diane Thomas, TRC Mariah Associates Inc., Laramie, Wyoming.

Reuter, J.E., C.R. Goldman, M.E. Lebo,. A.D. Jassby, R.C. Richards, S.H. Hacley, D.A. Hunter, P.A. King, M. Palmer, E. de Amezaga, B.C. Allen, G.J. Malyj, S. Fife, and A.C. Heyvaert. 1996. University contributions to lake and watershed management: case studies from the western United States — Lake Tahoe and Pyramid Lake. Proceedings, Watershed 96. Obtained online at http://www.epa.gov/docs/owowwtrl/watershed/Proceed/reuter.htm.

Ruscoe, M., and E. Seelinger. 1974. Report of the archaeological reconnaissance along proposed 230 kv transmission line right-of-way of Sierra Pacific Power Company. Nevada State Museum.

Schorn, H.E., C.J. Bell, S.W. Starratt, and D.T. Wheeler. 1994. A computer assisted annotated bibliography and preliminary survey of Nevada paleontology. U.S. Geologic Survey

Scott, S.L., editor. 1987. Field guide to the birds of North America. Second edition. National Geographic Society. 464 pp.

Shacklette, H.T., and J.G. Boerngen. 1984. Elemental concentrations in soils and other surficial materials of the conterminous United States. U.S. Geological Survey Professional Paper 1270.

Shepherd Miller, Inc. 1997. Baseline geochemistry and hydrology for the proposed Olinghouse open-pit mine, Washoe County, Nevada. Prepared for Alta Gold Company, Fernley, Nevada.

Siddarthan, R., J.G. Anderson, J.W. Bell, C.M. dePolo. 1993. Peak bedrock acceleration for the state of Nevada. Prepared for Nevada Department of Transportation. University of Nevada, Reno.

Slemmons, D.B., J.I. Gimlett, A.E. Jones, R. Greensfelder, and J. Koenig. 1964. Earthquake epicenter map of Nevada. Nevada Bureau of Mines Map 29.

Smith, R.C., J. McGuckian Jones, J.R. Roney, and K.E. Pedrick. 1983. Prehistory and history of the Winnemucca District: A cultural resources literature overview. U.S. Department of the Interior, Bureau of Land Management, Cultural Resource Series No. 6, Nevada.

Snow, C. 1972. Habitat management for endangered species. Report No. 1 - American peregrine falcon (*Falco peregrinus anatum*) and arctic peregrine falcon (*F. p. tundrius*). U.S. Department of the Interior, Bureau of Land Management, Technical Note No. 167. 35 pp.

_____. 1973. Habitat management series for endangered species. Report No. 5 - Southern bald eagle (*Haliaeetus leucocephalus leucocephalus*) and northern bald eagle (*H. l. alascanus*). U.S. Department of the Interior, Bureau of Land Management, Technical Note No. 171. 58 pp.

Soil Conservation Service. 1975. Soil survey, Fallon-Fernley area, Nevada. U.S. Department of Agriculture, Soil Conservation Service.

_____. 1983. Soil survey of Washoe County, Nevada, south part. U.S. Department of Agriculture, Soil Conservation Service.

Soil Conservation Service. 1992. Nevada site description, Major Land Resource Area 26, Carson Basin and Mountains. U.S. Department of Agriculture, Soil Conservation Service.

Starnes, D. 1996. Traffic Engineer, Nevada Department of Transportation, Reno, Nevada. Personal communication on August 5, 1996. Contacted by Roger Schoumacher, TRC Mariah Associates Inc., Laramie, Wyoming.

_____. 1997. Traffic Engineer, Nevada Department of Transportation, Reno, Nevada. Personal communication on February 20, 1997. Contacted by Roger Schoumacher, TRC Mariah Associates Inc., Laramie, Wyoming.

Stebbins, R.C. 1966. A field guide to western reptiles and amphibians. Houghton Mifflin Company, Boston. 270 pp.

Steenhof, K. 1978. Management of wintering bald eagles. U.S. Fish and Wildlife Service. FWS/OBS-78/79. 59 pp.

Steward, J.H. 1938. Basin-plateau aboriginal sociopolitical groups. Bureau of American Ethnology Bulletin 120, Washington, D.C. Reprinted: University of Utah Press, Salt Lake City, 1970.

Stewart, O.C. 1939. The Northern Paiute bands. University of California Anthropological Reports 2:3, Berkeley.

Suter, G.W., and C.L. Tsao. 1996. Toxicological benchmarks for screening potential contaminants of concern for effects on aquatic biota: 1996 revision. ES/ER/TM-96/RZ. Prepared for the U.S. Department of Energy. Oak Ridge National Laboratory, Oak Ridge Tennesee.

Sulahria, B. 1996. Bureau of Land Management, Carson City, Nevada. Personal communication on August 22, 1996. Contacted by Anne MacDonald, PTI Environmental Services, Boulder, Colorado.

Terres, J.K. 1991. The Audubon Society encyclopedia of North American birds. New York.

Toby, R. 1997. Pyramid Lake Paiute Tribe, Wadsworth, Nevada. Personal communication in March 1997. Contacted by Jennifer Kathol, Kathol & Company, Fort Collins, Colorado.

University of Nevada, Reno. 1996. Census tract and Washoe County statistics. Nevada University of Nevada, Reno, Bureau of Business and Economic Research, College of Administration, Small Business Development Center.

_____. 1997. Estimates of 1996 median household income and per capita income. University of Nevada, Reno, Bureau of Business and Economic Research, College of Administration, Nevada Small Business Development Center.

U.S. Bureau of Census, Department of Commerce. 1990. 1990 census of population and housing, Summary Tape File 3A.

U.S. Department of Labor, Bureau of Labor Statistics. 1993. Consumer Expenditures in 1992. Report 861. December 1993.

U.S. Fish and Wildlife Service. 1984. National Wetlands Inventory, Reno, Nevada - California. 1:250,000 scale wetland map.

_____. 1992. Cui-ui (*Chasmistes cujus*) second revision recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon.

U.S. Geological Survey. 1996. Water resources data for Nevada. Electronic retrieval for Truckee River at Wadsworth and Truckee River near Nixon stations. U.S. Geological Survey, Reston, Virginia.

VanDenburgh, A.S., and F.E. Arteaga. 1985. Revised water budget for the Fernley area, west-central Nevada, 1979. U.S. Geological Survey. Carson City, Nevada.

Vanderburg, W.O. 1936. Placer mining in Nevada. Nevada Bureau of Mines and Geology Bulletin 27, Reno.

Warren, M. 1997. Fisheries Biologist, Nevada Division of Wildlife, Reno. Personal communication on March 24, 1997. Contacted by Diane Thomas, TRC Mariah Associates Inc., Laramie, Wyoming.

Washoe County District Health Department. 1996. Transmittal of PM_{10} data collected at air monitoring network, Mustang Site, near Sparks, Nevada. Letter to Andy Goodrich, Air Quality Management Division, Reno, Nevada. August 19, 1996.

Weide, D.L. 1976. The Altithermal as an archaeological non-problem in the Great Basin. Pp. 174-184 *In* R. Elston, editor. Holocene environmental change in the Great Basin. Nevada Archaeological Survey Research Paper 6. Reno, Nevada.

Williams, P. 1997a. Bureau of Indian Affairs, Carson City, Nevada. Personal communication in February 1997. Contacted by Jennifer Kathol, Kathol & Associates, Fort Collins, Colorado.

_____. 1997b. Bureau of Indian Affairs, Carson City, Nevada. Personal communication in April 1997. Contacted by Jennifer Kathol, Kathol & Associates, Fort Collins, Colorado.

_____. 1997c. Bureau of Indian Affairs, Carson City, Nevada. Personal communication on February 3, 1997. Contacted by Anne MacDonald, PTI Environmental Corporation, Boulder, Colorado, via Carla James, Bureau of Land Management, Carson City, Nevada.

8.0 GLOSSARY

Acid rock drainage (ARD). Acidic, metal-rich water discharge that occurs when rocks containing metal sulfide minerals are exposed to air and water.

Acre-feet (acre-ft). The volume of liquid or solid required to cover 1 acre to a depth of 1 foot, which is equivalent to 43,560 cubic feet.

Adit. A nearly horizontal passage, driven from the surface, by which a mine may be entered, ventilated, and/or dewatered.

Alkaline. Having excess hydroxide ions in solution.

Alluvial. Pertaining to material or processes associated with transportation or deposition of soil and rock by flowing water.

Alluvium. Soil and rock deposited by flowing water consisting of unconsolidated deposits of sediment, such as silt, sand, and gravel.

Ambient. Surrounding, existing.

Aquifer. An underground body of rock, sand, or gravel that is saturated with and conducts groundwater; a water-bearing formation that yields water to wells or springs.

Aquifer drawdown. The lowering of the water level in a well as a result of withdrawal; the reduction in head at a point caused by the withdrawal of water from an aquifer.

Basic elements (visual). The four major elements (form, line, color, and texture) that determine how the character of a landscape is perceived.

Barren solution. In a metallurgical process, the solution left after the value has been removed.

Candidate species. Those species for which the U.S. Fish and Wildlife Service has sufficient data to list as threatened or endangered under the *Endangered Species Act*, but for which proposed rules have not yet been issued. These species were formerly classified as Category 1 candidate species.

Checkerboard landownership. A pattern of landownership in which alternative sections are in private and public ownership. This is often the result of land grants by the U.S. to railroads during the 1800s, at which time the railroads were given every odd-numbered section within 20 mi of each side of the railroad mainline as an inducement to build the railroad.

Chlorite. A group of widely distributed minerals that are essentially hydrous silicates of aluminum, ferrous iron, and magnesium.

Confined aquifer. An aquifer confined above and below by geologic materials of low permeability.

Contrast (visual). The effect of a striking difference in form, line, color, and texture of the landscape features within the area being viewed.

Cretaceous. The latest system of rocks, or period of the Mesozoic era, between 136 million and 65 million years ago.

Cumulative impacts. The combined environmental impacts that accrue over time and space from a series of similar or related individual actions, contaminants, or projects. Although each action may seem to have a negligible impact, the combined effect can be significant. Included are activities of the past, present, and reasonably foreseeable future; synonymous with cumulative impacts.

dBA (A-weighted decibel). The sound pressure levels in decibels measured with a frequency weighing network corresponding to the A scale on a standard sound level meter. The A scale tends to suppress lower frequencies (i.e., below 1,000 hertz).

Decibel (dB). A unit for expressing the relative intensity of sounds on a scale from 0 (for the average least perceptible sound) to about 130 (for the average pain level).

Dike. A tabular body of igneous rock that has been injected, while molten, into a fissure.

Direct impacts. Impacts that are caused by the action and occur at the same time and place (40 CFR 1508.7); synonymous with direct effects.

Disturbed area. An area where natural vegetation and soils have been removed.

Doré bars. Product of retort furnace containing gold, silver, and impurities.

Electrowinning/electrometallurgy. The process of electrolytically depositing metals, or separating them from their ores or alloys.

Endangered species. A species in danger of extinction throughout all or a significant portion of its range.

Ephemeral stream. A stream or portion of a stream that flows briefly in direct response to precipitation in the immediate vicinity, and whose channel is at all times above the water table.

Epicenter. The point on the earth's surface that is directly above the focus of the earthquake.

Epidote. A yellowish green mineral consisting of silicates of calcium, aluminum, and iron.

Ethnographic. Relating to ethnography, a branch of anthropology dealing historically with the origins and relationships of races and cultures.

Evapotranspiration. Water returned to the atmosphere through evaporation and transpiration.

Fault. A major fracture in the earth's crust with relative movement of the rock masses on both sides.

Forage. Vegetation used for food by animals, particularly big game and domestic livestock.

Forb. Any herbaceous plant other than a grass, especially one growing in a field or meadow.

Great Basin. The physiographic province containing parts of Nevada, Utah, California, and Oregon that drains internally rather than to an ocean.

Fugitive dust. Dust particles suspended randomly in the air from road travel, excavation, and rock loading operations.

Guzzler. An artificial device that holds water for use by wildlife, generally in arid environments.

Heap leach. The process of recovering gold from low grade ores by leaching ore that has been mined and placed on a specially prepared pad. A chemical solution is applied through low volume emitters, and the metal-bearing leachate solution percolates and is collected.

Hydraulic conductivity. The measure of the rate of water movement through an aquifer, expressed as gallons per day per square foot (gpd/ft^2).

Incised channel. A stream channel in a deep, steep-sided valley generally created by water erosion.

Indirect impact. Impacts that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable (40 CFR 1508.8); synonymous with indirect effects.

Infrastructure. The basic framework or underlying foundation of a community or project, including road networks, electric and gas distribution, water and sanitation services, and facilities.

Interburden. Non-ore grade material interlayed with ore; or located within or horizontally adjacent to the ore, such that it must be removed in the process of extracting ore grade material.

Intermittent stream. A stream that flows part of the time with some annual regularity, as during periods of snowmelt or seasonally high flows from springs or seeps.

Intrusive rock. Rock that was, while in a liquid state, forced into cracks or between layers of rock.

Irretrievable. Applies primarily to the lost production of renewable natural resources during the life of the project.

Irreversible. Applies primarily to the use of nonrenewable resources, such as minerals, cultural resources, wetlands, or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options.

Isolated artifact/isolated find. In Nevada, a single artifact, feature, or object not associated with other cultural resources.

Jurisdictional waters. See "Waters of the U.S."

Key observation point (KOP). An observer position on a travel route used to determine and evaluate visual resource values.

Late Archaic. The period from approximately 700 to 1,300 years ago during which there was increasing settlement of the area by Native Americans, prior to contact with Euro-Americans in the early nineteenth century.

Lek. An area, generally flat and open, used for courtship by sage grouse.

Lineaments. Topographic features, especially ones that lie in a straight line.

Liquifaction. The loss of strength of soil materials when saturated, cohesiveless materials are subjected to earthquake vibratory ground motion, and the resulting tendency to compact due to increased porewater pressure.

Lithic scatter. A discrete grouping of flakes of stone created as a byproduct in the tool making process. Often includes flakes used as tools as well as formal stone tools, such as projectile points, knives, or scrapers.

Mineralization. The process of compounds being converted into a mineral; herein refers to geologic materials containing metals as sulfide or oxide minerals or in their native state.

Mitigation. Actions to avoid, minimize, reduce, eliminate, replace, or rectify the impact of an action on the environment.

Modified Mercalli Intensity Scale. A commonly used measurement of earthquake intensity expressing damage levels with Roman numerals I to XII.

Native species. Plants or animals that originated in the area in which they are found, i.e., they naturally occur in that area.

NDEP Profile II analytes. Alkalinity, aluminum, antimony, arsenic, barium, beryllium, bismuth, cadmium, calcium, chloride, chromium, cobalt, copper, cyanide (weak acid dissociable), fluoride, gallium, iron, lead, lithium, manganese, magnesium, mercury, molybdenum, nickel, nitrate (as N), nitrite (as N), nitrate + nitrite (as N), pH, phosphorus, potassium, scandium, selenium, silver, sodium strontium, sulfate, thallium, tin, titanium, total dissolved solids, vanadium, and zinc.

Overburden. Material that must be removed to allow access to an orebody, particularly in a surface mining operation.

Paleontological resources. Fossils--the remains of plant and animal life from previous geological periods.

Peak flow. The greatest flow attained during melting of winter snowpack or during a major precipitation event.

Perched aquifer. An aquifer that is separated from the underlying main body of groundwater by an impermeable layer.

Perennial stream. A stream that contains water at all times except during extreme drought.

Permeability. The property or capacity of a porous rock, sediment, or soil to transmit a liquid.

pH. The negative $\log_{10}$ of the hydrogen ion concentration in solution; a measure of acidity or basicity of a solution.

Physiographic province. A region having a pattern of relief features or landforms that differs significantly from that of adjacent regions.

Piezometer. An instrument for measuring fluid pressure.

Placer dredging. A mining method that recovers heavy minerals from depositionally concentrated portions of the sediments in alluvial or glacial deposits.

PM_{10}. Particulate matter less than 10 microns in aerodynamic diameter.

Pregnant solution. Solution derived from the leaching process that contains dissolved minerals.

Quaternary. The second period of the Cenozoic era, following the Tertiary, and including the last 2-3 million years.

Raptors. Birds of prey (e.g., eagles, hawks, falcons, and owls).

Recharge. The process by which aquifers gain water, usually from infiltration and percolation of rainfall and snowmelt.

Richter scale. A commonly used logarithmic scale of earthquake magnitude, with each whole number representing a level of energy release that is 31.5 times the next lower whole number.

Riparian. Situated on or pertaining to the bank of a river, stream, or other body of water. Riparian is normally used to refer to plants of all types that grow along streams, rivers, or at spring and seeps.

Scoping. Procedures by which agencies determine the extent of analysis necessary for a proposed action (i.e., the range of actions, alternatives, and impacts to be addressed; identification of significant issues related to a proposed action; and the depth of environmental analysis, data, and task assignments needed).

Sediment load. The amount of sediment (sand, silt, and fine particles) carried by a stream or river.

Sedimentary rock. Rock formed by consolidated sediment deposited in layers.

Seismicity. The relative frequency and distribution of earthquakes.

Sensitive species. Those species formerly listed as candidate species under the Endangered Species Act, but not as Category 1 candidate species.

Shear zone. A zone of closely spaced approximately parallel faults that often become a channel for underground solutions and the seat of ore deposition.

Significant. A term used in NEPA determination of significance; requires consideration of both context and intensity. Context means that the significance of an action must be analyzed in several contexts, such as society as a whole and the affected region, interests, and locality. Intensity refers to the severity of impacts (40 CFR 1508.27).

Subsidence. The slow sinking of the ground surface, often associated with collapse of underground excavations or groundwater withdrawal.

Tertiary. The older major subdivision (period) of the Cenozoic era, extending from the end of the Cretaceous to the beginning of the Quaternary, from 70 million to 2 million years ago.

Threatened species. Any species of plant or animal that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Total dissolved solids (TDS). Total amount of dissolved material, organic or inorganic, contained in a sample of water.

Total suspended solids (TSS). Amount of undissolved particulates suspended in liquid.

Tuff. Thermal spring deposits of calcium carbonate, or consolidated volcanic ash.

Unconfined aquifer. An aquifer where the water table forms the upper boundary.

Water balance. The comparison of sources of water with losses of water from a given area.

Waters of the U.S. Navigable waters and their tributaries, interstate waters and their tributaries, non-navigable intrastate waters whose use or misuse could affect interstate commerce, and all freshwater wetlands adjacent to other waters protected by Section 404(g) of the *Clean Water Act*.

Wetlands. Areas inundated by surface water or groundwater frequently enough to support vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

9.0 INDEX

BUREAU OF LAND MANAGEMENT LIBRARY
BLDG. 50, ST-136
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, COLORADO 80225