U.S. Department of the Interior

Bureau of Land Management

Elko District Office
Elko, Nevada

February 1996

DRAFT

Environmental Impact Statement
Bootstrap Project

MISSION STATEMENT

The Bureau of Land Management is responsible for the stewardship of 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/EK/PL-96/007+1793

DRAFT

ENVIRONMENTAL IMPACT STATEMENT
NEWMONT GOLD
BOOTSTRAP PROJECT

LEAD AGENCY:

U.S. Department of the Interior
Bureau of Land Management
Elko District Office

PROJECT LOCATION: Elko and Eureka Counties, Nevada

COMMENTS ON THIS DRAFT (EIS) SHOULD BE DIRECTED TO:

Deb McFarlane, EIS Project Manager
Bureau of Land Management
Elko District Office
P.O. Box 831
Elko, Nevada 89801
(702) 735-0200

DATE DRAFT EIS FILED WITH EPA: March 8 , 1996

DATE BY WHICH COMMENTS MUST BE POSTMARKED TO THE BLM: April 29, 1996

ABSTRACT

The Draft Environmental Impact Statement analyzes impacts associated with a proposal by Newmont Gold Company to initiate gold mining operations on a site in northeastern Nevada. The Proposed Action includes: (1) re-opening the Bootstrap/Capstone Mine, (2) development of the Tara Mine, (3) construction of two new waste rock disposal areas, (4) construction of a new heap leach facility, (5) construction of ancillary mine facilities, (6) upgrading existing access roads to accommodate truck transportation of ore to the North Operations Area Mill #4 complex, and (7) reclamation of disturbed areas. Alternatives to the Proposed Action are analyzed in the document. The Agency Preferred Alternative is implementation of Alternative B (leach ore would be transported to North Area Leach Facility for processing) and Alternative C-2 (off-site power would be used for the Bootstrap Project).

Responsible Official for EIS:

Ann J. Morgan
State Director, Nevada

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Nevada State Office
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P.O. Box 12000
Reno, Nevada 89520-0006

In Reply Refer To:
1793.6/3809
N16-94-002P
(NV-013/NV-932.8)

FEB 20 1996

Dear Reader:

Enclosed for your review and comment is the Draft Environmental Impact Statement (EIS) for Newmont Gold Company's Bootstrap Project. This Draft EIS analyzes the potential environmental impacts associated with Newmont Gold Company's (Newmont) Plan of Operations, submitted to the Elko District Office under 43 Code of Federal Regulations 3809. Newmont proposes to reopen the existing Bootstrap/Capstone open-pit mine and initiate mining at the Tara open-pit mine, construct two new waste rock facilities, construct a new heap leach facility, and ancillary mine facilities. The Bootstrap Project is located approximately 30 air miles northwest of Carlin, Nevada.

The Draft EIS analyzes the Proposed Action and four alternatives, including the No Action Alternative. The alternatives analyzed include: (A) complete and partial backfilling, (B) utilizing an existing leach facility and not constructing the proposed Bootstrap leach facility, and (C) construct a substation and power line to utilize off-site power.

Public comments concerning the adequacy and accuracy of this document will be accepted during a 60-day comment period ending April 29, 1996. Comments on the Draft EIS must be submitted in writing to: Bureau of Land Management, Elko District Office, Attn: Deb McFarlane, Bootstrap EIS Coordinator, P.O. Box 831, Elko, NV 89803.

In addition, a public meeting to accept verbal and/or written comments on the Draft EIS is scheduled to be held Tuesday, March 26, 1996, at 7:00 P.M. at the following location:

Elko District Office, 3900 E. Idaho Street, Elko, Nevada.

The Final EIS may be in an abbreviated format, therefore, it is suggested this draft document be retained for reference purposes. Your interest in the management of public lands is appreciated. If you have any questions or need further information, please contact Deb McFarlane, Bootstrap EIS coordinator, at (702) 753-0200.

Sincerely yours,

Ann J. Morgan
State Director, Nevada

Enclosure
1. Draft Environmental Impact Statement

DRAFT ENVIRONMENTAL IMPACT STATEMENT
NEWMONT GOLD COMPANY
BOOTSTRAP PROJECT

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)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF TABLES

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF APPENDICES

SUMMARY

Newmont Gold Company (Newmont) proposes to re-open the Bootstrap Mine, develop the Tara Mine, and initiate ore processing facilities associated with these mines. Collectively the mines and associated facilities are known as the Bootstrap Project. Mining and ore processing activities associated with the proposed Bootstrap Project are described in a Plan of Operations (POO) submitted to BLM in July 1994 with revisions submitted in August and September 1995.

Newmont's Bootstrap Project area is located on public and private land in Elko and Eureka Counties, Nevada, approximately 30 miles northwest of Carlin, Nevada. BLM reviewed the POO and determined that the proposed mining operation (Proposed Action) has the potential to result in significant environmental impacts and that preparation of an Environmental Impact Statement (EIS) would be required.

This EIS describes Newmont's Proposed Action, reasonable alternatives to, and environmental consequences of implementing the Bootstrap Project. Potential direct, indirect, and cumulative effects of the project on the environment have been analyzed for the Proposed Action. Alternatives were developed and analyzed for potential direct and indirect effects. This evaluation has been completed to the extent necessary to determine whether potential impacts are significant. Impacts described in this EIS will form the basis for BLM's decision regarding the Proposed Action and alternatives and selection of appropriate mitigation measures. No distinction is made in the EIS regarding potential impacts on public versus private land that would result from the possible federal authorization.

SUMMARY OF PROPOSED ACTION

Implementation of Newmont's Proposed Action would result in the construction of two pits (Bootstrap/Capstone and Tara), construction of two waste rock disposal facilities (Bootstrap/Capstone Waste Rock Disposal Facility and Tara Waste Rock Disposal Facility), construction and operation of the Bootstrap Heap Leach Facility, and construction of ancillary mine facilities including an office, maintenance complex, security office, crusher facility, process ponds, and carbon stripping facility. Run-on and run-off control water ditches would also be constructed to control overland water flow from precipitation events. In addition, refractory ore stockpiles would be placed at a designated location on the Bootstrap/Capstone Waste Rock Disposal Facility. Newmont would also widen an existing access road to accommodate haulage of ore from the Bootstrap Project site to be processed at existing facilities. Newmont would continue geologic evaluations and exploration activities in the project area.

Total land disturbance associated with the Proposed Action would be 1,271 acres of which 234 acres have been disturbed by past mining activities at the Bootstrap Project site. Of the 1,271 acres of disturbance, 886 acres would be public land and 385 acres would be private land.

Mining at the Bootstrap Project is expected to encompass a 7-year period. Ore processing would extend for 10 years.

Mining operations at the Bootstrap Project would result in the construction of two pits; the Bootstrap/Capstone pit and the Tara pit. The Bootstrap/Capstone pit would generate a total of 61.7 million tons of ore and waste rock material. The pit would disturb approximately 121 acres. The Tara pit would generate approximately 94.5 million tons of ore and waste rock material and would disturb about 143 acres.

Mining at the Bootstrap Project would result in the recovery of oxide leach ore, oxide mill ore, and refractory ore. Oxide leach ore (approximately 32.6 million tons) recovered from the mining operation would be processed at the Bootstrap Heap Leach Facility using standard cyanide solutions to recover gold from ore. The leach pad and process pond system would occupy an area totaling approximately 165 acres. Oxide mill ore (approximately 6 million tons) would be shipped to Newmont's Mill #4 for processing. Refractory ore (approximately 1.6 million tons) would be shipped for processing at either Newmont's Mill #6 located in the South Operations Area or would be stockpiled for processing at a bioleach facility that is in the preliminary planning stages for the North Operations Area.

Waste rock generated during mining operations at the Bootstrap Project would be disposed of in two waste rock disposal facilities; the Bootstrap/Capstone Waste Rock Disposal Facility or the Tara Waste Rock Disposal Facility. The Bootstrap/Capstone Waste Rock Disposal Facility would be located immediately east and adjacent to the Bootstrap/ Capstone pit and would have a capacity of approximately 28.6 million tons. The Tara Waste Rock Disposal Facility would be located immediately east of the Tara pit and would have a design capacity of approximately 87.4 million tons.

Electrical power for the Bootstrap Project would be generated using on-site diesel-generator sets. In addition, ancillary mine facilities which would be constructed at the project site include a maintenance complex, office, security office, a carbon stripping facility, and stormwater ditches. Water would be supplied via a buried pipeline from the Betze/Post Mine dewatering system located approximately 4 miles south of the Bootstrap Project.

Mining operations at the Bootstrap Project would not require the use of a dewatering system to control groundwater inflow to the mine pit. The Betze/Post Mine dewatering system located south of the Bootstrap Project has effectively lowered groundwater levels in the Bootstrap Project area such that no additional dewatering is necessary.

Proposed reclamation at the Bootstrap Project would include neutralization of process solutions, regrading of disturbance areas and heap leach and waste rock disposal facility slopes. Topsoil salvaged during construction of mine facilities would be respread on regraded areas. Where topsoil volumes are not adequate, Newmont would add soil amendments such as fertilizers and mulch to surface materials to supplement topsoil for vegetation. The open-pits would be allowed to fill with groundwater as the dewatering program at the Betze/Post Mine ceases pumping. Safety berms would be constructed around the rim of the open-pits.

PROJECT ALTERNATIVES

Issues raised during public scoping and BLM review of the Proposed Action were used to identify potential significant impacts which could result from development of the Bootstrap Project. In general, potential significant effects identified during the review and public scoping include post-operations pit water quality and effects on mule deer migration (cumulative effects).

Four alternatives are evaluated in the EIS: Alternative A - backfill of the Bootstrap/Capstone pit; Alternative B - ore processing at Newmont's North Area Leach Facility; Alternative C - off-site power supply; and the No Action Alternative.

Alternative A -- Backfill of Bootstrap/Capstone Pit: Alternative A would include all components of the Proposed Action with the addition of backfilling the Bootstrap/Capstone pit with waste rock generated from the Tara pit. Alternative A includes analysis of complete backfill (Alternative A-1) and partial backfill (Alternative A-2: backfill to a level above the regional water table) of the Bootstrap/Capstone pit. Complete backfill of the Bootstrap/Capstone pit would restore approximately 100 acres of land to beneficial uses after closure of mining operations. Partial backfill would reduce loss of groundwater to evaporation.

Alternative B -- Ore Processing at North Area Leach Facility: Alternative B would include all components of the Proposed Action except that in lieu of constructing and operating a heap leach facility at the Bootstrap Project site, leach grade ore would be hauled to Newmont's existing facilities at the North Area Leach Facility located approximately 4 miles southeast of the Bootstrap Project site. Implementation of Alternative B would result in 165 acres less disturbance associated with the Bootstrap Project as compared to the Proposed Action.

Alternative C -- Off-Site Power Supply: Alternative C would also include all components of the Proposed Action but would eliminate use of diesel-generator sets for supplying electrical power to the project. Implementation of Alternative C would result in the construction of a substation west of the project site and installation of a single-pole power line to supply power to the project. Alternative C includes analysis of off-site power associated with the Proposed Action (Alternative C-1) and off-site power associated with Alternative B (Alternative C-2). Alternatives C-1 or C-2 would result in approximately 1 additional acre of disturbance to the Bootstrap Project.

No Action Alternative: Under the No Action Alternative, the proposed Bootstrap Project would not be authorized and no disturbance beyond that currently authorized would occur to public land.

Agency Preferred Alternative: The agency preferred alternative is Alternative B and Alternative C-2. Potential mitigation measures identified in Chapter 4 may be required by BLM in the Record of Decision for whichever alternative is finally selected; subsequent to public review.

SUMMARY OF IMPACTS

Analysis of potential impacts and mitigation associated with the proposed Bootstrap Project is presented in Chapter 4, Consequences of the Proposed Action and Alternatives. Resources that are analyzed in this EIS and are determined to have minimal impacts as a result of the Proposed Action and alternatives include: Paleontology; Recreation and Wilderness; Noise; Aquatic Habitat and Fisheries; and Threatened, Endangered, and Candidate Species. The following is a summary of potential impacts, by resource, resulting from implementation of the Proposed Action and alternatives.

Geology and Minerals

Implementation of the Proposed Action would result in the relocation of waste rock and ore from the Bootstrap/Capstone and Tara pits to waste rock disposal facilities, heap leach pad, and tailings impoundment. Placement of the waste rock and ore at these facilities would modify the topography and landscape of the Bootstrap Project area. Approximately 1.13 million ounces of gold would be removed from this geologic resource.

When exposed to oxygen and water, sulfide-bearing waste rock and ore, has the potential to result in production of acid rock drainage. Newmont has proposed methods to encapsulate and monitor this rock material to minimize potential impacts to the environment.

Air Resources

On-site power generation using diesel-powered generator sets is proposed by Newmont to supply 3.5 megawatts of electrical power to the Bootstrap Project. Use of diesel-powered generator sets would generate particulate and gaseous emissions which would require installation of emission control systems in order to meet State of Nevada ambient air quality standards.

Water Quantity and Quality

The Proposed Action would not require dewatering or discharge of excess water because the nearby Betze/Post Mine dewatering system would maintain the groundwater level below the Bootstrap/Capstone and Tara pit bottoms. Impacts on water resources from the Bootstrap Project would consist primarily of minor increases in sedimentation in drainages from disturbed areas and the development of three separate pit lakes. Quality of pit lake water is predicted to be similar to natural groundwater because of continued groundwater flow through the pits and the low potential for net acid-production from the pit wall rock. Antimony is predicted to exceed primary drinking water standards in the pit lakes. Maximum net evaporation from the three pit lake surfaces would be approximately 52 gallons per minute (gpm). The Bootstrap/Capstone pit would extend across a portion of Boulder Creek at the northern end of the project site where a diversion for the creek exists. Relatively low rates (<30 gpm) of groundwater flow in alluvium along Boulder Creek in this area would be intercepted by the mine.

Soil and Watershed

Potential impacts to soil and watershed resources resulting from implementation of the Proposed Action would include loss of soil during salvage and replacement operations, sediment loss due to erosion, and reduction in productivity of soil material during the life of the operation.

Vegetation

The Proposed Action would eliminate approximately 1,037 acres of vegetative cover in the Bootstrap Project area. Reclamation of the Bootstrap Project site would restore vegetation on all but approximately 264 acres of the mine area. The mine pits (264 acres) would not be revegetated.

Terrestrial Wildlife

Impacts to terrestrial wildlife as a result of the Proposed Action would include direct loss of habitat and loss or displacement of wildlife from affected habitat. Direct losses would include elimination of forage, hiding cover, breeding sites, and nesting cover.

Aquatic Habitat and Fisheries

Negligible impacts to aquatic habitat and fisheries is anticipated from implementation of the Proposed Action. Slight increases in sediment in Boulder, Rodeo, and Bell creeks from construction activities would occur.

Threatened, Endangered, and Candidate Species

No threatened, endangered, or candidate species or their habitat would likely be affected by the Proposed Action. None of these species are known to use habitat on or near the Bootstrap Project site.

Grazing Management

Livestock grazing has been suspended in the Bootstrap Project site since 1990 due to mining activity in the area. The Proposed Action would result in a reduction in livestock forage production on lands disturbed by mining. Following reclamation, livestock forage production would increase and eventually would reach pre-mining levels. Approximately 52 animal-unit-months (AUMs) would be eliminated because 264 acres of mine pits would remain after closure.

Recreation and Wilderness

Fewer acres would be available for recreational use during mining operations and after cessation of mining as a result of the Proposed Action. Employees associated with construction of new facilities at the Bootstrap Project could impact existing campgrounds and result in increased use of recreational facilities in the area.

Access and Land Use

Access, and therefore recreational opportunities have been restricted in the Bootstrap Project area since 1974 when active mining and exploration began. No changes in access or land use from current uses is expected as a result of the Proposed Action. No impacts to water use is expected as a result of the Proposed Action.

Noise

Noise in the Bootstrap Project area would increase if the Proposed Action is implemented; however, noise generated by the project would not impact any residential areas. Effects of noise on wildlife is expected to be minimal.

Visual Resources

The primary impact on visual resources from the Proposed Action would be large-scale modification of landforms. Moderate contrasts with adjacent areas would be formed from the angular, blocky forms of the waste rock disposal facilities, heap leach pad, and mine pit benches. All proposed disturbances associated with the Bootstrap Project would occur within an area designated as Visual Resource Management (VRM) Class IV by BLM. This classification allows the greatest degree of landscape modification.

Cultural Resources

Fifty-six cultural sites have been recorded within the area of potential effect in the Bootstrap Project site. Sixteen of these sites are eligible for inclusion on the National Register of Historic Places (NRHP). Ten of the NRHP sites would be disturbed by implementation of the Proposed Action.

Native American Religious Concerns

Although there are no known traditional cultural properties within the Bootstrap Project site, the Proposed Action would impact Western Shoshone traditional values. These impacts would include disturbance of the land affecting Little Men and animal spirits, and collection of artifacts that may be powerful or items of significance.

Social and Economic Values

The primary impact of the Proposed Action on social and economic values would be associated with the work force (approximately 110 people) needed to construct new facilities at the Bootstrap Project site. No additional permanent employees would be hired for the 7-year operational life of the project.

Positive effects of the project would include continuation of direct employment in the mining industry and secondary employment in the retail and service sectors in the study area. Income would be generated from wages paid by Newmont and property taxes and net proceeds of mining tax would be collected by local and state jurisdictions.

Negative impacts would include further stress on community service providers and housing in the area during the construction phase.

ALTERNATIVES

Where specific impacts, by resource, are not presented under each alternative, impacts to those resources are predicted to be the same as the Proposed Action.

ALTERNATIVE A
(Includes Alternatives A-1 and A-2)

Water Quantity and Quality

Complete or partial backfill would eliminate the formation of two pit lakes at closure of mining. Groundwater recovery in this area would saturate the backfill in the two pit-lakes and this would cause a change in the quality of groundwater in the backfilled pits. Groundwater quality is predicted to be adversely affected by metals and blasting compounds; at least during initial groundwater recovery. Backfilling of two pits would also eliminate evaporative loss of groundwater in comparison to the Proposed Action.

Soil and Watershed

Complete backfill of the Bootstrap/Capstone pits (Alternative A-1) would restore an additional 100 acres of land surface which would then be reclaimed. Reclamation of the additional 100 acres would reduce the amount of soil which would be available for reclamation of other areas.

Partial backfill of the Bootstrap/Capstone pit (Alternative A-2) would restore approximately 10 acres of land surface which would be reclaimed. Reclamation of an additional 10 acres of land would not measurably affect available soil volumes for reclamation activities.

Vegetation

Implementation of Alternative A-1 would result in revegetation of an additional 100 acres of land surface as compared to the Proposed Action. Alternative A-2 would restore an additional 10 acres of land surface for revegetation.

Terrestrial Wildlife

Complete backfilling of the Bootstrap/Capstone pits (Alternative A-1) and successful revegetation of the land surface would restore approximately 100 additional acres of land to productive use including wildlife habitat. Loss of two pit lakes as a result of backfilling would eliminate aquatic life that would potentially colonize the pit lakes and would remove a potential source of drinking water for wildlife.

Partial backfill of the pits (Alternative A-2) would restore approximately 10 acres of land to wildlife use. Similar loss of use of the pit lakes by wildlife and aquatic organisms would result as Alternative A-1.

Aquatic Habitat and Fisheries

Complete or partial backfilling of the Bootstrap/Capstone pit would eliminate the potential for these lakes to support aquatic life and fish.

Grazing Management

Complete backfilling (Alternative A-1) of the Bootstrap/Capstone pit would restore an additional 100 acres of land to productive use. Successful reclamation of these areas would result in restoration of land which could become available for livestock grazing.

Partial backfill of the Bootstrap/Capstone pit (Alternative A-2) would restore approximately 10 acres of land surface to productive use. The additional 10 acres could become available for livestock use.

Recreation and Wilderness

Implementation of Alternative A-1 would restore 100 acres of land to recreational use.

Access and Land Use

Alternative A-1 would result in the restoration of 100 acres of additional land surface as compared to the Proposed Action. Land use for this 100 acres would change from a pit lake to wildlife use and livestock grazing.

Noise

Complete backfilling of the Bootstrap/Capstone pit would extend noise impacts several years beyond the proposed Bootstrap Project mine life.

Visual Resources

Reductions in visual impacts as viewed from KOPs 1 and 3 would result if complete backfilling of the Bootstrap/Capstone pit is implemented. The Tara Waste Rock Disposal Facility would be less visually dominant; however, visual impacts would remain moderately strong.

ALTERNATIVE B

Air Quality

Increased haul truck traffic associated with Alternative B would result in increased fugitive dust emissions compared with the Proposed Action. On-site power generation requirements would be reduced to less than 0.5 megawatts resulting in reduced particulate and gaseous emissions from generator sets as compared to the Proposed Action.

Water Quantity and Quality

The amount of water piped from the Betze/Post Mine dewatering system and consumed at the Bootstrap Project would be reduced under Alternative B. Cyanide would not be used at the project site which would eliminate potential for leakage or spill problems. Consumption of water and cyanide at North Area Leach Operations would continue as a result of this alternative.

Soil and Watershed

The amount of land to be disturbed would be reduced by 165 acres if Alternative B is implemented. Loss of soil and erosion of disturbed land would also be reduced.

Vegetation

Alternative B would reduce the amount of natural vegetation loss by 165 acres as compared to the Proposed Action.

Terrestrial Wildlife

Elimination of a leach operation and associated process ponds would reduce the potential for mortality of wildlife as a result of exposure to process solutions.

Visual Resources

Visual impacts as viewed from KOPs 2 and 3 would be reduced if Alternative B is implemented. Elimination of the heap leach pad would reduce the scale of earthen structures associated with the Bootstrap Project.

Cultural Resources

Six cultural sites, one of which is NRHP eligible, would not be disturbed under this alternative.

ALTERNATIVE C
(Includes Alternatives C-1 and C-2)

Air Quality

Electrical power supplied from off-site sources would eliminate the need for on-site diesel generator sets under this alternative. Particulate and gaseous emissions associated with the on-site generator sets would be eliminated; thereby reducing the amount of particulate and gaseous emissions for the project as a whole.

Soil and Watershed

Implementation of Alternatives C-1 and C-2 would increase the disturbance area associated with the project by approximately 1 acre. Effects of this additional disturbance are negligible.

Terrestrial Wildlife

Alternative C-1 and C-2 would result in an increase in the amount of powerlines in the project area. Waterfowl and other birds are known to collide with transmission lines, particularly during foul weather or at night when visibility is poor. Higher incidence of these collisions occur where transmission lines cross rivers or streams where birds tend to concentrate.

Electrocution of birds attracted to power poles for perching and nesting can occur. In areas where trees and other perching areas are limited, power poles would attract birds; especially raptors.

Noise

Noise levels during operation would decrease if off-site power is provided to the Bootstrap Project site.

Visual Resources

A slight increase in visual impacts would result from construction of a substation and power line under Alternative C. These increases would be negligible.

NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed Plan of Operations and disturbance of public land would not occur.

AGENCY PREFERRED ALTERNATIVE

The agency preferred alternative is Alternative B and C-2. Alternative B would reduce the area of disturbance by 165 acres. Alternative C-2 would reduce gaseous and particulate emissions in the Bootstrap airshed.

CHAPTER 1

INTRODUCTION

Elko District of the Bureau of Land Management (BLM) received a Plan of Operations (3809, N16-94-002P) from Newmont Gold Company (Newmont) in July 1994 proposing activities that would support operation of new open-pit gold mining and ore-processing facilities in the Bootstrap Project area. A revised Plan of Operations was submitted by Newmont in September 1995 (Newmont 1995a).

Newmont's Bootstrap Project area is located on public and private land in Elko and Eureka Counties, Nevada, approximately 30 miles northwest of the town of Carlin (**Figure 1-1**). Since certain proposed facilities in the Bootstrap Project area are located on public lands administered by BLM, review and approval of Newmont's Plan of Operations are required by BLM pursuant to Title 43, Code of Federal Regulations, Part 3809 (43 CFR 3809) Surface Management Regulations. Due to the potential for the proposed project to result in significant environmental impacts, BLM determined that an Environmental Impact Statement (EIS) would be necessary, as required by the National Environmental Policy Act of 1969 (NEPA).

The BLM is serving as lead agency in preparing this EIS for the proposed operation. This document follows regulations promulgated by the Council on Environmental Quality (CEQ) for implementing the procedural provisions of NEPA (40 CFR 1500-1508) and BLM's NEPA Handbook (H-1790-1).

This EIS describes the components of, reasonable alternatives to, and environmental consequences of proposed mining and ore-processing operations in the Bootstrap Project area. Chapter 1 describes Purpose and Need, the role of BLM, and public participation in the EIS process. Chapter 2 provides a historical perspective of gold mining in the project area, a description of the existing operations and the Proposed Action, and alternatives to the Proposed Action. Chapter 3 describes the existing environment in the Bootstrap Project area. Chapter 4 details the potential direct, indirect, and cumulative impacts associated with the Proposed Action and alternatives, and possible mitigation actions to reduce or minimize impacts. Chapter 5 includes consultation and coordination with state and federal agencies and a list of preparers. Chapter 6 contains a list of references cited in developing the EIS.

PURPOSE AND NEED

The purpose of Newmont's proposal is to use Newmont's existing work force in conducting open-pit mining and ore processing operations on unpatented mining claims and adjacent fee lands within the Bootstrap Project area to produce gold from ore reserves contained in the Bootstrap/Capstone deposit and Tara deposit. Gold is an established commodity with international markets and demand. Uses include jewelry, investments, standard for monetary systems, electronics, and other industrial applications.

AUTHORIZING ACTIONS

A proposal submitted to the BLM may be approved only after an environmental analysis is completed as required by NEPA. BLM decision options include approving Newmont's Plan of Operations as submitted, approving alternatives to the Plan of Operations to mitigate environmental impacts, approving the Plan of Operations with stipulations to mitigate environmental impacts, or denying the Plan of Operations.

A substantial portion of Newmont's Bootstrap Project facilities would be located in whole or in part on public lands administered by BLM; such operations must comply with BLM regulations for mining on public lands (43 CFR 3809, Surface Management Regulations), the Mining and Mineral Policy Act of 1970, and the Federal Land Policy and Management Act of 1976. These laws recognize the statutory right of mining claim holders to develop federal mineral resources under the General Mining Law of 1872. These laws, however, in combination with other BLM policies (i.e., the Resource Management Plan) also require BLM to analyze proposed mining operations 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 statutes and regulations.

In addition to BLM, other federal, state, and local agencies have jurisdiction over certain aspects of the Proposed Action. **Table 1-1** provides a comprehensive listing of the agencies and identifies their respective permit/authorizing responsibilities (also see Chapter 6, Statute Glossary).

Newmont is in the process of applying to the U.S. Army Corps of Engineers for an amendment to the Section 404 Clean Water Act Permit Number 199300369. The permit amendment would address the haul road crossing on Bell Creek that would be used as part of the Bootstrap Project.

As part of the stormwater permitting process, Newmont has developed a Stormwater Pollution Prevention Plan for the Bootstrap Project (Newmont 1996). An Emergency Response Plan and a Spill Prevention, Control, and Countermeasure Plan (Newmont 1995b, 1995c) have also been developed for the project, in accordance with Mine Safety and Health Administration (MSHA) requirements and Nevada Administrative Code (NAC) 445A.398.

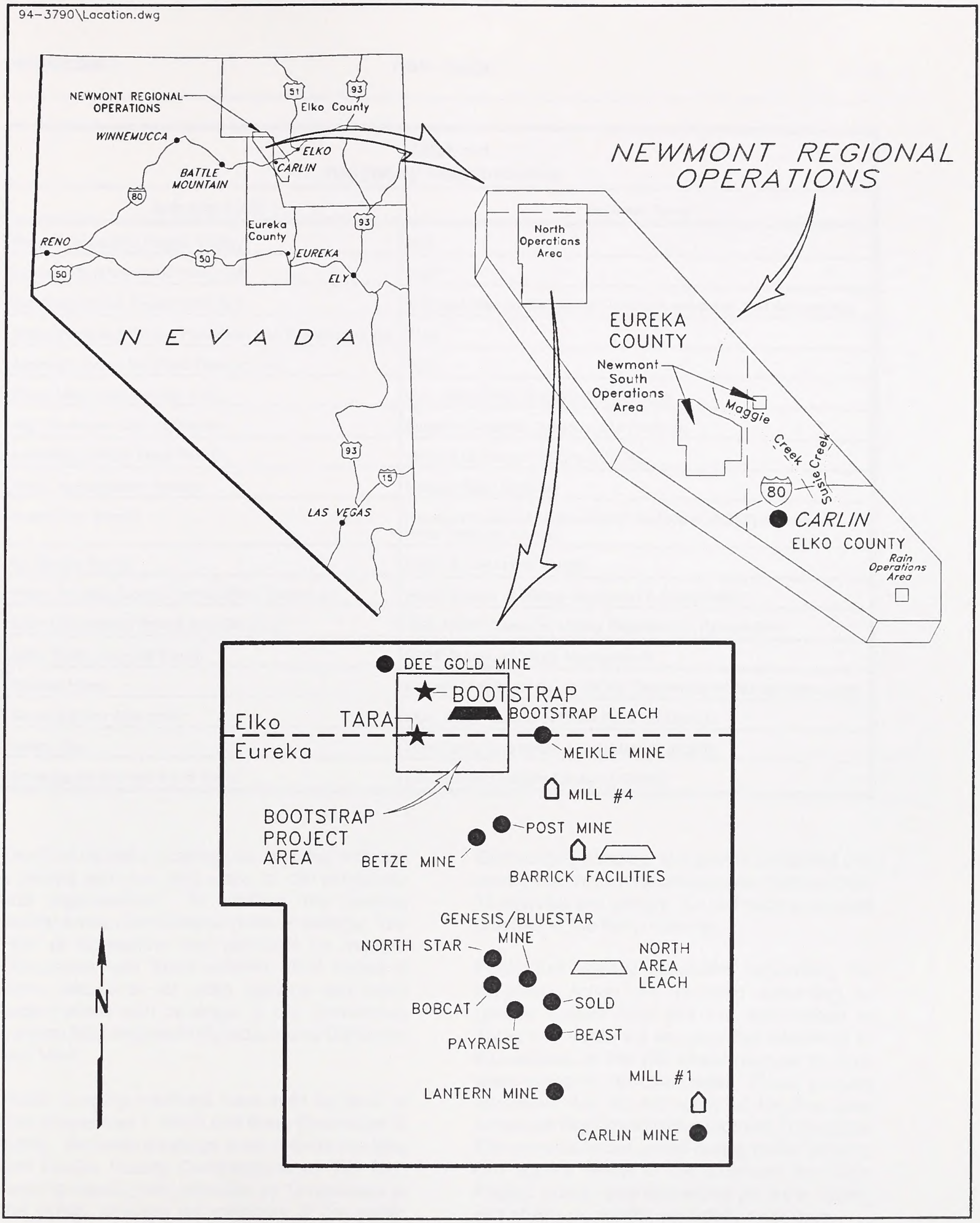
The bonding or "surety" requirements for mine reclamation in Nevada are outlined in NAC 519A.350 - 519A.630. For BLM, the Surface Management Regulations (43 CFR 3809) establishes bonding policy relating to mining and mineral development. The BLM and State of Nevada have entered a cooperative agreement establishing bond levels at not less than $2,000/acre for mining operations. Estimated costs of reclamation are determined by mining companies using industry guidelines and standards for equipment, material, and labor rates. These rates are approved by BLM and the Nevada Division of Environmental Protection (NDEP) in determining the bond amount.

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

The Bootstrap Project 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, Elko Resource Area, Resource Management Plan, approved in March 1987. Through the EIS process, the proposed Bootstrap Project is being evaluated for conformance with existing land use restrictions by the State of Nevada and Elko and Eureka counties.

PUBLIC SCOPING

To allow an early and open process for determining the scope of significant issues related to the Proposed Action (40 CFR 1510.7), a public scoping period was provided by BLM. A Notice of Intent to prepare the EIS was published in the Federal Register on December 2, 1994. Publication of this notice in the Federal Register initiated a 30-day public scoping period for the Proposed Action that provided for acceptance of comments through January 3, 1995.



General Location Map
Bootstrap Project
FIGURE 1-1

TABLE 1-1
Regulatory Responsibilities

Authorizing Action	Regulatory Agency
Plan of Operations/Rights of Way	BLM
National Environmental Policy Act	BLM
National Historic Preservation Act	BLM and Nevada Division of Historic Preservation and Archaeology
Native American Graves Protection and Repatriation Act	BLM
American Indian Religious Freedom Act	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
Stormwater Permit	Nevada Division of Environmental Protection (NDEP) Bureau of Water Pollution Control
Air Quality Permit	NDEP Bureau of Air Quality
Water Pollution Control Permit (Zero Discharge)	NDEP Bureau of Mining Regulation & Reclamation
Mine Reclamation Permit (and Bonding)	BLM, NDEP Bureau of Mining Regulation & Reclamation
Solid Waste Disposal Permit	NDEP Bureau of Waste Management
Potable Water	Nevada Division of Health (NDH), Department of Human Resources
Sewer System Approvals	NDH, NDEP Bureau of Water Pollution Control
Safety Plan	Mine Safety and Health Administration (MSHA)
Endangered Species Act of 1973	U.S. Fish and Wildlife Service (USFWS)

The BLM mailed a scoping package that included a project summary and maps to 438 individuals and organizations. In addition, the scoping package was distributed at public meetings. The Plan of Operations was provided on request. Concurrent with these actions, BLM issued a news release to 23 radio stations and news organizations with coverage in the surrounding geographical regions in Nevada, Idaho, California, and Utah.

Public scoping meetings were held by BLM in Elko (December 7, 1994) and Reno (December 8, 1994). Separate meetings were held for the Elko and Eureka County Commissioners. The Elko scoping meeting was attended by 18 members of the public, whereas no members of the public attended the Reno scoping meeting. During the Elko scoping meeting, two people presented oral comments. Written responses were received from 11 agencies and groups. No oral comments were received at the Reno meeting.

Public and agency comments concerning the Proposed Action are grouped according to general subject area and are summarized in **Table 1-2**. **Table 1-2** also provides references to the sections of this EIS which respond to each issue raised in the comments. Those scoping comments that do not apply to the Proposed Action are highlighted with a footnote in the table. The principal issues raised during public scoping and agency review of the proposed Bootstrap Project include post-operations pit water quality and effects on wildlife, especially mule deer.

TABLE 1-2
Issues and Concerns Identified in Scoping

Issue	EIS Document Section(s)
Air Quality	
Discuss impacts on air quality from particulate and dust emissions from mining, ore processing, and loss of vegetative cover.	Chapter 4 - Air Quality, pp. 4-6
Describe byproducts of blasting and their impacts on air quality.	Chapter 4 - Air Quality, pp. 4-6
Compare project impacts from emissions, excavation, construction, operation, and support activities with the National Ambient Air Quality Standards (NAAQS) and Prevention of Significant Deterioration (PSD) requirements.	Chapter 4 - Air Quality, pp. 4-6 & 4-7 Chapter 3 - Air Quality, pp. 3-15
Discuss the air quality monitoring program that ensures project compliance with permits.	Chapter 2 - Resource Monitoring, pp. 2-25
Water Quantity and Quality	
Summarize impacts on water resources from all aspects of the project and alternatives.	Chapter 4 - Water Quantity and Quality, pp. 4-8 through 4-18
Evaluate impacts from release of toxic effluent, salts, sediment, residues, and tailings[1] fluids on surface water and groundwater.	Chapter 4 - Water Quantity and Quality, pp. 4-10 Chapter 4 - Soil and Watershed, pp. 4-19
Evaluate potential for failure of the Boulder Creek Diversion[2]	Beyond the scope of this EIS
Evaluate potential impacts of the open pit on surface water in the project vicinity.	Chapter 4 - Water Quality and Quantity, pp. 4-9
Discuss effects on the Humboldt River, such as reduction in flow, degradation of water quality, and mobilization of metals or other trace elements.	Chapter 4 - Water Quantity and Quality, pp. 4-9
Describe long-term effects on wetlands near the terminus of the Humboldt River.	Not applicable to this project (no water discharges are planned)[3].
Describe effects on downstream Humboldt Project irrigation users.	Not applicable to this project (no water discharges are planned)[3].
Discuss impacts from discharge of pumped groundwater or any other discharges into any waters of the United States.	Not applicable to this project (no water discharges are planned)[3].
Access potential for contamination of surface flows (perennial and ephemeral) and rainfall that may pass through tailings[1] disposal facilities or waste rock disposal facility.	Chapter 4 - Water Quantity and Quality, pp. 4-10 and 4-11
Discuss scouring and sedimentation from surface water discharges.	Not applicable to this project (no water discharges are planned)[3].
Evaluate impacts and reversibility of impacts resulting from failure of solution containment systems.	Chapter 4 - Water Quantity and Quality, pp. 4-10
Discuss impacts from release of cyanide and/or other contaminants into the soil and groundwater.	Chapter 4 - Water Quantity and Quality, pp. 4-10
Describe effects of reducing environments on cyanide and heavy metal complexes, interactions of cyanide in water and soil, and impacts of cyanide from heap leach processing.	Chapter 4 - Water Quantity and Quality, pp. 4-16
Discuss impacts on water resources from acid generation/neutralization of waste rock, tailings[1], and pit walls.	Chapter 4 - Geology and Minerals, pp. 4-2 Chapter 4 - Water Quantity and Quality, pp. 4-9 and 4-11

TABLE 1-2 (continued)
Issues and Concerns Identified in Scoping

Issue	EIS Document Section(s)
Characterize water quality of the mine pit after mine closure, such as effects of contamination from acid generation, dissolution, precipitation, and evaporation.	Chapter 4 - Water Quantity and Quality, pp. 4-11 through 4-16
Provide monitoring plans for pit water and groundwater quality over time following project completion.	Chapter 2 - Resource Monitoring, pp. 2-25 & 2-26 Chapter 3 - Water Quantity and Quality, pp. 3-17
Describe monitoring of water use, including water depletion.	Chapter 2 - Ancillary Facilities, pp. 2-22
Identify those responsible for monitoring water use, dewatering quantities, and quality of water discharge[3].	Chapter 3 - Water Quantity and Quality, pp. 4-18
Provide locations of all monitoring wells, vadose zone monitoring devices, and points of compliance.	Chapter 3 - Water Quantity and Quality, pp. 3-17 through 3-35
Describe monitoring well screening intervals, parameters to be monitored, and monitoring frequencies.	Chapter 3 - Water Quantity and Quality, pp. 3-30 and 3-35 Chapter 4 - Water Quantity and Quality, pp. 4-18
Soils	
Summarize impacts on soil quality from the project and alternatives.	Chapter 4 - Soil and Watershed, pp. 4-19 through 4-25
Describe restoration of soil and associated wildlife habitat types and values in all portions of the mining areas following project closure.	Chapter 2 - Proposed Action, Reclamation, pp. 2-30 Chapter 4 - Soil and Watershed, pp. 4-19 Chapter 4 - Terrestrial Wildlife, pp. 4-28 through 4-32
Discuss effects of the project on erosion potential and sedimentation.	Chapter 4 - Soil and Watershed, pp. 4-19
Evaluate potential for flash floods to transport sediment from disturbed areas to stream channels.	Chapter 4 - Soil and Watershed, pp. 4-19 and 4-20 Chapter 4 - Water Quantity and Quality, pp. 4-9
Wildlife and Fisheries	
Assess direct and indirect impacts on wildlife and fisheries resources, including: alteration of breeding and nesting cover and forage habitat; reduction in biological diversity; mortality or displacement of individuals; alteration of migration corridors; loss of reproductive potential; pressure on adjacent populations and habitat; and long-term impacts on regional populations.	Chapter 4 - Terrestrial Wildlife and Aquatic Habitat and Fisheries, pp. 4-28 through 4-34
Identify loss of habitat for antelope, mule deer, and upland game birds.	Chapter 4 - Terrestrial Wildlife, pp. 4-28 through 4-31
Discuss impacts on wildlife from haul roads, utility corridors, and ancillary facilities.	Chapter 4 - Terrestrial Wildlife, pp. 4-28 through 4-30
Discuss impacts on wildlife from hazardous materials and cyanide in tailings[1] ponds, heap leach pads, and other facilities.	Chapter 4 - Terrestrial Wildlife, pp. 4-30
Discuss impacts on threatened, endangered, and candidate species and their habitat.	Chapter 4 - Threatened, Endangered, and Candidate Species, pp. 4-33 and 4-34
Assess impacts on wildlife from use of bacteria-enhanced cyanidation and potential benefits, costs, and implications to wildlife mortality.	Not applicable to this project (no bacteria-enhanced cyanidation is proposed).
Reclamation	
Provide reclamation plans to restore natural ecosystems, benefit wildlife, and reduce erosion potential.	Chapter 2 - Proposed Action, Reclamation, pp. 2-28 through 2-38

TABLE 1-2 (continued) Issues and Concerns Identified in Scoping	
Issue	**EIS Document Section(s)**
Delineate reclamation designs and plans that provide benefits to wildlife resources.	Chapter 2 - Proposed Action, Reclamation, pp. 2-28 through 2-38 Chapter 4 - Terrestrial Wildlife, pp. 4-29
Implement reclamation using only native plant species indigenous to the area.	Chapter 2 - Proposed Action, Reclamation, pp. 2-28 through 2-38
Describe measures to decommission mine operations, stabilize slopes, and neutralize or cap waste rock, tailings[1], and leach heaps.	Chapter 2 - Proposed Action, Reclamation, pp. 2-28 through 2-38
Identify areas and quantify acreage of land targeted for reclamation, clarify intended degree of reclamation treatment, and describe standards for determining and means of assuring successful reclamation.	Chapter 2 - Proposed Action, Reclamation, pp. 2-28 through 2-38
Estimate any irrigation requirements for reclamation.	Chapter 2 - Proposed Action, Reclamation, pp. 2-28 through 2-38
Delineate timing of reclamation relative to mining operations and duration of reclamation treatment. Implement reclamation concurrent with operations where possible.	Chapter 2 - Proposed Action, Reclamation, pp. 2-28 through 2-38
Provide means of assuring maintenance will continue in reclaimed areas after operations cease or while operations are suspended.	Chapter 2 - Proposed Action, Reclamation, pp. 2-28 through 2-38
Coordinate reclamation plan with a site-specific closure plan.	Chapter 2 - Proposed Action, Reclamation, pp. 2-28 through 2-38
Specify the level of bonding appropriate for reclamation and identify responsible party for post-closure cleanup actions, should that be necessary.	Chapter 1 - Authorizing Actions, p. 1-2
Provide frequent revegetation monitoring to determine the success of reclamation efforts and to implement remedial measures if necessary.	Chapter 2 - Proposed Action, Reclamation, pp. 2-28 through 2-38
Access and Land Use	
Discuss impact on existing water rights.	Chapter 4 - Access and Land Use, pp. 4-38
Specify responsibility for roadway upgrade and widening for SR-766 (Newmont Mine Road).	Chapter 2 - Proposed Action, pp. 2-22
Provide continued access to the Dunphy Road and Antelope Creek/Bell Creek roads for exploration.	Chapter 4 - Access and Land Use, pp. 4-38
Hazardous Materials	
Describe the handling, use, recycling and final disposition of cyanide and hazardous materials on site.	Chapter 2 - Proposed Action, Hazardous Materials, pp. 2-26 and 2-27
Explain the processes that form free cyanide.	Chapter 4 - Water Quantity and Quality, pp. 4-16
Describe how the toxicity of cyanide would be controlled or eliminated during use in processing.	Chapter 2 - Proposed Action, Hazardous Materials, pp. 2-26 and 2-27 Chapter 4 - Water Quantity and Quality, pp. 4-16
Discuss how pond overflow of hazardous materials would be handled.	Chapter 2 - Proposed Action, Hazardous Materials, pp. 2-27
Summarize the projected types, quantities, and rates of hazardous material shipments.	Chapter 2 - Proposed Action, Hazardous Materials, pp. 2-26 and 2-27

TABLE 1-2 (continued) Issues and Concerns Identified in Scoping	
Issue	**EIS Document Section(s)**
Describe the location of transportation routes for hazardous materials in relation to surface waters and threatened, endangered, and candidate species.	Chapter 2 - Proposed Action, Hazardous Materials, pp. 2-26 and 2-27
Describe the location and qualifications of personnel and equipment which would respond to transportation accidents involving hazardous materials.	Chapter 2 - Proposed Action, Hazardous Materials, pp. 2-26 and 2-27
Discuss measures to ensure compliance with applicable Resource Conservation and Recovery Act (RCRA) regulations and/or Nevada hazardous waste requirements.	Chapter 2 - Proposed Action, Hazardous Materials, pp. 2-26 through 2-28
Evaluate the adequacy of current safety procedures and availability of emergency management services and personnel to respond to an "incident."	Chapter 2 - Proposed Action, Hazardous Materials, pp 2-26 through 2-28
Noise	
Discuss impacts of noise on wildlife, especially impacts on birds from high levels of background noise that inhibit detection of mates, young, and predators.	Chapter 4 - Terrestrial Wildlife, pp. 4-29
Evaluate impacts of noise on reproductive success and possible subsequent decline of wildlife populations.	Chapter 4 - Terrestrial Wildlife, pp. 4-29
Social and Economic Values	
Estimate economic impact of project on tax rolls in Elko and Eureka counties.	Chapter 4 - Social and Economic Values, pp. 4-50
Assess economic impact of delays in mine development due to EIS preparation.	Beyond the Scope of the EIS
Engineering Designs	
Describe the design capacity and long-term integrity of the Boulder Creek Diversion[2].	Beyond the scope of this EIS.[2]
Describe the facility design and operation, including liner and cover specifications, ditches and ponds, and maintenance and monitoring activities.	Chapter 2 - Proposed Action, pp. 2-20
Describe the design of any tailings[1] disposal facilities, dams, seepage collection systems, and pumpback systems.	Chapter 2 - Proposed Operations, pp. 2-21
Cumulative Impacts	
Identify direct, indirect, and cumulative short- and long-term impacts on surface water flow, water supply wells, wetlands, springs and seeps, vegetation, wildlife, and other groundwater-dependent resources.	Chapter 4 - Cumulative Impacts, Water Quantity and Quality, pp. 4-58
Address past, current, and reasonably foreseeable future mining and other activities in the project vicinity. Analysis should include a discussion of impacts on water and air quality, hydrology, soils, vegetation, wildlife, and biodiversity.	Chapter 4 - Cumulative Impacts, pp. 4-51 through 4-63
Discuss past, present, and reasonably foreseeable actions by agency or non-agency personnel that would impact wetlands and riparian communities, such as grazing and general ranching practices, residential and commercial development, and other activities.	Beyond the scope of this EIS.

TABLE 1-2 (continued)
Issues and Concerns Identified in Scoping

Issue	EIS Document Section(s)
Evaluate impacts on Humboldt River flows from groundwater pumping and water management operations of the proposed project, in combination with other mining projects.	Not applicable to this project (no dewatering is planned as part of this project).[3]
Assess impacts of mining on wildlife and wildlife resources in the Boulder Valley.	Chapter 4- Cumulative Impacts, pp. 4-59
Address potential cumulative effects of mass loadings on waters of the U.S. that are, or may be, affected by the mine operations.	Not applicable to this project (no surface water discharge is planned as part of this project).[3]
Assess cumulative effects of discharges of trace elements such as selenium, arsenic, and boron, as well as cyanide, into waters of the U.S., particularly terminal wetlands.	Not applicable to this project (no surface water discharge is planned as part of this project).[3]
Alternatives	
Demonstrate that all reasonable alternatives to proposed actions have been thoroughly considered and incorporated into the project.	Chapter 2 - Project Alternatives, pp. 2-38 through 2-46
Develop alternative sites for major facilities to restore pre-project habitat types and values for wildlife.	Chapter 2 - Project Alternatives, pp. 2-38
Delineate alternatives to prevent degradation of pit water and other surface water quality, such as pit backfilling, and treatments to reduce pit water toxicity.	Chapter 2 - Project Alternatives, pp. 2-38
Provide reclamation alternatives after assessment of previous reclamation activities.	Chapter 2 - Project Alternatives, pp. 2-38
Develop alternatives that discuss benefits and costs of contouring abandoned disposal facilities and leach heaps to resemble "natural" topography.	Chapter 2 - Proposed Action, Reclamation, pp. 2-28 Chapter 2 - Project Alternatives, pp. 2-38
If a Clean Water Act (CWA) Section 404 permit is required, demonstrate that all practicable measures have been taken to avoid the placement of dredge or fill materials into waters of the U.S. Select the least damaging alternative to waters of the U.S. in compliance with the 404 process.	Chapter 1 - Authorizing Actions, pp. 1-2 Chapter 2 - Previous and Current Operations, p. 2-6
Environmental Baseline Information	
Discuss the NAAQS PSD increments applicable to project.	Chapter 3 - Air Resources, pp. 3-15
Identify any Class I areas within at least 100 kilometers of the project.	Chapter 3 - Air Resources, pp. 3-15
Identify wetland and riparian areas, including springs and seeps in the area of potential impact.	Chapter 3 - Water Quantity and Quality, pp. 3-30
Describe results of past/current water quality monitoring of existing mining operations for groundwater and surface water at various locations over time. Discuss any water quality trends.	Chapter 3 - Water Quantity and Quality, pp. 3-17
Describe the original (natural) drainage patterns and the drainage patterns during project operations and following reclamation.	Chapter 2 - Reclamation, pp. 2-30 Chapter 3 - Water Quantity and Quality, pp. 3-17
Include hydrologic and topographic maps of the area.	Chapter 3 - Water Quantity and Quality, pp. 3-19
Identify 100-year (24-hour storm) flood plains in the project area.	Chapter 3 - Water Quantity and Quality, pp. 3-27
Describe flow velocities of any discharges to waters of the U.S.	Not applicable to this project (no water discharges are planned)[3].
Identify water sources and project pumping rates during dewatering.	Not applicable to this project (no water discharges are planned)[3].

TABLE 1-2 (continued)
Issues and Concerns Identified in Scoping

Issue	EIS Document Section(s)
Project rates of water use for mine operations.	Chapter 2 - Proposed Action, pp. 2-22
Describe leach tests to be conducted on ore and waste rock and provide results for each test.	Chapter 4 - Geology and Minerals, pp. 4-2
Describe the quality of waters at any mining sites nearby, particularly older mines, that may be used to predict future acid generation.	Chapter 4 - Water Quantity and Quality, pp. 4-8
Provide qualitative and quantitative information regarding unique plant communities, wetland and riparian areas, raptor nesting sites, sage grouse leks, winter and summer range for deer, and wildlife migration routes.	Chapter 3 - Vegetation, pp. 3-43 Chapter 3 - Terrestrial Wildlife, pp. 3-47 Chapter 3 - Threatened, Endangered, and Candidate Species, pp. 3-50
Describe occurrences of Lahontan cutthroat trout, loggerhead shrikes, pygmy rabbits, Townsend's big-eared bats, bald eagles, prairie falcons, rough-legged hawks, red-tailed hawks, and golden eagles.	Chapter 3 - Threatened and Endangered Species, pp. 3-50 Chapter 3 - Aquatic Habitat and Fisheries, pp. 3-50
Characterize the use of the area by nongame animals.	Chapter 3 - Terrestrial Wildlife, pp. 3-47
Permits and Regulatory Compliance	
Discuss any air permits required for any aspect of project construction and/or operation.	Chapter 1 - Table 1-1, pp. 1-5 Chapter 2 - Resource Monitoring, pp. 2-25
Coordinate with the NDEP Bureau of Air Quality regarding air quality permits.	Chapter 2 - Resource Monitoring, pp. 2-25
Consult with the National Park Service and the Forest Service for a determination of which areas could be adversely affected by the proposed action. Discuss potential impacts to Class I PSD areas, including visibility impacts.	Chapter 4 - Air Resources, pp. - 4-6 Chapter 4 - Visual Resources, pp. - 4-40
Discuss applicability and requirements of the New Source Performance Standards for Metallic Mineral Processing Plants (40 CFR Part 60.380-386).	Chapter 3 - Air Resources, pp. - 3-15
Discuss compliance with state-adopted, U.S. Environmental Protection Agency (USEPA) approved water quality standards.	Chapter 4 - Water Quantity and Quality, pp. - 4-9 through 4-18
Coordinate with USCOE, NDEP, Bureau of Mining Regulations and Reclamation, Bureau of Water Quality Planning, and Bureau of Water Pollution Control to ensure that water quality is protected and beneficial uses are maintained.	Chapter 4 - Water Quantity and Quality, pp. - 4-9 through 4-18
Address water rights permits required for any water used for running the operation. Address dewatering permits required from Nevada Division of Water Resources (NDWR).	Chapter 2 - Proposed Action, pp. - 2-22 Not applicable to this project (dewatering discharge is not planned for this project)[3].
Address exploratory drill waivers required by NDWR.	Beyond the scope of this EIS,
Discuss whether the project has, or will require, a CWA National Pollutant Discharge Elimination System (NPDES) permit.	Not applicable to this project (dewatering discharge is not planned for this project)[3].
Describe any stormwater-related permit requirements that may be applicable to the project, either for construction or operation.	Chapter 1 - Authorizing Actions, pp. 1-2 Chapter 1 - Table 1-1, pp. 1-5 Chapter 2 - Proposed Action, pp. 2-22
Document consultation with the USCOE to determine if the project requires a CWA, Section 404 permit, which regulates dredge or fill materials into waters of the U.S., including wetlands and special aquatic sites.	Chapter 2 - Previous and Current Operations, pp. 2-6

TABLE 1-2 (continued)
Issues and Concerns Identified in Scoping

Issue	EIS Document Section(s)
Address applicability of "Bevill rulings" of the RCRA to the project (40 CFR Parts 260, 261, 262).	Chapter 2 - Proposed Action, Hazardous Materials, pp. 2-28
Discuss compliance with the Migratory Bird Treaty Act (15 U.S.C. 701-718h) regarding the timing of land clearing (to avoid active nests) and the dangers posed by toxic ponds or leach facilities to migratory birds.	Chapter 4 - Terrestrial Wildlife, pp. 4-28
Discuss compliance with USFWS policy to avoid, to the greatest extent possible, impacts on wetlands and riparian habitats.	Chapter 4 - Vegetation, pp. 4-25
Coordinate with the USFWS and NDOW to determine impacts on plant and wildlife species, especially threatened, endangered, or candidate species on state or federal lists.	Chapter 4 - Vegetation, pp. 4-25 Chapter 4 - Threatened, Endangered and Candidate Species, pp. 4-33
Discuss the need to submit an engineered design to NDWR for tailings[1] facilities or other facilities requiring an embankment equal to or greater than 20 feet in height or an impoundment of 20 acre-feet or greater.	Chapter 2 - Proposed Action, pp. 2-11 Chapter 1 - Table 1-1, pp. 1-5
Develop a reclamation plan before permitting mine expansion.	Chapter 2 - Proposed Action, Reclamation, pp. 2-28
Mitigation	
Define in detail any "preventative" and "replacement" mitigation measures.	Chapter 4 - (See individual resource discussions).
Assess the effectiveness of project-related mitigation.	Chapter 4 - (See individual resource discussions).
Describe mitigation measures designed to comply with the NAAQS and PSD requirements, and/or State Implementation Plan.	Chapter 4 - Air Resources, pp. 4-6
Describe measures to prevent excess destruction, contamination, and depletion of water resources.	Chapter 4 - Water Quantity and Quality, pp. 4-8
Provide thorough explanations of "preventative measures" and "replacement" mitigation measures. What water will "replace" the water consumed? What impacts will occur in the area where the water is taken for "replacement"?	Not applicable to this project (no dewatering activities are proposed as part of this project)[3].
Describe measures to prevent or reduce the likelihood of a catastrophic event with attendant release of toxic elements to surface and groundwater.	Chapter 2 - Proposed Action, pp. 2-26 Chapter 4 - Water Quantity and Quality, pp. 4-9
Describe mitigation measures associated with stormwater permitting, such as a Stormwater Pollution Prevention Plan.	Chapter 2 - Proposed Action, pp. 2-22 Chapter 4 - Water Quantity and Quality, pp. 4-9 and 4-10
Describe mitigation measures to prevent surface water contamination, such as runon/runoff channels, impermeable covers, and collection or sedimentation ponds.	Chapter 2 - Proposed Action, pp. 2-22
Describe methods for discovering failure of solution containment systems.	Chapter 2 - Proposed Action, pp. 2-21
Delineate mitigation measures for impacts of dewatering on riparian areas, wetlands, and waters of the U.S.	Not applicable to this project (dewatering of waters of the U.S. not proposed).[3]
Describe methods to protect downstream beneficial uses.	Chapter 4 - Water Quality and Quantity, pp. 4-9 and 4-10
Discuss back-up measures to prevent acid generation, and mitigation should preventative measures fail.	Chapter 2 - Proposed Action, pp. 2-26 Chapter 4 - Geology and Minerals, pp. 4-2

TABLE 1-2 (continued)
Issues and Concerns Identified in Scoping

Issue	EIS Document Section(s)
Describe mitigation measures for any unavoidable impacts on waters of the U.S. (after the least damaging alternative is chosen).	Chapter 4 - Vegetation, pp. 4-25 and 4-26
Describe measures to avoid, minimize, and mitigate losses or modification of fish, wildlife, and plant habitats and impacts on species composition.	Chapter 4 - Terrestrial Wildlife, pp. 4-28 Chapter 4 - Aquatic Habitat and Fisheries, pp. 4-32 Chapter 4 - Vegetation, pp. 4-25
Describe mitigation measures for any hindrance to wildlife migration paths.	Chapter 4 - Terrestrial Wildlife, pp. 4-28
Describe measures to reduce or compensate for unavoidable direct or indirect habitat loss and other negative impacts on fish, wildlife, and plant resources. Describe mitigation plans to create or restore habitat, including acreages and habitat types; water sources to maintain riparian and wetland areas; revegetation plans, including percentages of species to be planted; maintenance and monitoring plans; size and location of mitigation area buffer zones; parties responsible for success of plan; success criteria; contingency plans if the original plan fails; and mitigation or compensation for wildlife habitat losses in areas where impacts on wetland and riparian habitats are unavoidable.	Chapter 4 - Terrestrial Wildlife, pp. 4-28 Chapter 4 - Vegetation, pp. 4-25
Describe mitigation measures to prevent wildlife access to cyanide or other toxic solutions, including placement of netting, floating balls, or floating covers on ponds; placement of coarse materials on tops of heap leach pads and in solution channels; and covering of cyanide solutions with materials other than netting.	Chapter 2 - Proposed Action, p. 2-26
Describe off-site mitigation or compensation for loss of fish and wildlife resources, habitat fragmentation, and other impacts, such as: enhancement and protection of springs supporting spring snails (*Hydrobiidae*); rehabilitation and protection of streams supporting, or having the potential to support, threatened Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*); reclamation of other lands disturbed by past mining activities (after negotiating any necessary memoranda of understanding to limit Newmont Gold Company from future liability); and closure of compensation sites or mitigation sites in perpetuity to mineral entry.	Chapter 4 - Terrestrial Wildlife, pp. 4-28 Chapter 4 - Threatened, Endangered and Candidate Species, pp. 4-33 Chapter 4 - Aquatic habitat and Fisheries, pp. 4-32
Summarize post-operational surveillance program of mining waste stabilization.	Chapter 2 - Proposed Action, pp. 2-20
Describe mitigation measures if destabilization is detected and identify parties responsible for monitoring and mitigation actions.	Chapter 2 - Proposed Action, pp. 2-20 Chapter 1 - Authorizing Actions, pp. 1-2

Notes:

1 Tailings facility modifications are not associated with the Proposed Action. Tailings facilities to be used as part of the Bootstrap Project are currently permitted for operation in the North Operations Area and the South Operations Area.

2 The Boulder Creek Diversion is described in Chapter 2 - Previous and Current Operations. The diversion has been permitted and mitigation measures were developed by the U.S. Army Corps of Engineers.

3 Dewatering and surface water discharge are not planned for the project. Dewatering at the nearby Betze/Post Mine has lowered the water table to a level where dewatering at the Bootstrap Project will not be necessary. Minor flows (<30 gpm) intercepted from near-surface alluvium in the Bootstrap/Capstone pit would be used for dust suppression.

CHAPTER 2

DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

INTRODUCTION

This chapter describes Newmont Gold Company's (Newmont) previous operations at the Bootstrap Mine, Newmont's Proposed Action to reopen the Bootstrap Mine and expand operations in the Bootstrap/Capstone and Tara deposit areas, and reasonable alternatives to the Proposed Action. Proposals to develop ore reserves in the Bootstrap/Capstone and Tara deposits are collectively referred to as the Bootstrap Project in this document.

Alternatives considered in the Environmental Impact Statement (EIS) are based on issues identified by the Bureau of Land Management (BLM) and comments received during the public scoping process. Alternatives are intended to reduce or minimize potential impacts associated with the Proposed Action that cannot be mitigated by Newmont (Chapter 2) or BLM (Chapter 4).

Detailed discussions of the following topics are presented in this chapter:

- History of mineral exploration and mining in the Carlin Trend and Bootstrap Project area.
- Newmont's previous operations in the Bootstrap Project area.
- Newmont's Proposed Action for the Bootstrap Project area.
- Alternatives to the Proposed Action, including the No Action Alternative and Alternatives Considered but Eliminated from Detailed Analysis.

HISTORY OF EXPLORATION AND MINING

The area of gold mine development in the vicinity of Carlin, Nevada, is known as the Carlin Trend (**Figure 2-1**). The Carlin Trend is a linear sequence of gold deposits extending from approximately 10 miles southeast to approximately 40 miles northwest of Carlin. Although mining has occurred in the area for the past 120 years, the majority of mining activity has taken place since 1980.

Newmont operates open-pit and underground mines and processes ore using both milling and heap leach facilities in Eureka and Elko counties in the Carlin Trend. The Newmont mines and facilities are at the following locations: the Rain Operations Area approximately 10 miles southeast of Carlin; the South Operations Area 6 miles northwest of Carlin; the North Operations Area approximately 21 miles northwest of Carlin; and the Hollister Mine approximately 38 miles northwest of Carlin. The Bootstrap Project is located approximately 30 miles northwest of Carlin in Newmont's North Operations Area.

Newmont initiated mining activities in the North Operations Area at the Carlin open-pit mine in 1965. Mining at the Bootstrap open pit began in 1974 and continued until 1984; closure and reclamation activities were completed in 1988 in accordance with the standard operating procedures in place at that time. After cessation of mining, exploration drilling to define additional gold resources continued, leading to the delineation of the Bootstrap/Capstone and Tara ore deposits.

Gold Mineralization

The following primary geologic occurrences have led to present-day gold mining in the Carlin Trend: 1) deposition of marine sedimentary rocks that host the gold mineralization; 2) faulting that disrupted these rocks and created pathways for movement of mineralizing fluids and openings for deposition of gold; 3) deposition of gold from mineralizing fluids associated with igneous activity; and 4) surface erosion that exposed the mineralized rocks.

As gold-bearing fluids migrated upward along faults and fractures, they permeated the disrupted rocks throughout the area. This resulted in widespread dissemination of gold particles and sulfide minerals through large volumes of rock, creating the large-tonnage, low-grade gold deposits known to geologists as "Carlin-type" deposits. Disseminated gold deposits are typically composed of submicron-sized gold particles often visible only with a scanning electron microscope. Over 20 ore deposits have been identified in the Carlin Trend since exploration for disseminated gold was initiated.

Geologic and mineralization processes have resulted in the formation of two disseminated ore types in the Carlin Trend. The uppermost or near-surface ore type is known as oxide ore. This type of ore occurs at shallow depths where oxygenated water percolating through the subsurface has leached sulfide minerals from the rock. The natural leaching process leaves gold in the rock but removes sulfidic minerals.

A second ore type is unoxidized and typically occurs at greater depths at or below the groundwater table where water is low in oxygen. Unoxidized ore is commonly rich in sulfides and can be refractory (i.e., difficult to treat for recovery of precious metals). Refractory ore is further broken down into two subclassifications: 1) silica-sulfide ore, in which gold is locked within sulfide and quartz minerals; and, 2) carbon-sulfide ore, in which gold occurs with carbonaceous and sulfidic minerals. Refractory ore is not readily amenable to gold extraction through conventional cyanide leaching; additional processing is required to recover the gold.

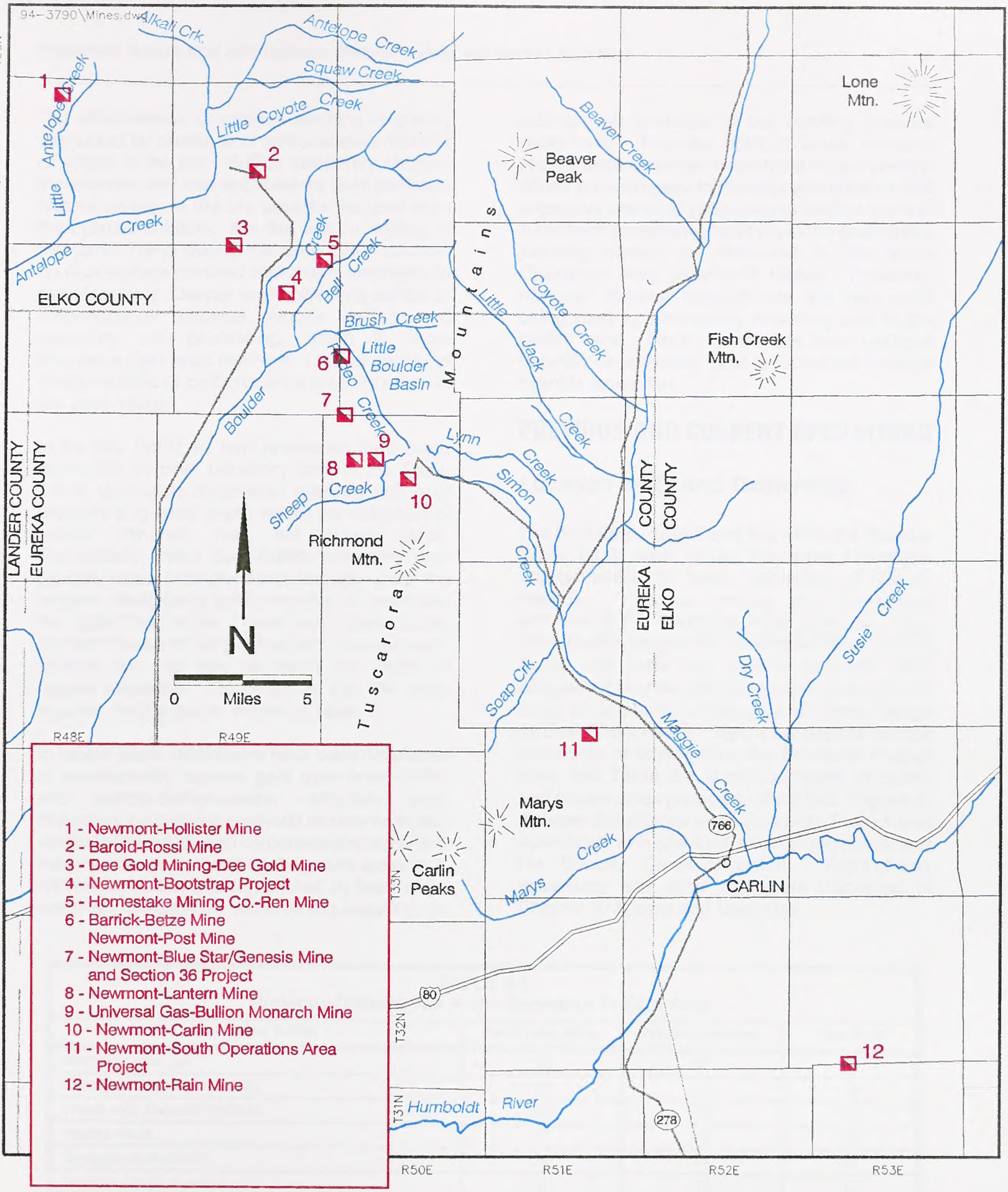
Mining and Ore Processing in the Carlin Trend

Exploration activities in the Carlin Trend began in the early 1870s with staking of the Good Hope claims in the Maggie Creek district (Coope 1991). These claims produced mainly lead and silver, with minor amounts of barite and gold. The first significant gold discovery was made on Lynn Creek in 1907, approximately 1.5 miles north of the present Carlin Mine. Placer gold discoveries followed in Sheep, Rodeo, and Simon creeks (**Figure 2-1**).

Early hard rock mining focused on small, rich ore deposits of copper, lead, and barite and minor concentrations of gold and silver. Adits and shafts were used to access and remove the ore, creating a historically interesting but relatively inconsequential overall surface disturbance.

In the Carlin Trend, early mines relied on milling and vat leaching to recover gold from high-grade ore. Vat leaching involved grinding the rock to a fine sandy texture (milling) and mixing the ground rock with cyanide solution in tanks for removal of gold (vat leaching). Oxidized ore low in carbon could be directly leached, while unoxidized carbonaceous ore was pre-treated with chlorine prior to extraction. Milling methods continue to be economically viable for richer ores, but are generally not cost-effective for low-grade ores.

Development of heap leaching for gold recovery from low-grade oxide ore began in the 1970s, allowing further expansion of the regional mining industry. Heap leaching involves placing the low-grade oxide ore in large heaps and sprinkling the heaps with a weak cyanide solution. The cyanide solution percolates through the heaps, dissolving gold from the ore. The heaps are lined with impervious materials and are designed to channel gold-bearing solution to holding ponds. Gold is removed from the cyanide solution by adsorption to carbon. The carbon is then processed to remove the gold, which is shipped to specialty smelters for further refinement.



Major Mines in the Carlin Trend
Bootstrap Project
FIGURE 2-1

The effectiveness of cyanide leaching is greatly decreased by presence of carbonaceous material or sulfide in the ore. Sulfide selectively absorbs the cyanide and can encapsulate gold particles. Natural carbon in the ore adsorbs the gold from the cyanide solution. For this reason, mining in the Carlin Trend during the early 1980s focused on near-surface oxidized rock that is amenable to heap leaching. Deeper ores containing sulfide or carbonaceous material require milling and refractory ore processing, which is more expensive than heap leaching. Limited mining of deeper sulfidic or carbonaceous ores did occur in the early 1980s.

In the late 1980s, as new processes were being developed to treat refractory ores in the Carlin Trend, geologists discovered relatively rich gold deposits at greater depth where the oxidation of sulfide minerals had not taken place. Geologically, these deep-sulfide refractory ores typically occur in feeder zones through which the original mineralizing fluids migrated to permeate the upper host rocks. These deep feeder zones typically have a richer gold content than the near-surface ore, but they lie below the depth of natural oxidation. Extraction of this ore often requires mining below the water table.

In recent years, techniques have been developed to economically recover gold from both sulfide and sulfidic-carbonaceous refractory ores. Refractory processing methods involve artificially oxidizing the sulfide and carbonaceous material in the ore prior to conventional cyanide extraction. Artificial oxidation is accomplished by heating the ore in an oxygen-rich environment (roasting) or adding high pressure to the roasting process (autoclave). Because both of these methods require large amounts of electrical or gas energy, efforts are underway to develop biological or less expensive chemical processes to oxidize the ore. A bioleach processing facility is in the preliminary planning phases for Newmont in the North Operations Area (Newmont 1995a). Presently, however, thermal methods are the only ones being used for processing refractory ores in the Carlin Trend. Once the ore has been oxidized naturally or artificially, gold is recovered through cyanide extraction.

PREVIOUS AND CURRENT OPERATIONS

Location and Land Ownership

The Bootstrap Project area lies within the Boulder Creek Basin west of the Tuscarora Mountains approximately 30 miles northwest of Carlin, Nevada. Previous mining and exploration activities at the Bootstrap Mine (open pit, heap leach facility, waste rock disposal facilities, access roads, drill pads and sumps, trenches, etc.) disturbed 234 acres (99 acres public land and 135 acres private land) in Township 36 North, Range 49 East (T36N R49E). **Figure 2-2** depicts surface ownership of lands within the Bootstrap Project area, and **Table 2-1** shows acreages of public and private lands previously disturbed. **Figure 2-3** shows disturbance in the Bootstrap Project area associated with previous mining operations and the Boulder Creek Diversion. Right-of-way easements and water rights are discussed in Chapter 3, Access and Land Use.

TABLE 2-1
Previous Disturbance in the Bootstrap Project Area

Development Activity	Public Lands Acres	Private Lands Acres	Total Acres
Bootstrap open-pit	12	47	59
Bootstrap heap leach facility	10	0	10
Waste rock disposal facilities	36	38	74
Access roads	11	11	22
Geologic evaluations	30	24	54
Boulder Creek diversion	0	15	15
TOTAL DISTURBANCE	**99**	**135**	**234**

Source: Newmont 1995a.

Bootstrap Open-Pit Mine

Mining and ore-processing operations were suspended in the Bootstrap Project area in 1984. The existing Bootstrap open-pit encompasses approximately 12 acres of public land and 47 acres of private land. The pit is approximately 220 feet deep, 1,100 feet along the north-south axis, and 200 feet in width.

Waste Rock Disposal Facilities

Approximately 3 million tons of waste rock were removed from the Bootstrap Mine and placed along the east and south rims of the pit. Total area disturbed by these waste rock disposal facilities was 74 acres (36 acres public land and 38 acres private land). The existing waste rock disposal facility would be incorporated into the proposed Bootstrap/Capstone Waste Rock Disposal Facility.

Bootstrap Heap Leach Facility

Approximately 900,000 tons of oxide leach ore from the mine were placed on the original Bootstrap Heap Leach Facility, which was constructed on 10 acres of public land. The leach facility was approximately 700 feet long, 600 feet wide, and up to 100 feet high. Two processing ponds were incorporated into the facility. During 1987 and 1988, Newmont closed this facility and reclaimed it by filling, contouring, and seeding the ponds and plugging monitor wells. All closure and reclamation operations were performed in accordance with Nevada Division of Environmental Protection (NDEP) regulations in place at that time. The original Bootstrap Heap Leach Facility would be incorporated into the proposed Bootstrap/ Capstone Waste Rock Disposal Facility.

Roads

The existing Bootstrap Project haul road (tram road, N-7683) is approximately 4 miles in length and extends from the North Operations Area Mill #4 complex to the Dunphy Road on the north boundary of the project area (**Figure 2-3**). Existing roads within the Bootstrap Project area occupy approximately 11 acres of public land and 11 acres of private land. The Dunphy Road is currently used to access exploration sites and other mines in the area. The existing tram road right-of-way N-7683 within Section 14 (T36N R49E) would be upgraded to a haul road to provide access to Mill #4.

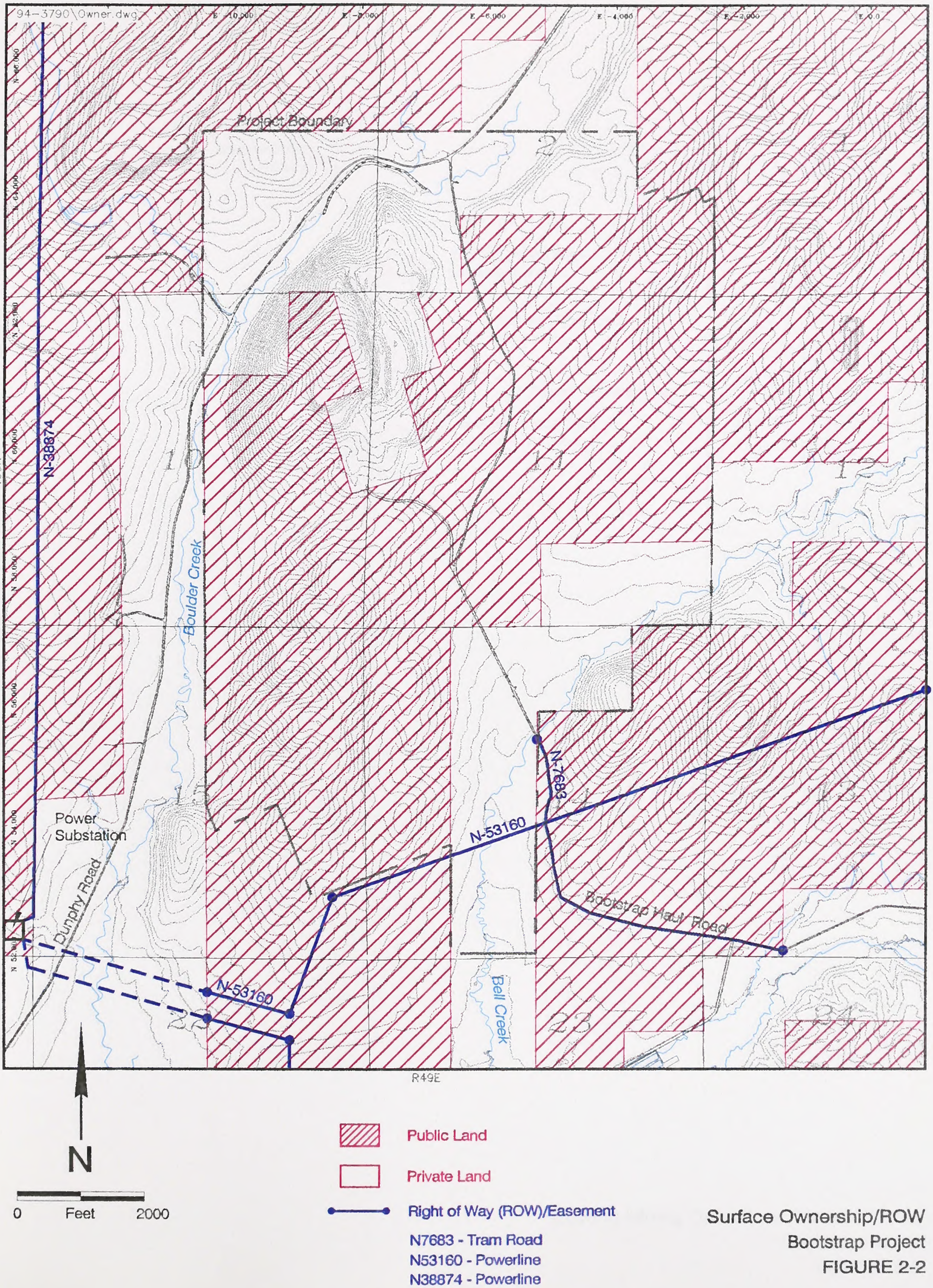
Boulder Creek Diversion

In 1993, Newmont acquired Permit No. 199300369 from the U.S. Army Corps of Engineers (USCOE), pursuant to Section 404 of the Clean Water Act, to allow diversion of Boulder Creek around the north portion of the proposed expansion of the Bootstrap/Capstone open pit. Boulder Creek is located approximately ¼ mile north of the existing Bootstrap open-pit (**Figure 2-3**). The diversion extends approximately 3,000 feet in length and disturbed 15 acres of private land. As a condition of the permit, USCOE has approved a mitigation plan to create wetland habitat farther downstream along Boulder Creek to replace wetland habitat. Construction of the Boulder Creek diversion has resulted in the loss of water flow to a pond used by livestock.

The Boulder Creek diversion was completed in 1995. According to Section 404 Permit No. 199300369, the Boulder Creek Diversion channel will be maintained in good condition and monitored for erosion over a period of 3 years to ensure it handles all flows as designed. Failure of a constructed diversion channel to handle the designed flow may require remedial action at the discretion of USCOE. For additional discussion of the diversion, see Chapter 3, Water Quantity and Quality.

Geologic Evaluations

Geologic exploration operations in the Bootstrap Project area are currently conducted under the Tara Exploration Plan of Operations (3809, N16-91-002P) and Environmental Assessment (EA-NV-010-92-021; BLM/EK/PL-96-003); the Bootstrap Notice (3809, N16-93-003N); and the East Bootstrap Notice (3809, N16-94-027N). Exploration activities such as geophysical surveys, trenching, and drilling operations



Public Land

Private Land

Right of Way (ROW)/Easement

N7683 - Tram Road

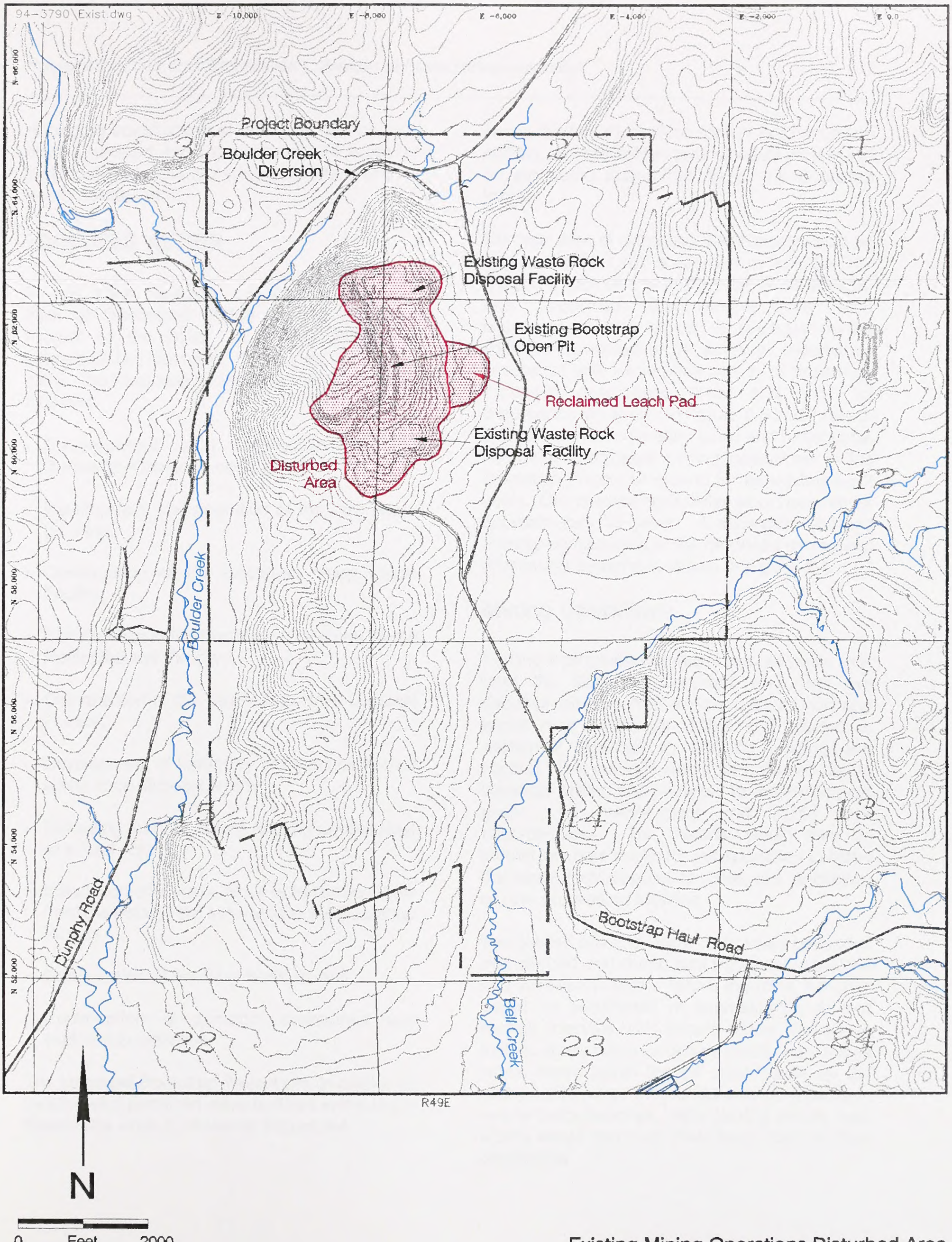
N53160 - Powerline

N38874 - Powerline

Surface Ownership/ROW

Bootstrap Project

FIGURE 2-2



Existing Mining Operations Disturbed Area
Bootstrap Project
FIGURE 2-3

(including construction of drill pads, sumps, and roads) account for approximately 54 acres of surface disturbance (30 acres public land and 24 acres private land).

PROPOSED ACTION

In July 1994, Newmont submitted a Proposed Plan of Operations (POO) for the Bootstrap Project to the BLM. A revised POO was submitted by Newmont (1995a) in September 1995. The Proposed Action described in the POO includes:

- Development and operation of the Bootstrap/Capstone open-pit mine;
- Development and operation of the Tara open-pit mine;
- Construction of the Bootstrap Heap Leach Facility;
- Construction of the Bootstrap/Capstone Waste Rock Disposal Facility;
- Construction of the Tara Waste Rock Disposal Facility;
- Development of refractory ore stockpiles on a waste rock disposal facility;
- Rerouting and upgrading existing access road to a haul road;
- Installation of a water pipeline to deliver water from the Betze/Post Mine area to the Bootstrap Project.
- Construction of ancillary facilities; and
- Continuation of geologic evaluations and exploration activities.

The proposed Bootstrap Project site, in relation to existing and permitted mine facilities in the North Operations Area, is shown in **Figure 2-4**.

Approximately 40.2 million tons of ore (oxide and sulfide) and 116 million tons of waste rock would be excavated during the life of the Bootstrap Project.

The total area of proposed disturbance would be approximately 1,037 acres, which includes 787 acres of public land and 250 acres of private land. The proposed disturbance area also encompasses 234 acres of previous mining disturbance, including 54 acres of disturbance associated with exploration activity at Bootstrap. Proposed disturbance areas and acres of disturbance are shown in **Figure 2-5** and **Table 2-2**. Under current operating plans and projections, Newmont anticipates mining operations in the Bootstrap Project to extend for approximately 7 years. Ore-processing facilities would operate for approximately 10 years. A schematic showing primary components of the proposed mining and processing systems is shown in **Figure 2-6**.

Mining Operations

Newmont proposes to remove ore and waste rock from the Bootstrap/Capstone and Tara ore deposits using open-pit mining methods. Ore and waste rock would be drilled and blasted in sequential benches to facilitate loading and hauling. Drill cuttings would be collected during blasthole drilling and analyzed to determine gold grade and metallurgical and waste rock characteristics. The material would then be loaded into haul trucks for transportation to either the waste rock disposal facilities, ore stockpiles, or ore- processing facilities.

The blasted ore and waste rock would be loaded into off-road, end-dump haul trucks using shovels and front-end loaders. Within the mine, benches would be established at approximately 20-foot vertical intervals with bench widths varying to include safety benches or haul roads. Haul trucks would move within the pit using roads on the surface of benches with ramps extending between two or more benches. After leaving the pit, haul trucks would travel on main haul roads to their destination.

TABLE 2-2
Proposed Disturbance in the Bootstrap Project Area

Proposed Action	Public Land (acres)	Private Land (acres)	Total Land (acres)
Bootstrap/Capstone Open-Pit Mine	0	62	62
Tara Open-Pit Mine	143	0	143
Bootstrap Heap Leach Facility	102	63	169
Bootstrap/Capstone Waste Rock Disposal Facility	194	24	218
Tara Waste Rock Disposal Facility	236	48	284
Access roads and ancillary facilities	117	62	169
Geologic evaluations	25	25	50
Existing geologic evaluations*	(30)	(24)	(54)
Total Proposed Disturbance	**787**	**250**	**1,037**
Previously disturbed area*	99	135	234
TOTAL DISTURBANCE	**886**	**385**	**1,271**

* The 54 acres of disturbance associated with the existing geological evaluations are included within the proposed disturbance for pits, waste rock disposal facilities, and leach facility.

Source: Newmont 1995a.

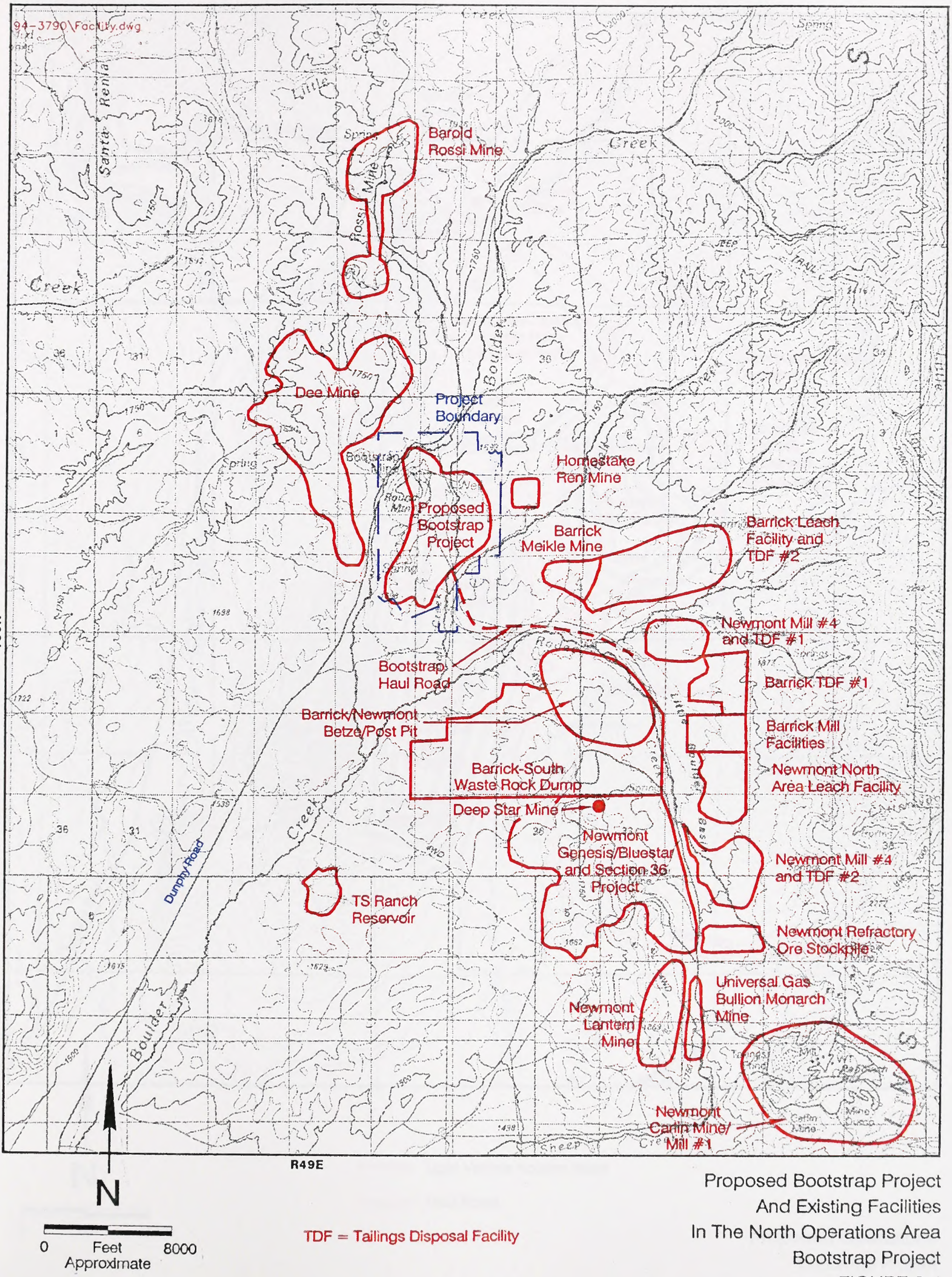
The Bootstrap/Capstone and Tara deposits consist primarily of oxidized material. However, 1.6 million tons of refractory ore would be mined from the Tara open pit and stockpiled to provide surge capacity for either the Refractory Ore Treatment Plant (Mill #6) located in the South Operations Area or for a bioleach process that is in the preliminary planning stages for the North Operations Area.

Refractory ore in the Tara deposit is a mixture of siliceous, sulfidic, and carbonaceous ore that occurs in limestone. Stockpiles of refractory ore would be located at a designated area on the Bootstrap/Capstone Waste Rock Disposal Facility or hauled to an existing refractory ore stockpile located in Section 3, T35N R50E, in the North Operations Area.

The Bootstrap/Capstone deposit does not contain sulfidic ore. Bootstrap/Capstone ore occurs in altered limestone that contains calcite, dolomite, and other carbonate minerals.

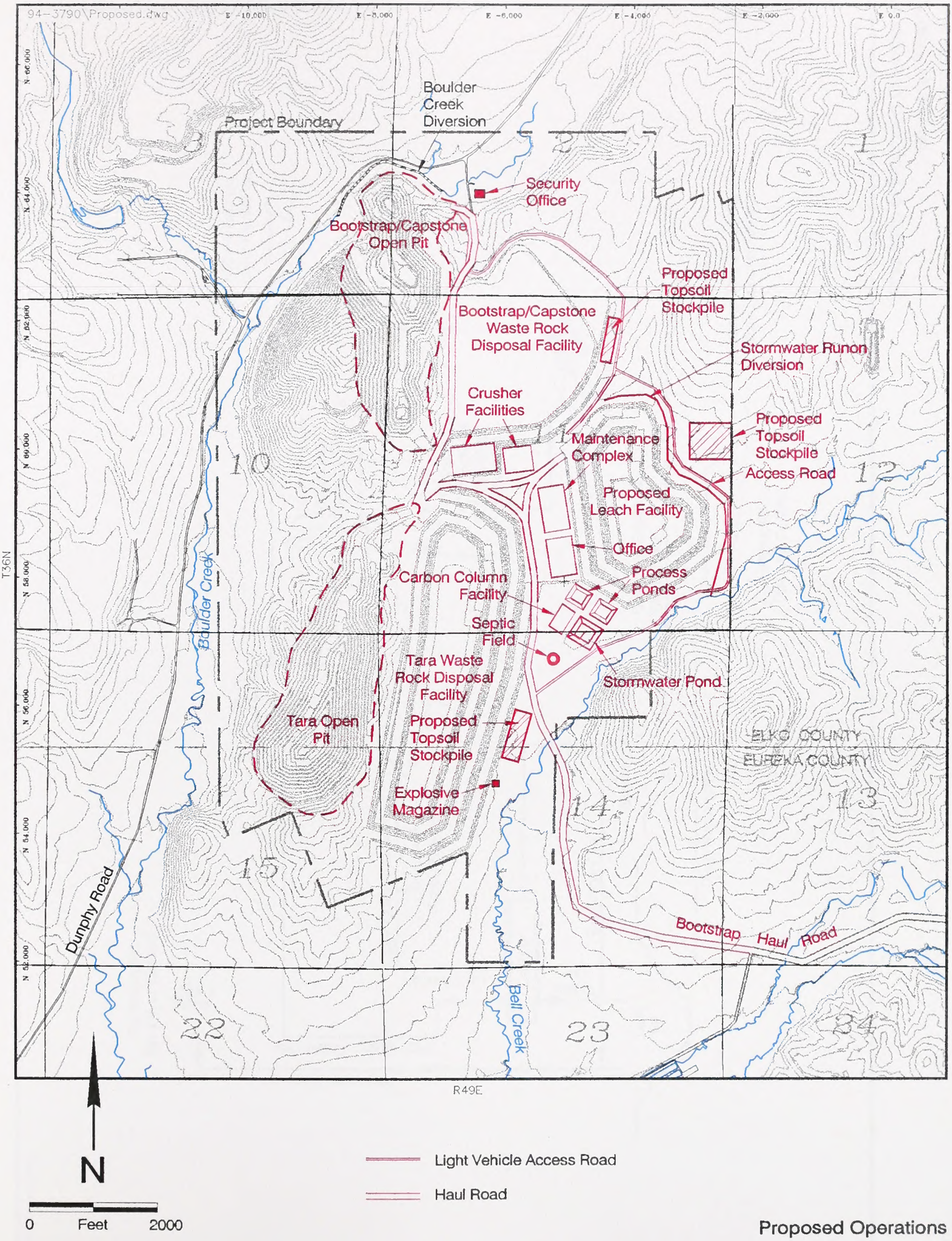
Bootstrap/Capstone Open-Pit Mine

Excavation of near-surface oxide ores at the Bootstrap/Capstone open-pit mine would disturb approximately 62 acres of private land in Sections 10 and 11, T36N R49E. The additional 62 acres of disturbance does not include the existing disturbance on 12 acres of public land and 47 acres of private land (**Table 2-1**). The mine would extend approximately 700 feet below existing ground surface and would measure 4,100 feet along the north-south axis and 1,500 feet in width. Approximately 33.1 million tons of ore would be removed over a 5-year period. Projected production rates for the Bootstrap/Capstone Mine are shown in **Table 2-3.**

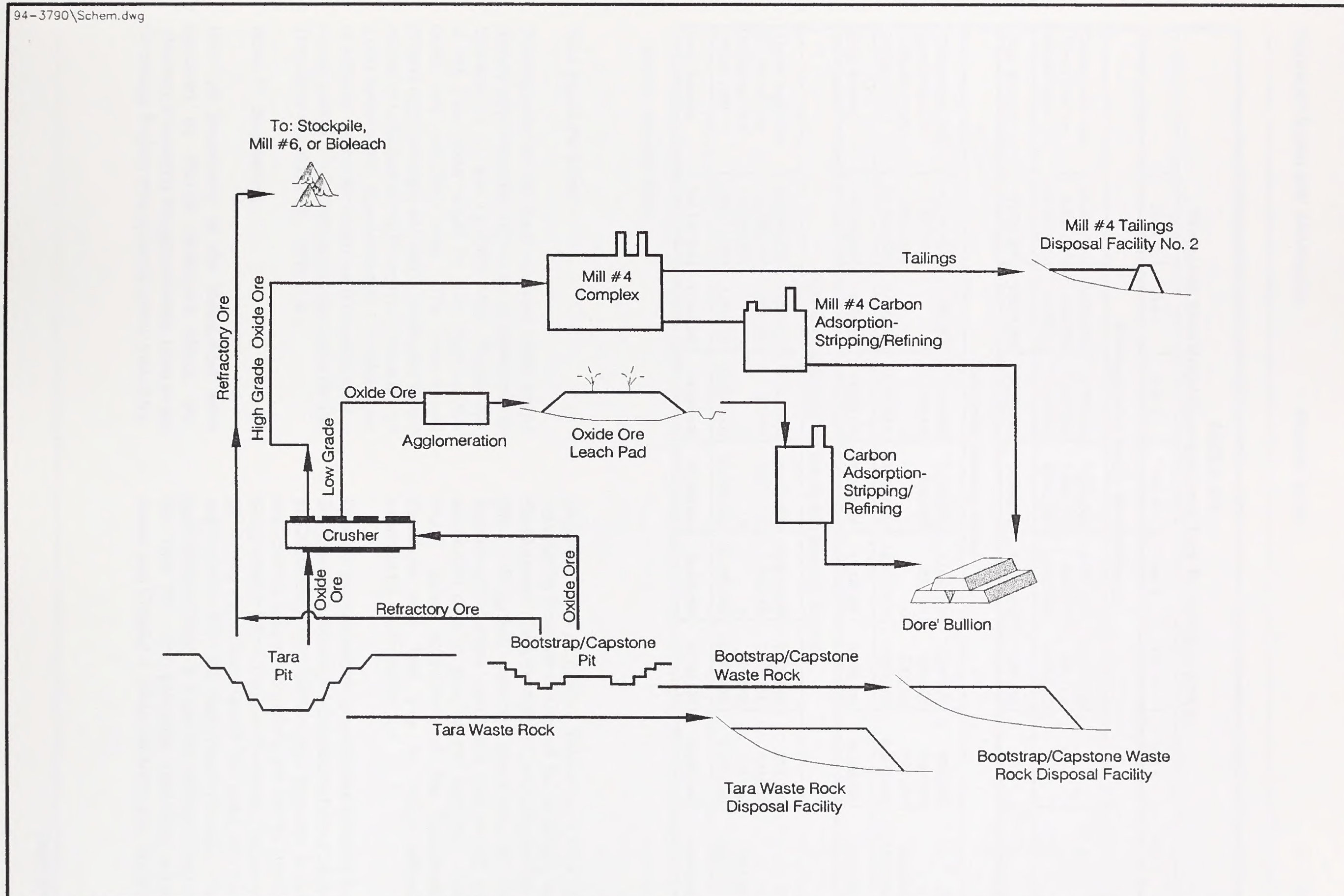


TDF = Tailings Disposal Facility

Proposed Bootstrap Project
And Existing Facilities
In The North Operations Area
Bootstrap Project
FIGURE 2-4



Proposed Operations
Bootstrap Project
FIGURE 2-5



Schematic of Proposed Operations
Bootstrap Project
FIGURE 2-6

TABLE 2-3
Projected Bootstrap/Capstone and Tara Production (tons)

	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Bootstrap/Capstone Material Movement Summary								
Oxide leach ore	28,500,000	3,400,000	5,700,000	7,000,000	8,600,000	3,800,000	0	0
Oxide mill ore	4,600,000	300,000	1,000,000	1,800,000	800,000	700,000	0	0
Waste rock	28,600,000	7,200,00	7,700,000	5,800,000	5,200,000	2,700,000	0	0
Total Material	**61,700,000**	**10,900,000**	**14,400,000**	**14,600,000**	**14,600,000**	**7,200,000**	**0**	**0**
Tara Material Movement Summary								
Oxide leach ore	4,100,000	100,000	500,000	1,200,000	1,000,000	1,000,000	300,000	0
Oxide mill ore	1,400,000	0	100,000	200,000	200,000	500,000	400,000	0
Refractory ore	1,600,000	0	0	0	0	200,000	700,000	700,000
Waste rock	87,400,000	6,000,000	14,300,000	21,100,000	18,000,000	17,600,000	8,900,000	1,500,000
Total Material	**94,500,000**	**6,100,000**	**14,900,000**	**22,500,000**	**19,200,000**	**19,300,000**	**10,300,000**	**2,200,000**
Total Bootstrap/Capstone and Tara Material Movement Summary								
Oxide leach ore	32,600,000	3,500,000	6,200,000	8,200,000	9,600,000	4,800,000	300,000	0
Oxide mill ore	6,000,000	300,000	1,100,000	2,000,000	1,000,000	1,200,000	400,000	0
Refractory ore	1,600,000	0	0	0	0	200,000	700,000	700,000
Waste rock	116,000,000	13,200,000	22,000,000	26,900,000	23,200,000	20,300,000	8,900,000	1,500,000
Total Material	**156,200,000**	**17,000,000**	**29,300,000**	**37,100,000**	**33,800,000**	**26,500,000**	**10,300,000**	**2,200,000**

Source: Newmont 1995a.

Tara Open-Pit Mine

Development of the Tara open-pit mine would disturb approximately 143 acres of public land in Sections 10, 11, and 15, T36N R49E. Production at the Tara Mine would be from near-surface oxide and refractory ores. The mine would extend approximately 440 feet in depth and would measure 4,000 feet along the north-south axis and 2,000 feet in width. Approximately 7.1 million tons of mineral resources would be recovered over a 7-year period. Projected production rates for the Tara Mine are shown in **Table 2-3**.

Mine Pit Dewatering

Mine pit dewatering at the Betze/Post Mine operated by Barrick Goldstrike Mines, Inc. (Barrick) is lowering the groundwater table in the Bootstrap Project area to levels below that of the proposed open-pit mines. Therefore, a mine pit dewatering program would not be necessary for development of the Bootstrap/Capstone and Tara pits. Proposed mining operations at the Bootstrap/Capstone and Tara pits would be concluded prior to groundwater recovery. This would allow excavation of the Bootstrap/Capstone and Tara pits to occur without intercepting groundwater.

During mine operations, groundwater entering the Bootstrap/Capstone pit from perched water zones in Quaternary- and Tertiary-age deposits is not expected to exceed 30 gallons per minute (gpm). Groundwater inflow into the Bootstrap/Capstone pit during operations would be used for dust suppression or in the heap leach process. No groundwater inflow is expected during mining of the Tara Pit. For predicted post-mine water levels, see Chapter 4, Water Quantity and Quality.

Waste Rock Disposal Facilities

Development of the Bootstrap/Capstone and Tara open-pit mines would require construction of one new waste rock disposal facility and expansion of an existing waste rock disposal facility. These facilities would be engineered for stability and designed, where practicable, with boundaries to blend with surrounding topography. Waste rock would be placed by end-dumping down an advancing face in successive horizontal lifts varying in height from 10 to 200 feet, depending on topography. Waste rock would be reclaimed at an overall average slope of 2.5 horizontal to 1.0 vertical (2.5H:1.0V).

Bootstrap/Capstone Waste Rock Disposal Facility

Development and operation of the Bootstrap/Capstone open-pit mine would generate approximately 28.6 million tons of waste rock and would require expansion of the existing Bootstrap Waste Rock Disposal Facility. Portions of the existing Bootstrap Waste Rock Disposal Facility would be relocated to the proposed Bootstrap/Capstone Waste Rock Disposal Facility to accommodate expansion of the Bootstrap/Capstone pit. The proposed new waste rock disposal facility, located on approximately 194 acres of public land and 24 acres of private land immediately east of the Bootstrap/Capstone open pit, would cover the reclaimed heap leach pad. The height of the waste rock disposal facility would range from 100 to 300 feet above the existing terrain.

Up to 2 million tons of refractory ore would potentially be stockpiled in the southern portion of the Bootstrap/Capstone Waste Rock Disposal Facility. If refractory stockpiles are not economical to process, and it is determined that they are potentially acid producing, they would be encapsulated in accordance with the Refractory Stockpile and Waste Rock Dump Monitor Plan (Newmont 1995a). If potentially acid-producing waste rock is encountered, it would be handled in a similar manner (see Resource Monitoring section in this chapter).

Tara Waste Rock Disposal Facility

Development and operation of the Tara open-pit mine would produce approximately 87.4 million tons of waste rock. The proposed Tara Waste Rock Disposal Facility would be located immediately east of the Tara open-pit and would disturb approximately 236 acres of public land and 48 acres of private land. The height of the waste rock disposal facility would vary between 300 and 400 feet above the natural ground surface.

Ore Stockpiles and Ore Processing

Approximately 6 million tons of oxide mill-grade ore would be excavated through development of the Bootstrap/Capstone and Tara open pits. Ore would be hauled to and processed in the existing Mill #4 located in the North Operations Area. Tailings from Mill #4 would be deposited in the existing Mill #4 Tailings Disposal Facility (TDF) No. 2 (**Figure 2-4**). Modification or expansion of the tailings disposal facility beyond the current authorized capacity would not be required to process ore from the Bootstrap Project.

Approximately 1.6 million tons of refractory ore would be mined from the Tara pit. The refractory nature of this ore is due to the presence of carbon and pyrite minerals with some silica encapsulation. The refractory ore would be stockpiled at one of the following three refractory ore stockpile locations until the ore can be processed:

1) Bootstrap/Capstone Waste Rock Disposal Facility;

2) Refractory ore stockpiles at the North Operations Area (**Figure 2-4**);

3) Refractory ore stockpiles at Mill #6. Refractory ore would be hauled via the North Area Haul Road and stockpiled to provide surge capacity for the mill.

Haulage of up to 16.5 million tons of refractory ore to Mill #6 via the North Area Haul Road was analyzed by BLM as part of the South Operations Area Project EIS and Record of Decision (BLM 1993a).

Bootstrap Heap Leach Facility

Mining at the Bootstrap Project area would result in excavation of approximately 32.6 million tons of low- grade oxide ore. This ore would be processed in a conventional cyanide heap leach pad constructed east of the Bootstrap/Capstone mine pit. The ultimate height of the leach pad would be 300 feet above the natural ground surface. The proposed leach facility, which would operate for approximately 10 years, would encompass approximately 102 acres of public land and 63 acres of private land.

The proposed Bootstrap Heap Leach Facility would be constructed adjacent to the Bootstrap/Capstone and Tara waste rock disposal facilities in six stages: 1) topsoil would be removed and stockpiled; 2) remaining subsoils would be compacted to attain a low-permeable subgrade; 3) an 80-mil (0.080-inch), high-density polyethylene (HDPE) synthetic liner would be installed; 4) an 18-inch-thick layer of fine-grained gravel material would be placed over the liner for protection; 5) an additional 18-inch-thick coarse rock layer would be added for drainage purposes; and 6) ore would be placed in successive lifts on top of the prepared base. A small amount of nonacid-producing waste rock (<5% of total waste rock) would be used for construction of the proposed Bootstrap Heap Leach Facility.

Figure 2-6 illustrates the various stages of the proposed heap leach ore processing. Leach-grade ore would be excavated from the Bootstrap/Capstone and Tara pits and transferred via haul trucks to a crushing facility. After crushing the ore to reduce its size, cement or other agglomerating agents and water would be added to agglomerate fine particles that could otherwise impede flow of the solution. Crushed and agglomerated ore would be dumped and spread in 50-foot lifts on the leach pad. The maximum overall height of the leach pad would reach 300 feet. The leach ore would be processed through the crushing facility at a peak rate of 6.0 million tons per year. Ore production in excess of this amount would be placed directly on the leach pad.

After the ore is in place, a weak cyanide leach solution would be applied by continuous drip emitter or sprinkler systems at a typical rate of 0.006 gallons per square foot per minute. The leach solution would migrate through the ore pile, dissolve gold contained in ore, and drain to a central collection point at the bottom of the ore pile. A typical leach cycle is expected to take up to 90 days.

The leach solution containing the dissolved gold would be pumped from the collection point (two pregnant solution ponds) to a series of activated carbon columns, where gold is adsorbed onto carbon. A single train of carbon columns capable of processing up to 6,000 gpm would be placed adjacent to the pregnant solution ponds. The gold-laden carbon would be periodically removed and transported to the stripping facility located at the North Area Leach for gold recovery. After removal of gold from solution, the solution would be recycled to the leach pad. Ore processing would continue for approximately 3 years following completion of mining operations, based on gold recovery and other criteria. Water supplies are discussed in Chapter 2, Water Pipeline.

Process ponds for pregnant solutions would be located southwest of the heap leach facility (**Figure 2-5**). The ponds would be constructed with a primary and secondary liner and a leak-detection and collection system between liners. A storm water pond would be designed and constructed to capture and contain run-off from a 100-year/24-hour storm event.

ROADS AND ANCILLARY FACILITIES

A total of 169 acres (117 acres public land and 52 acres private land) would be disturbed for construction and widening of access roads (35-foot roadbed width) and haul roads (120-foot roadbed width) and construction of maintenance complex, office, fueling facilities, surface water control ditches, and other ancillary mine facilities. Roadbed width is the width of the travel surface of the road. These facilities are further described in this section.

Haul Roads

Development of the Bootstrap Project would require upgrading and relocating an existing road between the project site and the Mill #4 complex. Approximately 4 miles of haul road would be widened to 120 feet (roadbed width) to safely accommodate haul truck traffic between the project site and Mill #4. As waste rock disposal facilities expand, approximately 1.5 miles of the existing route would be relocated. The proposed haul road is shown in **Figure 2-7.** In addition, an amendment to ROW N-7683 would be required to widen the existing haul road.

Approximately 6 million tons of ore would be hauled to Mill #4 from the Bootstrap Project using 120- to 190-ton trucks. Haul truck traffic between Mill #4 and the proposed project site would range from 5 to 45 trucks per day. A small amount of nonacid-producing waste rock (<5% of total waste rock produced from the Bootstrap Project) would be used for road construction. Newmont has applied to USCOE to amend its Clean Water Act, Section 404, Permit No. 199300369 for the new road crossing at Bell Creek (**Figure 2-7**).

Access Roads

Approximately 3 miles of access roads would be constructed from the Dunphy Road to an intersection south of the mining operation near Bell Creek. Light vehicle traffic would be integrated with haul trucks and other mining equipment at this intersection. Access roadbed disturbance width would average 35 feet. The access road would be constructed using in-situ materials and waste rock similar to the haul road.

Ancillary Facilities

Ancillary facilities in the Bootstrap Project would include an office; a security office; equipment ready line (to accommodate shift change parking); fueling facilities; equipment maintenance complex; explosives magazine; topsoil stockpile; hydrocarbon-contaminated soil treatment pad; septic field; Class III landfill; surface water control ditches; downstream cutoff trenches; power distribution systems; and water developments (to provide a constant, reliable source of water). Potable water for human consumption would be transported to the site via truck. Additional information for the ancillary facilities is in the POO (Newmont 1995a).

Water Pipeline

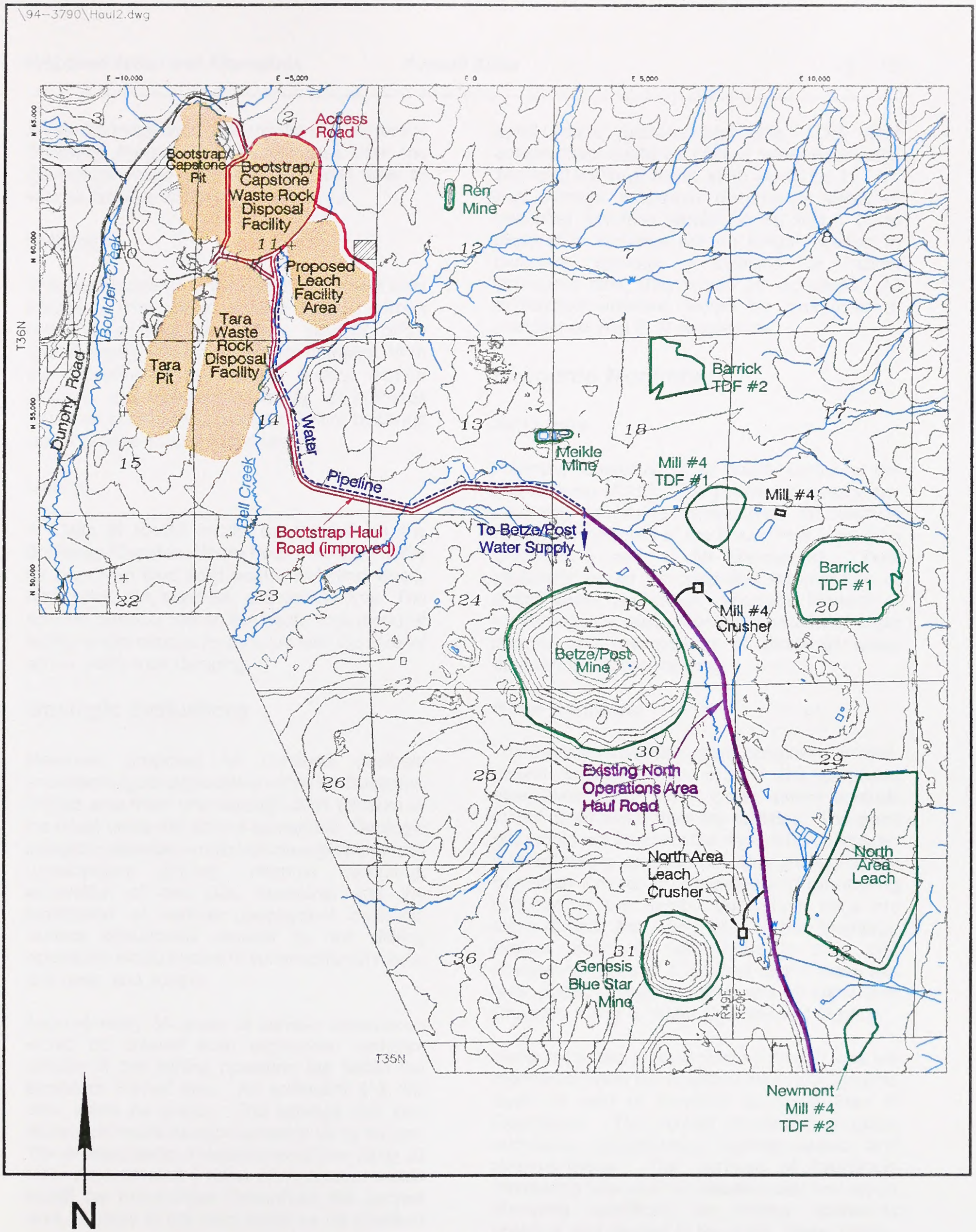
A constant supply of water for operation of the heap leach facility and other project activities would be supplied via a buried pipeline from the Betze/Post Mine approximately 4 miles southeast of the Bootstrap Project area. This 8- to 12-inch diameter pipeline would be constructed of HDPE material. Water would be used by the heap leach facility, as well as in the office and maintenance facilities, and for dust control. The water make-up requirement for the Bootstrap Project is approximately 500 gpm. The pipeline would be constructed within the 120-foot wide haul road corridor from the Betze/Post Mine to the project site (**Figure 2-7**).

Water Control Ditches

A primary stormwater run-on diversion ditch would be located on the east side of the heap leach facility to prevent water from undisturbed areas from entering the project site (**Figure 2-5**). Run-off water from the heap leach pad would be contained within the leach fluid management system. Run-off from other facilities would be managed according to Newmont's Stormwater Pollution Prevention Plan (Newmont 1996). Various water control ditches would be used to collect stormwater within the project area. All water control ditches would be vegetated to control erosion.

Energy Requirements

Energy required for the Bootstrap Project area would be supplied by on-site diesel generators.



0 Feet 4000

TDF = Tailings Disposal Facility

Proposed Haul Road and Pipeline
Bootstrap Project
FIGURE 2-7

A total 3.5 megawatts of energy is required for the Bootstrap Project. Distribution lines from the generators would extend as overhead lines to various facilities within the project area.

Buildings

Proposed buildings in the Bootstrap Project area include a time shack, crusher facility, carbon columns, administrative office, security office (guard shack), and a maintenance complex. With the exception of the crusher facility, carbon columns, and maintenance facility, all buildings would be portable and modular. Other buildings would require concrete foundations.

Landfill

A Class III landfill would be located on the Bootstrap/Capstone Waste Rock Disposal Facility for approved inert solid waste, including wood, rock, brick, dirt, concrete, and vehicle tires. The specific disposal site on the waste rock disposal facility would change to coincide with the area of active waste rock dumping.

Geologic Evaluations

Newmont proposes to continue geologic evaluations (gold exploration) within the Bootstrap Project area from 1996 through 2003 (closure of the mine) under this plan of operations. Geologic evaluation activities would include exploration and development drilling, channel sampling, excavation of test pits, trenching, and the application of various geophysical methods. Surface disturbance created by the drilling operations would consist of construction of roads, drill pads, and sumps.

Approximately 50 acres of surface disturbance would be created from exploration activities outside of the mining operation but within the Bootstrap Project area. An estimated 315 drill sites could be drilled. The average drill pad dimension would be approximately 85 by 50 feet. The average sump dimension would be 70 by 20 feet. An estimated 8 miles of exploration roads would be constructed throughout the project area. Access to drill sites would be via overland travel where practical and safe. Drill road construction would be utilized when necessary. The road width or travel width would be 12 feet. The average maximum disturbance width of trenching activities would be 25 feet. Once exploration activities are no longer needed to complete geologic evaluations or collect geological data, they would be reclaimed. All exploration activities would be conducted in compliance with BLM regulations.

Resource Monitoring

Air Quality

Newmont is seeking an air quality permit for the project from NDEP. The permit will specify any air quality monitoring requirements. Air quality is currently monitored at the Betze/Post Mine (see Chapters 3 and 4, Air Resources). Dust emissions would be controlled through use of direct water application, chemical binders or wetting agents, dust collection devices and water sprays, and revegetation of disturbed areas concurrent with operations.

Water Resources

The Boulder Creek Diversion, completed in 1995, diverts Boulder Creek around the proposed operations; other storm water run-on controls would divert water from the facilities. The open pits would not intersect the regional groundwater system during operations. After mining at the Bootstrap Project is completed and dewatering activities at the nearby Betze/Post Mine are discontinued, the open pits of the Bootstrap Project would fill with water to near pre-dewatering levels of 5,250 feet above mean sea level (AMSL), creating permanent pit lakes (see Chapters 3 and 4, Water Quantity and Quality).

Water resources in the Bootstrap Project area are monitored within the Boulder Creek hydrographic basin as part of Barrick's approved Plan of Operations. The current monitoring program addresses groundwater, springs/seeps, and streams/rivers. The purpose of hydrologic monitoring is to establish baseline data and report changing conditions as mining operations continue and expand in the area. Water quality, levels, and flows are measured monthly or quarterly at designated monitoring wells, springs/seeps, and surface water stations. The U.S. Geological Survey (USGS) also collects groundwater and surface water data in the project area. Additional details on the hydrologic monitoring program in the Boulder Creek hydrographic basin are included in Chapter 3, Water Quantity and Quality. Newmont would monitor stability and function of the diversions and maintain them as required.

Cultural Resources

Inventories for cultural resources to date indicate that six sites eligible for the National Register of Historic Places would be impacted by the Proposed Action. These sites, and any new eligible sites discovered during ongoing cultural inventories, would be mitigated by Newmont in conformance with Section 106 of the National Historic Preservation Act (Newmont 1995a). For additional discussion of cultural resources, see Chapters 3 and 4, Cultural Resources.

Paleontological Resources

In the event vertebrate fossils are discovered within the Bootstrap Project area during the mining operations, Newmont would immediately notify the BLM Authorized Officer.

Potentially Acid-Producing Rock

Acid rock drainage from excavation of potentially acid-producing material is not anticipated from the Bootstrap/Capstone or Tara mines. Approximately 1.6 million tons of refractory ore would be mined from the Tara pit. The refractory nature of this ore is due to the presence of carbon and pyrite minerals with some silica encapsulation. These minerals are present in a limestone matrix and analyses indicate that the ore and waste rock would not create acid rock drainage (see Chapter 4, Geology and Minerals).

Testing has determined that waste rock mined with the ore would have neutral to high pH buffering capacities. Newmont would continue to sample, test, and classify waste rock in accordance with NDEP Waste Rock and Overburden Evaluation Guidelines (NDEP 1990) to determine its potential to generate acid. Should potentially acid-producing waste rock be identified, it would be separated and encapsulated within the waste rock disposal facility and monitored in accordance with the Refractory Stockpile and Waste Rock Dump Monitor Plan (Newmont 1995a).

Newmont designed the Bootstrap/Capstone Waste Rock Disposal Facility to accommodate a stockpile of up to 2 million tons of refractory ore (sulfide-rich or carbonaceous ore). If the refractory material is uneconomical to process, it would be encapsulated according to guidelines in Newmont's Refractory Stockpile and Waste Rock Dump Monitor Plan (Newmont 1995a).

The Tara Waste Rock Disposal Facility is designed to accommodate up to 11 million tons of potentially acid-producing waste rock. According to Newmont's Refractory Stockpile and Waste Rock Dump Monitor Plan (Newmont 1995a), potentially acid-producing waste rock would be placed in the interior of designated waste rock storage areas.

Wildlife

As part of the Proposed Action, monitoring programs would be implemented to determine wildlife mortality, particularly birds and bats. The heap leach facility would be thoroughly searched and dead wildlife would be identified and reported as directed by NDOW. If a given site contributes substantially to wildlife mortality, BLM and NDOW would be consulted and appropriate mitigation measures (e.g., detoxification of affected water, netting, or fencing) would be employed to reduce or eliminate the problem.

Hazardous Materials

Quantities Greater Than Reportable Quantities

The term "hazardous materials" is defined in 49 CFR 172.101. Hazardous substances are defined in 40 CFR 302.4 and the Superfund Amendments and Reauthorization Act (SARA) Title III. Hazardous materials and hazardous substances that would be transported, stored, or used at the

Bootstrap Project in quantities greater than the Threshold Planning Quantity (TPQ) designated by SARA Title III for emergency planning are summarized in **Table 2-4**.

The primary route for transporting hazardous materials to the Bootstrap Project area would be the Dunphy Road via I-80 west of Carlin, Nevada. The alternative transportation route would be via Newmont's Gold Quarry operations, 6 miles north of Carlin, Nevada. U.S. Department of Transportation-regulated transporters would be used for shipment. USDOT-approved containers would be used for on-site storage (Newmont 1995a), and spill containment structures would be provided. Hazardous materials would be stored in designated areas on private and public land.

Quantities Less Than Reportable Quantities

Small quantities of hazardous materials not included in **Table 2-4** would also be managed at the Bootstrap Project area. Hazardous materials that would be transported, stored, and used at the Bootstrap Project in quantities less than the TPQ are: ammonium hydroxide, gasoline, sodium hydroxide (solid and solution), sodium hypochlorite, paints, office products, and automotive and equipment maintenance products.

Cyanide

Process ponds for cyanide solution and use of cyanide at the Bootstrap Project are described in Chapter 2, Proposed Action, Bootstrap Heap Leach Facility. Cyanide storage, consumption and waste management practices are shown on **Table 2-4**. At the end of the project, remaining cyanide solution would be neutralized and detoxified as described in Chapter 2, Reclamation. Potential impacts of cyanide on water resources are described in Chapter 4, Water Quantity and Quality.

Spill Prevention and Response Procedures

Newmont's Stormwater Pollution Prevention Plan (Newmont 1996) states that all maintenance facilities and fueling vehicles would be equipped with spill response materials such as absorbents. Earth moving equipment would be available from the mining operation for constructing dikes. Above-ground tanks and associated piping would be visually inspected for leaks on a daily basis. Bulk storage tanks would be constructed with secondary containment to accommodate at least 110 percent of the largest tank. Mobile or portable oil storage tanks would be isolated to prevent spilled oil from reaching surface water.

Newmont personnel would be instructed in the operation and maintenance of equipment to prevent the discharge of oil. Spill response training would be provided through the Environmental Compliance Awareness Program outlined in Newmont's Emergency Response Plan (Newmont 1995b). Supervisors would schedule and conduct spill prevention briefings for personnel that would include a review of the Spill Prevention, Control and Countermeasure Plan (Newmont 1995c). Known spills, malfunctioning components, and precautionary measures would be discussed during briefings.

TABLE 2-4
Hazardous Materials Management
Bootstrap Project

Substance	Area Used/Stored	Rate of Use (per year)	Quantity Stored On-site	Storage Method	Shipment Quantities	Waste Management
Sodium cyanide	Leach pad	1,920,000 lbs	25,000 lbs	Bulk tank (liquid)	17,000 lbs	Reused
Diesel fuel	Mine pit/truck shop	4,294,000 gal	70,000 gal	Bulk tank	11,000 gal	No waste generated
Hydraulic fluid	Mine pit/truck shop	32,000 gal	10,000 gal	Bulk tank totes, drums	500 gal	Recycled
Motor oil	Mine pit/truck shop	53,000 gal	15,000 gal	Bulk tank totes, drums	1,000 gal	Recycled
Antifreeze	Mine pit/truck shop	6,000 gal	5,000 gal	Bulk tank totes, drums	2,800 gal	Recycled
Grease	Mine pit/truck shop	82,000 gal	7,000 gal	Totes, drums	1,000 gal	Recycled

Source: Conger 1995a.

Hazardous Wastes

Newmont's Resource Conservation and Recovery Act (RCRA) U.S. Environmental Protection Agency (USEPA) hazardous waste number for the Bootstrap Project is NVD070016662. Newmont has a waste minimization program which evaluates hazardous substances used on the mine property. Where possible, alternative products that generate no waste or solid waste, rather than RCRA-regulated hazardous waste, would be used. Newmont does not anticipate generating RCRA-regulated hazardous waste at the Bootstrap Project area. At the end of its useful life, carbon used in the heap leach facility gold recovery columns would be disposed consistent with applicable laws. Spent carbon used for the extraction of gold is excluded from RCRA hazardous waste management requirements by the Bevill Amendment which is codified under 40 CFR 261.4.

Human Health and Safety

General Requirements

The Bootstrap Project area is subject to the Federal Mine Safety and Health Act of 1977 (MSHA), which sets mandatory safety and health standards for surface metal and nonmetal mines, including open-pit mines. The purpose of these standards is the protection of life, promotion of health and safety, and prevention of accidents. Regulations promulgated under MSHA are codified under 30 CFR Subchapter N, Part 56.

Newmont would control traffic along the Dunphy Road during blasting periods at the Bootstrap Project. Traffic control would include Newmont personnel stopping traffic along the road at distances of 2,500 feet or more from the Bootstrap Project site. Traffic would be allowed to resume after blasting is concluded.

Health and Safety Training Programs

All new employees at the Bootstrap Project area would be required by Newmont to receive training outlined in **Table 2-5.**

Employment

Newmont presently employs approximately 555 people at the North Operations Area. Because personnel from the North Operations Area would operate the Bootstrap Project, Newmont does not anticipate an increase in its long-term work force. Up to 110 temporary employees would be hired during construction of project facilities which is expected to take about a year. Approximately half of the temporary construction workers would be hired from local communities (Conger 1995b).

Reclamation

Reclamation activities described in this section address both existing mine lands and lands included in the proposed expansion at the Bootstrap Project area. In compliance with BLM 43 CFR 3809 regulations and NDEP NRS/NAC 519A regulations, Newmont filed a reclamation and closure plan for the Bootstrap Project (Newmont 1995d).

The BLM Elko District's reclamation and revegetation goal for the area is as follows: leave areas disturbed by mining in a stable configuration that would withstand erosion and slump failure; to the extent feasible and reasonable, contour and slope mining disturbances to blend and match the surrounding topography; establish self-sustaining plant communities that achieve as close to 100 percent of the perennial plant cover of selected vegetation communities or reference areas as possible (Instruction Memorandum No. NV-94-026), and utilize diverse plant seed mixes in a mosaic pattern with plant species adapted to different geomorphic and environmental settings. Objectives of the reclamation and closure plan are to establish post-mining land uses including wildlife habitat, domestic livestock grazing, dispersed recreation, mineral exploration, and aesthetic values. Reclamation and closure would promote public safety, minimize adverse visual effects, and reestablish stable topographic features that would support a diverse, self-sustaining vegetative community.

TABLE 2-5
Bootstrap Project Area Health and Safety Training Programs

Course	Personnel	Frequency	Duration	Instruction
New-hire training	All new hires exposed to mine hazards	Once	24 hours	Employee rights Supervisor responsibilities Self-rescue Respiratory devices Transportation controls Communication systems Escape and emergency evacuation Ground control hazards Occupational health hazards Electrical hazards First aid Explosives Toxic materials
Task training	Employees assigned to new work tasks	Before new assignments	Variable	Task-specific health and safety procedures Supervised practice in assigned work tasks in nonproductive duty Supervised operation of assigned work tasks in productive duty
Refresher training	All employees who received new-hire training	Yearly	8 hours	Required health and safety standards Transportation controls Communication systems Escapeways, emergency evacuations Fire warning Ground control hazards First aid Electrical hazards Accident prevention Explosives Respirator devices
Hazard training	All employees exposed to mine hazards	Once	Variable	Hazard recognition and avoidance Emergency evacuation procedures Health standards Safety rules Respiratory devices

Source: Newmont 1995a.

Reclamation activities include closure and regrading of the heap leach facility, berming and installation of warning signs around the perimeter of open-pits, removal of structures not needed after cessation of operations, regrading of disturbed areas (including waste rock disposal facilities and roads), drainage control, well closure, replacement of salvaged soils, revegetation, and reclamation monitoring. The reclamation schedule would encompass the period between cessation of mining through decommissioning and revegetation of the heap leach facility. Reclamation activities are expected to be completed approximately 10 years after mining ceases.

As the various facilities reach the end of their useful lives, Newmont would initiate closure and reclamation measures. Reclamation would take place concurrent with operations where possible. The proposed post-reclamation topography for the Bootstrap Project is shown in **Figure 2-8**. **Figure 2-9** depicts cross-sections through selected portions of the mining area.

Soil Salvage

As open-pit mines, heap leach pad, haul roads, and waste rock disposal areas are developed, Newmont would recover available topsoil for future use in reclaiming disturbed areas. Topsoil recovery depths would be determined during salvage operations by reclamation specialists. Topsoil would be salvaged and transported to stockpiles using scrapers, wheel dozers, track dozers, haul trucks, and loaders. Topsoil stockpiles would be constructed in a series of sequential lifts with slopes graded to approximately 2.5H:1.0V and protected from wind and water erosion through establishment of vegetative cover. For a summary of topsoil salvage depths, see Chapter 3, Soil and Watershed.

Grading Disturbed Areas

Prior to replacing soil or a suitable growth medium, facilities would be graded except the open pits. Grading would create a stable post-mining configuration for disturbed areas, establishing effective drainage to minimize erosion and protect surface water resources.

To the extent practicable, grading would blend disturbed areas with the surrounding terrain. Angular features, including tops and edges of waste rock disposal facilities, would be rounded.

In areas where the post mining configuration cannot be significantly altered (i.e., mine pits), and where localized drainage and erosion control measures are necessary, Newmont would evaluate site-specific conditions and implement appropriate stormwater control measures. Contour ditches check dams, erosion control materials, and small catch basins may be utilized to stabilize the site.

Prior to initiating the proposed reclamation vegetation plan, Newmont would evaluate topsoil replacement depths for north and south exposures. Soil replacement depths would vary according to location and soil type. The variety of replacement depths would provide different vegetation mosaics on reclaimed areas.

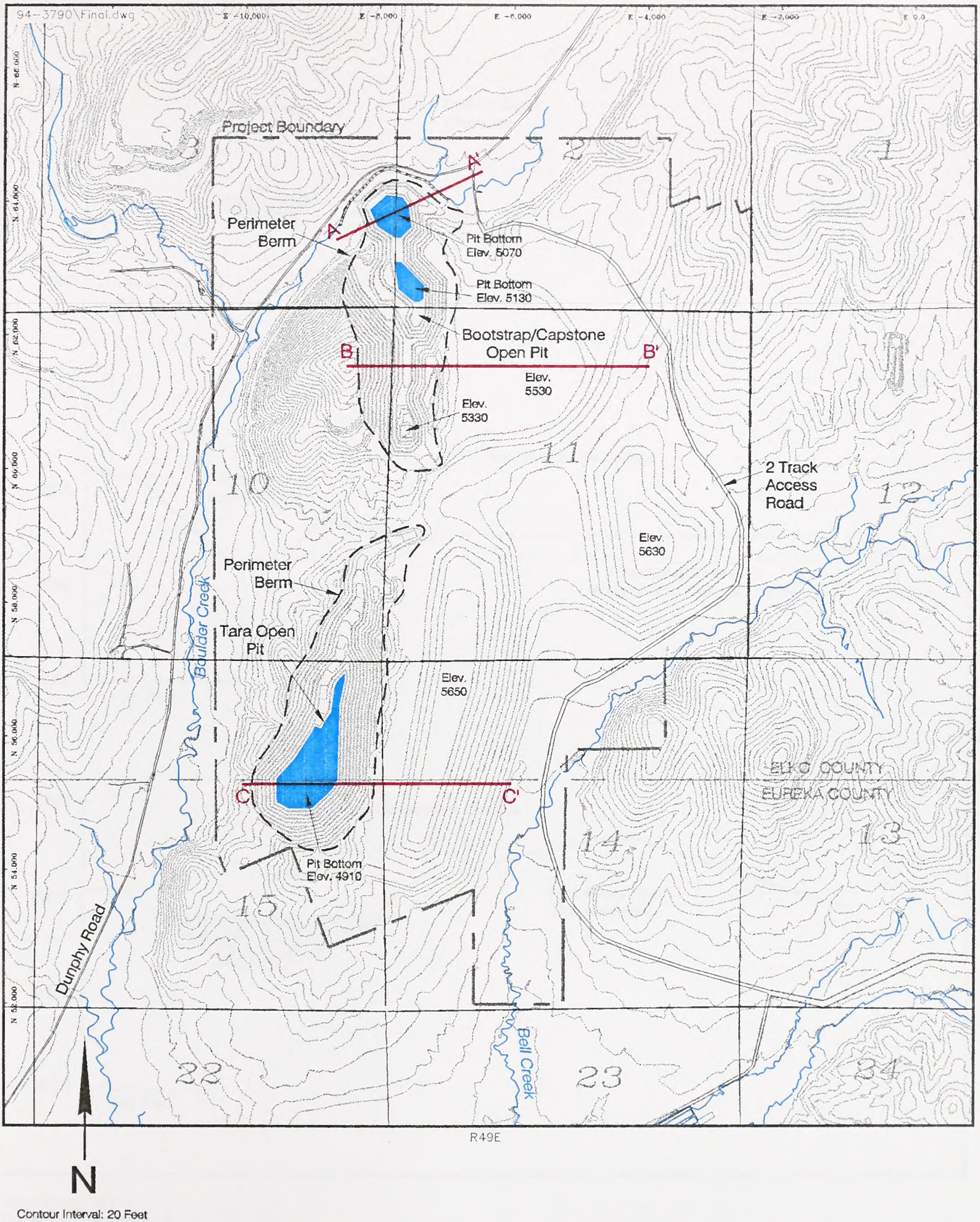
Revegetation

Newmont's goals for revegetation programs are to stabilize reclaimed areas, ensure public safety and establish a productive vegetative community based on the applicable land use plan and designated post-mining land uses.

Table 2-6 is a seed list proposed for the Bootstrap Project area. Seed mixes would be selected from the seed list, depending on availability or cost, and would be applied at a rate of 5 to 15 pounds per acre. Modifications in the seed list, application rates, and cultivation methods and techniques could occur based on success of concurrent reclamation. Changes and/or adjustments to seed mixtures and application rates would be developed through consultation with and approval by BLM. Seedlings may be substituted for seeds.

After spreading of suitable growth media, the surface would be scarified prior to seeding to reduce compaction, provide a uniform seed bed, and establish a good bond between the seed and soil growth media. Scarifying would include ripping, discing, tilling, or any necessary combination of these practices. Where feasible, scarifying would follow topographic contours to help limit erosion and create micro-climates for new vegetative growth.

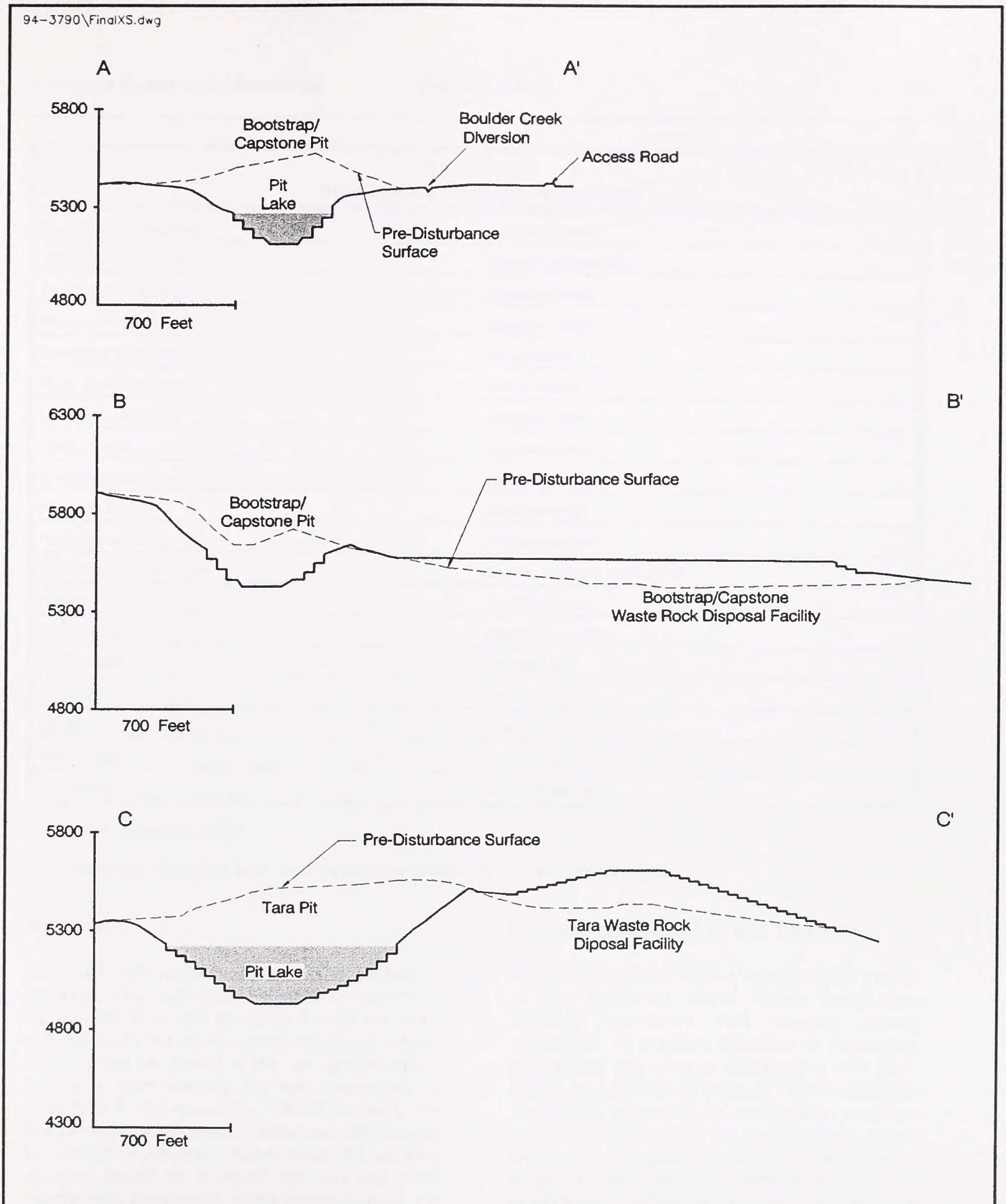
Soil amendments such as commercial fertilizers and mulch may be added to enhance reclamation success. Organic amendments or mulch (e.g., manure, sludge, or decomposed plant material) could supplement available topsoil. During reclamation, Newmont may install temporary fencing to allow seeded areas to become established and to protect them from grazing, until specific reclamation objectives are achieved.



Post-Reclamation Topography And Cross Section Locations

Bootstrap Project

FIGURE 2-8



See Figure 2-8 For
Cross Section Locations

Cross Sections of Post-Reclamation Topography
Bootstrap Project
FIGURE 2-9

TABLE 2-6
Seed List for Bootstrap Project Area

Bluebunch wheatgrass	*Agropyron spicatum*
Thickspike wheatgrass	*Agropyron dasystachyum*
Streambank wheatgrass	*Agropyron riparium*
Western wheatgrass	*Agropyron smithii*
Sandberg bluegrass	*Poa sandbergii*
Great Basin wildrye	*Elymus cinereus*
Chickpea milkvetch	*Astragalus cicer*
Small burnet	*Sanguisorba minor*
Scarlet globemallow	*Sphaeralcea coccinea*
Prostrate kochia	*Kochia prostrata*
Fourwing saltbush	*Atriplex canescens*
Wyoming big sagebrush	*Artemisia tridentata wyomingensis*
Bitterbrush[1]	*Purshia tridentata*
Serviceberry[1]	*Amelanchier alnifolia*
Snowbrush[1]	*Ceanothus spp.*
Winterfat	*Ceratoides lanata*
Currant[1]	*Ribes spp.*
Woods rose[1]	*Rosa woodsii*
Snowberry[1]	*Symphoricarpos spp.*

Source: Newmont 1995d.

[1] Seedlings, rather than seed, could be planted in designated areas during reclamation.

Mulching

Based on reclamation success at other projects in the area, mulch consisting of straw or hay would be applied at a rate of up to 2 tons per acre, depending on the surface to be reclaimed. Mulch could either be added to the soil growth media before or after seeding the site, depending on specific soil characteristics. Mulch added to the soil prior to seeding would be mixed with the soil by ripping or plowing. Mulch added to soil after seeding would be crimped into the soil using mechanical equipment where slopes permit. On steeper slopes, mulch would be held in place by chemical tackifiers or other accepted methods.

Concurrent Reclamation and Test Plots

As various facilities reach the end of their period of use, Newmont would initiate reclamation activities concurrent with ongoing mining operations. In addition, Newmont is developing reclamation test plots in cooperation with BLM, NDEP, and Nevada Division of Wildlife (NDOW). The results of concurrent reclamation practices and test plots would be evaluated to select successful, site-specific reclamation measures that would be adaptable to different geomorphic settings expected within the project. Reclamation measures that would be customized according to the needs of the project include:

topsoil thickness and type; organic soil amendments and fertilizers; surface preparation practices; seed mixtures; application rates; and cultivation practices. Each practice would also be evaluated to determine its success in promoting plant establishment and resistance to soil erosion.

Mine Pits

Reclamation activities for the Bootstrap/Capstone and Tara pits would include constructing a berm around each pit and posting warning signs to identify potential hazards associated with open-pit highwalls or open excavations.

Dewatering at other mine operations in the area is expected to continue after completion of mining at the Bootstrap Project area. Upon cessation of dewatering activities at the nearby Betze/Post Mine, those portions of the Bootstrap/Capstone and Tara pits below the original groundwater level would begin to fill with water as the groundwater table becomes reestablished (**Figures 2-8** and **2-9**). Additional information regarding development of mine pit lakes is in Chapter 4, Water Quantity and Quality.

Waste Rock Disposal Facilities

Waste rock disposal facilities would be constructed with a minimum 20-foot set-back bench for every 100 feet in elevation change, resulting in terraced slopes. The overall slopes (crest to toe) would range from 2.5H:1.0V to 3.0H:1.0V. The tops and edges of the facilities would be rounded and graded to blend with surrounding topography. A cross section of post-reclamation topography of the waste rock disposal facilities is shown in **Figure 2-9**.

Upon completion of grading, topsoil or other suitable growth medium would be redistributed over the waste rock. The waste rock would be ripped (to relieve compaction from mining equipment), fertilized, seeded, and mulched according to the reclamation plan (Newmont 1995d).

Ore Stockpiles

If refractory ore stockpiles remain after operations cease, they would be encapsulated and reclaimed as part of the waste rock disposal area on which they were constructed. Ore transported to either Mill #4 (North Operations Area) or Mill #6 (South Operations Area) would be reclaimed as part of the approved reclamation and closure plan for those areas. Potentially acid-producing stockpiles would be monitored in accordance with the Refractory Stockpile and Waste Rock Dump Monitor Plan (Newmont 1995a).

Bootstrap Heap Leach Facility

Closure of the heap leach facility would conform to NDEP Interim Guidelines for Closure of Heap Leach Cyanidation Projects (NAC 445A). Closure operations would include grading the top and sides of the leach facility to promote run-off, covering the leach rock with growth media (e.g., waste rock, straw mulch, organic fertilizers, or "green manure"), seeding the growth media, and irrigating the reclaimed surface with leach rinse water. Seeding would occur prior to detoxification (rinsing) of the leach material.

Residual cyanide solution would be rinsed from the leach pad and neutralized and detoxified concurrently with solutions contained in the leach pad solution ponds. The total volume of solution in the pad and pond system would be reduced by recirculation and evaporation. Fresh water would be introduced to rinse residual cyanide and other contaminants from the spent ore. Samples of leached ore would be collected from the Bootstrap Leach Facility and placed in column tests to assess the amenability to rinsing with fresh water. If test results indicate that the rinsing process was inadequate, Newmont would investigate alternative detoxification procedures.

The leach pad rinse water would be cycled through the leach pad, used for irrigation on reclamation on the leach material, and collected in the leach facility ponds until it meets regulatory criteria. According to NAC 445A.430, leach solution must be rinsed until: 1) weak acid dissociable (WAD) cyanide levels in the rinse water are less than 0.2 milligrams per liter (mg/L); 2) pH level of the effluent rinse water is between 6 and 9; and 3) contaminants in any effluent from the processed ore which would result from meteoric water (i.e., precipitation) would not degrade waters of the state. During rinsing procedures, all rinse water would be collected and disposed of through evaporation prior to final regrading and reclamation of the leach pad and pond. If fresh water rinsing does not meet cyanide, pH, and other contaminant criteria, additional neutralization techniques would be utilized. Rinsing would continue for approximately 3 years following cessation of leaching.

Side slopes of the leach pad would be graded to an overall final slope ranging from 2.5H:1.0V to 3.0H:1.0V. Benches and leach pad tops would be out-sloped to minimize water infiltration. The final reclamation configuration of the reclaimed heap leach pad is shown on **Figure 2-8**.

The process pond associated with the leach facility would be reclaimed following leach pad neutralization/ detoxification. Water or solution present at the end of operations would be disposed of by evaporation and by circulation within the facility. Once the leach pad is neutralized, precipitates on the pond bottom would be tested using the Toxicity Characteristic Leaching Procedure (TCLP) defined in 40 CFR 261, Subpart C to determine final disposition.

The HDPE pond liner beneath the process pond would be folded and buried at least 5 feet below the backfilled surface. Backfilling and regrading would establish a surface configuration compatible with adjacent terrain and, to the extent possible, reestablish pre-disturbance topography.

After regrading, growth media (waste rock, straw mulch, organic fertilizers, or "green manure") would be redistributed over the top and sides of the leach facility. The top and benches of the leach facility would be fertilized, seeded, and mulched in accordance with the reclamation plan (Newmont 1995d). Newmont would rip the ore material after it is initially placed on the leach pad to increase leach solution percolation. Additional ripping of this material prior to mulching and seeding is not proposed.

Roads

Haul roads associated with waste rock disposal areas or the heap leach pad would be reclaimed concurrently with closure of these sites. The haul road through the Bootstrap Project area to Mill #4 would be reclaimed to 35 feet wide (roadbed disturbance) following completion of ore hauling. Haul road safety berms that contain topsoil and other suitable growth media would be placed on top of the former roadway and reseeded. Road areas would be graded to approximate pre-disturbance topography, ripped to a depth of 6 inches to 2 feet, and seeded in accordance with the reclamation plan.

Ancillary Facilities

Buildings, equipment, pipelines, or other ancillary facilities on Newmont's private land necessary for post-mining land use may be retained after mine closure. The ancillary buildings and other structures on public land would be dismantled and removed following cessation of operations. Non-salvageable material (e.g., HDPE liner, scrap building material, concrete) would be buried on-site to a minimum depth of 5 feet, or disposed of off-site in compliance with BLM and NDEP regulations. Concrete foundations, basements, walls, and sumps would be flattened, broken so as to not impound water prior to burial. Septic systems would be decommissioned in accordance with state and federal requirements. Materials that had been in contact with cyanide or other toxic chemicals would be decontaminated prior to disposal, and any hazardous waste, if applicable, would be disposed of in accordance with state and federal regulations. Ancillary facilities, including parking lots and pipelines, would be removed. Run-on and run-off control ditches would remain as part of the reclamation program to control sediment loss from the site.

Disturbed areas would be graded to blend with adjacent topography. Fertilizing, seeding, and mulching would occur as previously discussed.

Monitoring/Evaluation of Reclamation Success

Qualitative erosion monitoring would be conducted annually to assess effectiveness of erosion control structures, drainage channels, and overall stability. Drainage channels would be evaluated to identify problems such as head cutting, sedimentation, and structural integrity. Hay bales and siltation fences would be periodically maintained and monitored. Additional erosion control measures would be implemented when necessary.

The criteria for revegetation success would be established under "Interim Standards for Successful Revegetation," BLM Instruction Memorandum No. NV-94-026. Monitoring would be conducted annually for 3 years, followed biannually until bond release. Monitoring would include sampling and analyzing vegetation from reclaimed areas to assess plant canopy cover, herbaceous production, and woody plant density. Reclamation maintenance activities may include additional earthwork, recontouring, fertilizing, and seeding. Details of the reclamation monitoring and sampling plans are described in the Bootstrap Project Reclamation Plan (Newmont 1995d).

PROJECT ALTERNATIVES

This section describes alternatives to the Proposed Action, including the No Action Alternative, Alternatives Considered but Eliminated from Detailed Analysis, and the Agency Preferred Alternative. Alternatives selected by BLM for consideration in this EIS are based on potential impacts associated with the Proposed Action and issues, including those identified by the public during the scoping process. BLM is required to analyze environmental effects resulting from the Proposed Action and to identify reasonable alternatives that would mitigate or eliminate potential impacts. BLM is also required to analyze the No Action Alternative describing the environmental consequences that would result if the Proposed Action is not implemented.

Components of the planned operations, respective functions, and potential environmental effects are considered in delineation of alternatives. Impacts that cannot be mitigated require development of alternatives. Potential mitigation measures are described in Chapter 4 for each resource. Other alternatives were considered early in the review process. These alternatives were eliminated because they were not technically or economically feasible, including partial and complete backfill of all open pits.

Alternatives Considered in Detail

Four alternatives are evaluated in this section of the EIS: Alternative A - backfill of the Bootstrap/Capstone pit; Alternative B - ore processing at the North Area Leach Facility; Alternative C - off-site power supply; and the No Action Alternative.

Alternative A - Backfill of Bootstrap/Capstone Pit

Consideration of pit backfilling as an alternative is consistent with NAC 519A.250 concerning solid minerals reclamation standards and policy statements outlined in the Federal Land Policy Management Act (PL-94-579, 43 USC 1701). Two variations of Alternative A are evaluated: Alternative A-1 -- complete backfill of the Bootstrap/Capstone pit; and Alternative A-2 -- partial backfill of the Bootstrap/Capstone pit.

Alternative A-1 - Complete Backfill of Bootstrap/Capstone Pit

Alternative A-1 includes all components of the Proposed Action (i.e., excavation of the Bootstrap/Capstone and Tara open pits, construction of heap leach and waste rock disposal facilities), and would require Newmont to modify the mine plan to sequentially develop the mine pits and backfill the Bootstrap/Capstone pit with waste rock generated from the Tara pit. This sequential mine development would add several years to the total project mine life. Although total disturbance area would remain the same as the

Proposed Action, reclaimed areas would increase by approximately 100 acres under Alternative A-1.

Geological evaluation of the Bootstrap/Capstone deposit indicates there are no significant gold resources beyond the proposed open pit. In addition to the 3 million tons of waste rock and ore removed prior to 1984, approximately 61.7 million tons of material would be excavated from the Bootstrap/Capstone pit (28.6 million tons are waste rock). The Tara pit would generate approximately 87.4 million tons of waste rock. Based on a 30 percent bulking factor, a portion of Tara waste rock (approximately 21 million tons), would be used to fill the Bootstrap/Capstone pit. The highwall on the west side of the Bootstrap/Capstone pit would remain exposed after the main body of the mine pit is backfilled. The height of the Tara Waste Rock Disposal facility would be reduced by approximately 120 feet. There would be no change in the acreage of disturbance area as compared to the Proposed Action. For Alternative A-1, a total of 95 million tons of waste rock from the two mine pits would be placed in waste rock disposal facilities.

Upon cessation of dewatering activities at the Betze/Post Mine, groundwater levels would reestablish and form a lake in the Tara pit. Approximately 100 acres of the backfilled Bootstrap/Capstone pit would be reclaimed according to procedures outlined in an approved reclamation plan. The remaining disturbed area for the Bootstrap/Capstone pit (approximately 20 acres) would consist of a highwall on the west side of the pit that would not be reclaimed.

Alternative A-2 - Partial Backfill of Bootstrap/Capstone Pit

Alternative A-2 incorporates all components of the Proposed Action and would require that Newmont dispose of a portion of the last 2 years of waste rock production from the Tara pit into the Bootstrap/Capstone pit. This sequence of waste rock disposal would not require modification of Newmont's proposed project schedule. Implementation of this alternative would result in placement of approximately 3 million tons of waste rock into the Bootstrap/Capstone pit bottom and would lower the projected height of the Tara Waste Rock Disposal Facility by approximately 30 feet. There would be no change in the acreage of disturbance area as compared to the Proposed Action.

As described under Alternative A-1, no significant gold resources are known to exist beyond the proposed Bootstrap/Capstone open-pit configuration. Waste rock produced in the Tara pit in the final 2 years of mining would be comprised of rock with a predicted net acid-neutralizing potential.

Partial backfill of the Bootstrap/Capstone pit would preclude development of two pit lakes in the pit bottom. Partial backfill involving 3 million tons of waste would fill the pit to an elevation exceeding the maximum predicted water table level (5,230 feet AMSL) after groundwater recovery related to dewatering at the Betze/Post Mine. Pit walls would remain exposed on all sides of the partially backfilled pit; reclamation of the pit floor would be limited to accessible areas of the backfilled pit floor (approximately 10 acres). Topsoil or growth medium would be hauled and placed on the backfilled pit floor.

Alternative B - Ore Processing at North Area Leach Facility

Alternative B would incorporate all aspects of the Proposed Action but would require Newmont to haul oxide grade leach ore to the North Area Leach Facility for ore processing (**Figure 2-7**). This alternative would eliminate the need for crushing, leaching, and processing facilities at the Bootstrap Project resulting in a net reduction of 165 acres of disturbed land.

Because of the hardness of silicified Bootstrap Project ore, additional crushing would be needed to process Bootstrap Project ore at the North Area Leach Facility. Alternative B would also result in a reduced amount of water supplied from the Betze/Post Mine operations to the Bootstrap Project, a reduced amount of on-site power generation, and an increase in haulage traffic on

Newmont's haul road from the Bootstrap Project area to the North Area Leach Facility. Haul truck traffic would vary from day to day; however, assuming haulage for a total of 300 days per year at peak mine production, approximately 7 haul trucks per hour would travel the approximate 6 miles to the North Area Leach Facility from the Bootstrap Project. This peak production would occur in the fourth year of Bootstrap Project development.

Alternative B would result in relocation of the light vehicle access road to the west in the vicinity of the proposed Bootstrap heap leach facility. No additional land would be disturbed and the existing capacity of the North Area Leach Facility is sufficient to accommodate Bootstrap Project leach-grade ore. The North Area Leach Facility is presently authorized under NDEP Water Pollution Control Permit NEV87065.

All matters pertaining to reclamation of heap leach ore would be part of existing plans and authorizations for North Area Leach Operations. The haul road expansion described under the existing POO would not change for this alternative.

As with the Proposed Action, Alternative B would require that Newmont obtain an air quality permit from NDEP prior to initiation of activities.

Alternative C - Off-Site Power Supply

Implementation of Alternative C would include all components of the Proposed Action but would replace on-site power generation with off-site power. Alternative C would eliminate the use of diesel-powered generator sets for the Proposed Action and alternatives.

Alternative C is comprised of two different energy distribution systems (Alternatives C-1 and C-2) inside the Bootstrap Project area. Alternative C-1 and C-2 would have a common power source, originating at Sierra-Pacific Power Company's (SPPC) existing 69kV power line located on the west side of the Bootstrap Project site. Both Alternative C-1 and C-2 would require construction of a substation near the existing 69kV power line. This substation would step-down the 69kV to 4.16kV. The substation would be comprised of a graveled pad measuring approximately 100 feet on each side, an 8-foot-high chain-link fence, and a gravel access road.

A power line would be constructed to deliver 4.16kV from the substation to the Bootstrap Project site. This power line would be constructed of single-poles (approximately 40 feet tall) with cross arms and would be built to industry standards. Total disturbance associated with construction of the power lines, substation, and access road is approximately 1 acre.

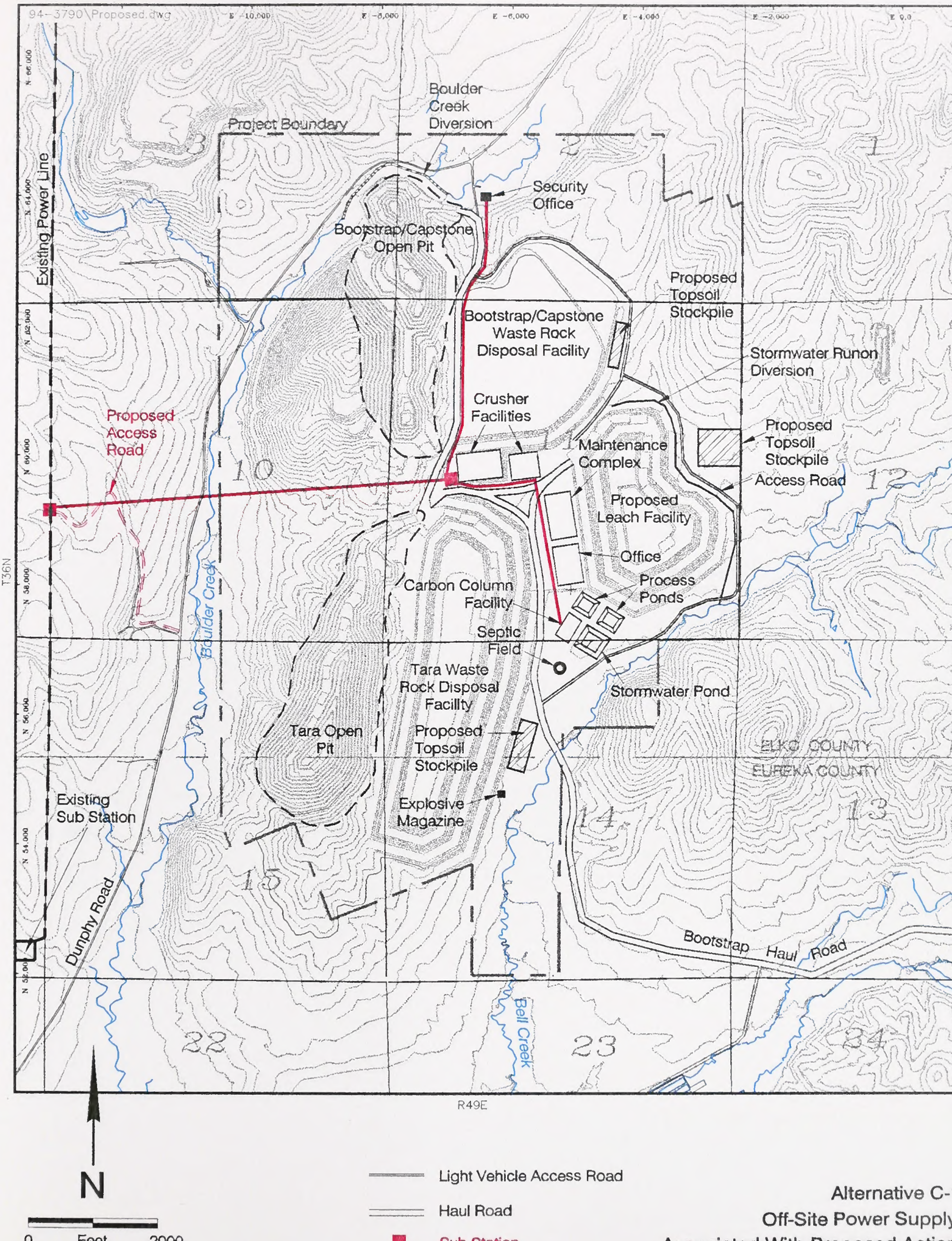
Power lines associated with off-site power supplies would remain in-place during the life of the Bootstrap Project. Once mining and ore processing cease, the power lines and substations described in this alternative would be removed.

Alternative C-1 - Off-Site Power Supply Associated with the Proposed Action

Figure 2-10 shows the location of Alternative C-1. This alternative would require construction of a substation near the proposed crusher facility associated with the Proposed Action. The substation would convert in-coming (3.5 megawatts) electrical power to meet requirements of the crushing facility, process pond pumping systems, maintenance complex, office facility, and security office. No additional land surface would be disturbed for construction of the substation.

Alternative C-2 - Off-Site Power Supply Associated with Alternative B (haulage and processing of ore at Newmont's North Area Leach Facility)

Figure 2-11 shows the location of Alternative C-2. This alternative would require 0.5 megawatts of energy. No substation would be required on the Bootstrap Project site to convert power. In addition, a power line would not be required at the carbon-column facility. Power distribution would be needed for the maintenance complex, office, and security office.



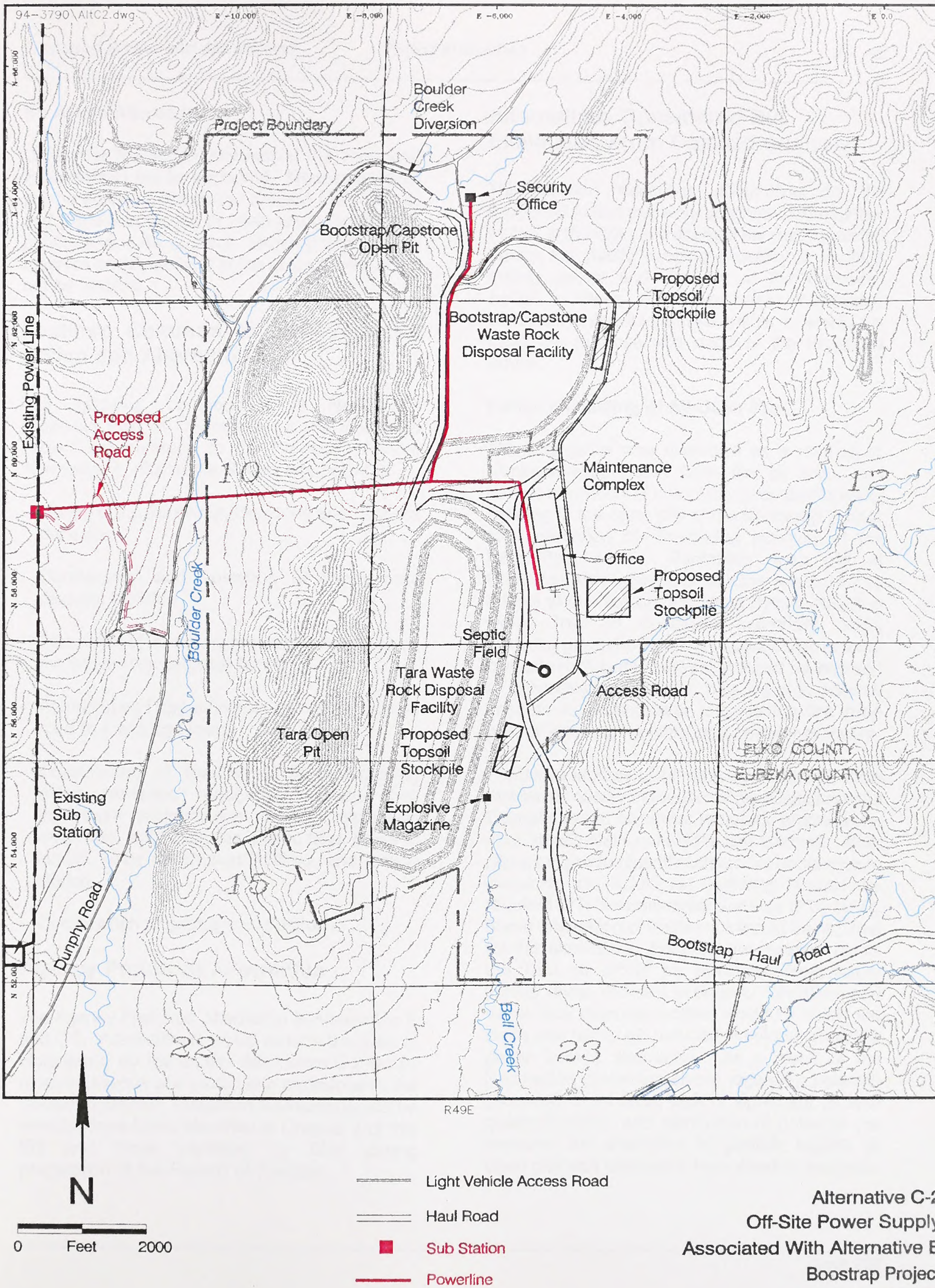
Light Vehicle Access Road

Haul Road

Sub Station

Powerline

Alternative C-1
Off-Site Power Supply
Associated With Proposed Action
Bootstrap Project
FIGURE 2-10



Alternative C-2
Off-Site Power Supply
Associated With Alternative B
Boostrap Project
FIGURE 2-11

No Action Alternative

Under the No Action Alternative, the Proposed Action would not be approved. Newmont would not be able to develop the defined ore reserves and place waste rock or heap leach facilities on public land. As a result, development of ore reserves on private land in the project area would not be feasible.

Features Common to the Proposed Action and Alternatives

The following components of Newmont's proposed Plan of Operations for the Bootstrap Project are common to the Proposed Action, Alternative A, Alternative B, and Alternative C:

- Mining of the Bootstrap/Capstone and Tara ore deposits.
- Construction and operation of waste rock disposal facilities.
- Placement of refractory ore surge stockpiles on the waste rock disposal facility.
- Rerouting and upgrading of the existing access road to a haulage road.
- Construction of ancillary facilities including office complex, equipment ready line, equipment maintenance facility, explosives magazine, soil stockpiles, septic field, Class III landfill, water distribution facilities, and fueling station.
- Continuation of geologic evaluations.

Agency Preferred Alternative

The Agency Preferred Alternative is Alternative B and C-2. Alternative B would reduce the area of disturbance by 165 acres. Alternative C-2 would reduce gaseous and particulate emissions in the Bootstrap airshed. Mitigation measures would be selected from those identified in Chapter 4 of this EIS and those identified by BLM during preparation of the Record of Decision.

Alternatives Considered But Eliminated From Detailed Analysis

This section describes alternatives to the Proposed Action that were eliminated from further review in the EIS. The alternatives were identified during the public scoping process or by BLM during review and analysis of the Proposed Action. These alternatives were considered technically infeasible, unreasonable, or would not meet the purpose and need of the Proposed Action.

Partial Backfilling of All Open Pits

This alternative was evaluated as a method to eliminate evaporation from the pit lakes and reduce the effects of potentially poor-quality water residing in the open pits at the Bootstrap Project after cessation of dewatering activities at the Betze/Post Mine. Backfilling open pits at Bootstrap with nonacid-producing waste rock to a level above the original groundwater elevation would help to neutralize potentially acidic inflowing groundwater. The relatively high amount of waste rock surface area that would be exposed to groundwater, however, may result in adverse impacts to groundwater surrounding the mine pits, at least during initial groundwater recovery.

Predictive studies of pit lake development show that water quality in the Bootstrap/Capstone and Tara pits would be similar to natural groundwater after steady-state conditions are attained. Both pits are in predominantly calcareous country rock; therefore, no additional buffering should be required (PTI Environmental Services (PTI) 1995). Some rehandling of waste rock would be required for this alternative. Potential ore reserves below the Tara pit would be eliminated from future mining under different economic conditions and waste rock disposal facilities would be nearly the same size (although reduced in height) under the partial backfill alternative. As a result of the information presented above regarding potential groundwater impacts, lack of significant pit lake quality impacts, and elimination of potential ore reserves, the alternative to partially backfill all open pits was eliminated from detailed analyses.

Complete Backfilling of All Open Pits

This alternative was identified in recognition of NAC 519A.250 concerning solid minerals reclamation standards and policy statements outlined in the Federal Land Policy Management Act (PL-94-579, 43 USC 1701) concerning minimization of unnecessary degradation to public land. These standards and policy statements require BLM to review the feasibility of backfilling open pits.

This alternative evaluated the feasibility of backfilling all open pits associated with the Bootstrap Project. Implementation of this alternative would involve modifying the mining schedule such that one of the open pits (Bootstrap/Capstone or Tara) would be completed prior to development of the other open pit. Waste rock produced from one open pit would be used to backfill the other open pit. Backfilling of the second open pit would require rehandling of waste rock produced from the first open pit and/or staging waste rock produced from the second open pit for use as backfill.

Backfilling all open pits at the Bootstrap Project would not eliminate the need for waste rock disposal facilities. About half of the waste rock produced in development of the Bootstrap Project would remain in waste rock disposal facilities due to bulking of the material once it is excavated. Backfilling all open pits at Bootstrap would not be expected to reduce the size of area needed for disposal of waste rock.

Backfilling the open pits would restore approximately 156 acres of the 205 acres proposed for open-pit development at Bootstrap. An estimated 49 acres would be left as highwall where backfill would not be technically feasible. The restored land surface would be available for post-mining land uses such as grazing and wildlife habitat.

This alternative was eliminated from detailed analysis because no impacts were significantly changed by implementation of completely backfilling the Bootstrap/Capstone and Tara pits. Quality of pit lake water is predicted to be similar to natural groundwater (PTI 1995) and waste rock disposal facilities would cover nearly the same area as the Proposed Action. Quality of groundwater surrounding the mine pits could be adversely affected for some time after groundwater recovers into the backfilled material.

CHAPTER 3

AFFECTED ENVIRONMENT FOR PROPOSED ACTION AND ALTERNATIVES

INTRODUCTION

Descriptions of the existing environmental resources in the Bootstrap Project area are included in this chapter. The project area is located in west-central Elko County and northern Eureka County in northeastern Nevada (**Figure 3-1**). Nearby drainages include Bell, Boulder, and Rodeo creeks, part of the watershed on the west side of the Tuscarora Range. Elevations range from 5,080 feet AMSL at the confluence of Boulder and Rodeo creeks to 8,800 feet AMSL in the surrounding mountains.

Figure 3-1 shows the general study area for most environmental resource investigations. The study area boundaries for social and economic resources, recreation and wilderness, access and land use, and air resources extend beyond the boundaries depicted in **Figure 3-1** and are described in the respective resource discussions below.

Study areas for each environmental resource are based on the predicted locations of direct and indirect impacts from the Proposed Action. Wild horses and unique prime farmlands are not addressed in this EIS because these resources are not present in the study areas and thus would experience no direct or indirect impacts as a result of the Proposed Action.

This chapter provides a summary of environmental baseline information. In the following sections, "project area" refers to the existing mine, the Proposed Action, and lands surrounding the existing mine. The project area is the same as study area "A" shown in **Figure 3-1**. The "area of potential effect" as used in the Cultural Resources section is synonymous with the project area.

GEOLOGY AND MINERALS

A description of gold mineralization in northern Nevada is presented in Chapter 2, History of Exploration and Mining. This section provides a more detailed account of geology in the Bootstrap Project area, which is composed of the Bootstrap, Capstone, and Tara ore deposits. Descriptions and diagrams are provided for the geologic history (**Table 3-1**), stratigraphy (**Figure 3-2**), and geology of the project surface (**Figure 3-3**) and subsurface (**Figure 3-4**). The Geology and Minerals study area is shown on **Figure 3-1**.

The Bootstrap Project area is located within the Basin and Range Physiographic Province, a region that extends over most of Nevada and parts of adjoining states. Range-front faulting in the province has created north-south trending fault-block mountain ranges separated by broad valleys filled with alluvium.

Gold deposits in the Bootstrap Project area are aligned along the crest of a north-south trending fault block composed chiefly of Paleozoic-age sedimentary rocks (**Figure 3-3**). Paleozoic-age rocks include the Ordovician-age Vinini Formation (western siliceous assemblage), which has been thrust over the Devonian-age Rodeo Creek and Popovich units, and the Silurian- to Devonian-age Roberts Mountains Formation (eastern carbonate assemblage). Erosion of the upper thrust plate created a "window" (the Bootstrap window) to the underlying thrust plate. The upper plate Vinini Formation is composed of cherts, shales, and limestone. Lower plate rocks are composed of siliceous mudstones and calcareous siltstones (Rodeo Creek unit) that overlie thick- and thin-bedded limestones (Popovich unit) and thin-bedded calcareous siltstones (Roberts Mountains Formation) (Kofoed 1995) (**Figure 3-2**).

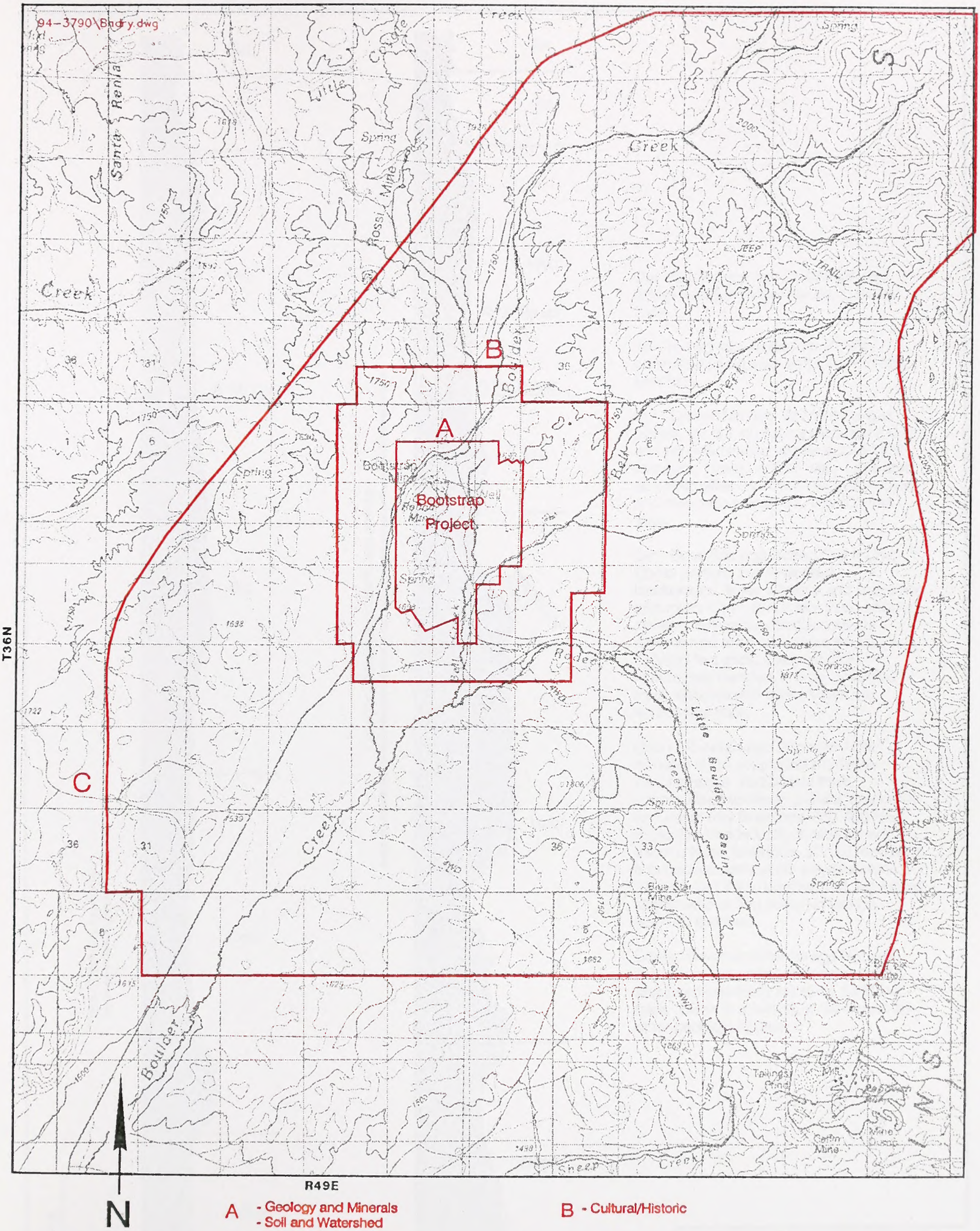
TABLE 3-1
Geologic History of the Bootstrap Project Area

Geologic Time[1]	Geologic Occurrence	Relationship to Mineralization
Paleozoic Era (225-570) Ordovician Period (430-500) Silurian Period (395-430) Devonian Period (345-395)	Deposition of marine sedimentary rocks. Roberts Mountains Fm. sediments (calcareous siltstones with sandy pelletal limestone interbeds) grade upwards into Devonian-age Popovich unit fossiliferous limestone. Upper Devonian-age siliceous mudstones and calcareous siltstones of the Rodeo Creek unit overlie Popovich unit limestones. Deposition of the deeper westward ocean, including shale and chert of the Vinini Fm.	Popovich unit and overlying Rodeo Creek unit are later the host to the Bootstrap Project ore deposits.
Paleozoic Era (225-570) Late Devonian and early Mississippian Period (325-360)	Roberts Mountains thrust faulting of Antler Orogeny. Deeper water marine sedimentary rocks (shale and chert of the Vinini Fm.) are pushed eastward along the Roberts Mountains thrust over local shallower water marine sedimentary rocks. (Silty limestones and calcareous siltstones of the Roberts Mountains Fm., and Popovich, and Rodeo Creek units).	Structural compression and thrust faulting in the deposit area.
Mesozoic Era (65-225)	Regional emplacement of granitic and dioritic intrusive rocks.	These intrusive rocks are not evident at Bootstrap, but they may be the source of base metal mineralization in the Carlin Trend and may have produced additional disrupted zones for later gold mineralization at other deposits in the area.
Mesozoic Era (65-225) and Cenozoic Era (0-65) Tertiary Period (3-65)	High-angle faulting along NW and NE trends. Local emplacement of igneous dikes along high-angle fault zones.	Structural movements prepare rock for mineralization. Mineralizing fluids are emplaced along high-angle structures and along sedimentary bedding planes.
Mesozoic Era (65-225) and Cenozoic Era (0-65)	Regional erosion.	Erosion eventually removes the upper plate rocks (Vinini Fm.), creating the "Bootstrap window."
Cenozoic Era (0-65) Tertiary Period (3-65)	Regional extension, high-angle faulting, shallow intrusion, and volcanism followed by fluvial and lacustrine deposition (Tertiary-age sediments of the Carlin Fm.).	Mineralizing fluids associated with the igneous activity deposit gold and associated sulfides in the fractured host rocks. Carlin Fm. sediments are deposited after gold mineralization.
Cenozoic Era (0-65) Quaternary Period (0-3)	Recent localized erosion, deposition, and circulation of groundwater.	Local erosion and deposition both exposes and masks parts of the mineralized host rocks. Groundwater circulation oxidizes the near-surface gold deposits.

[1] Geologic time presented with names of geologic time periods and millions of years before the present in parentheses.

Note: Fm. = formation

Source: Baker 1991; Flaherty and King 1991; BLM 1993a; Kofoed 1995.

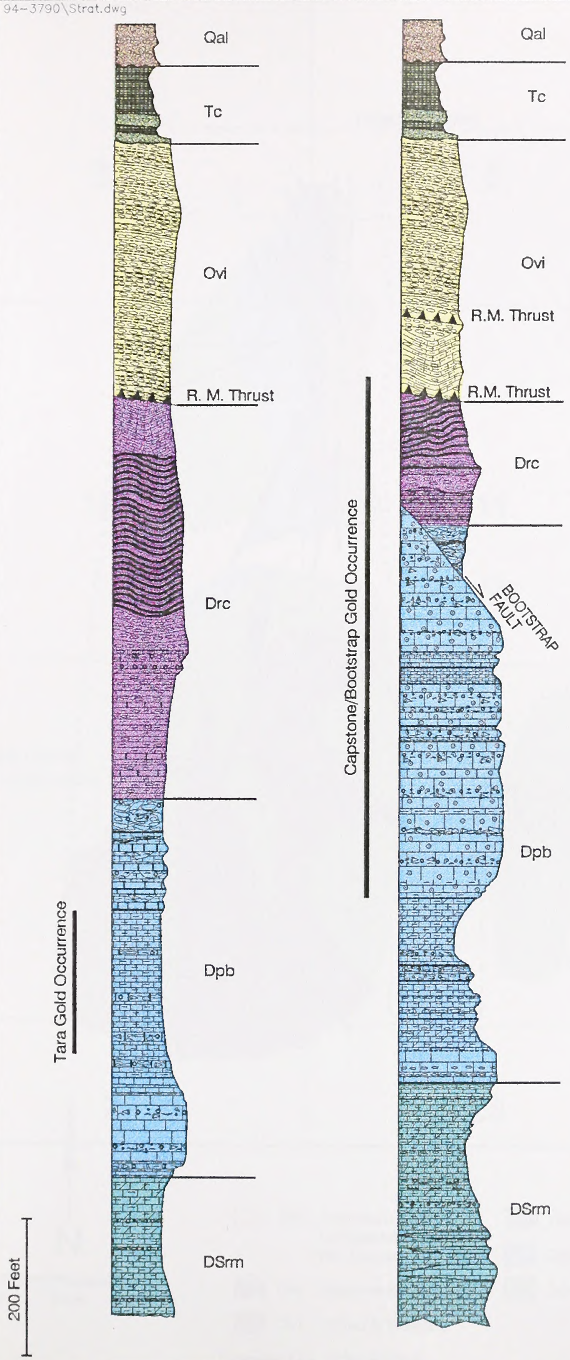


A
- Geology and Minerals
- Soil and Watershed
- Vegetation
- Land Use and Access
- Paleontology
- Grazing Management
- Noise
- Wildlife/Aquatic Habitat & Fisheries
- Threatened, Endangered, & Candidate Species

B
- Cultural/Historic

C
- Water Resources
- Visual Resources

Study Area Boundaries
Bootstrap Project
FIGURE 3-1



Qal - Quaternary-age undifferentiated gravel-boulder conglomerate, 0-50 feet thick.

Tc - Tertiary-age Carlin Fm. Poorly consolidated silt, clay and gravel, 0-800 feet thick.

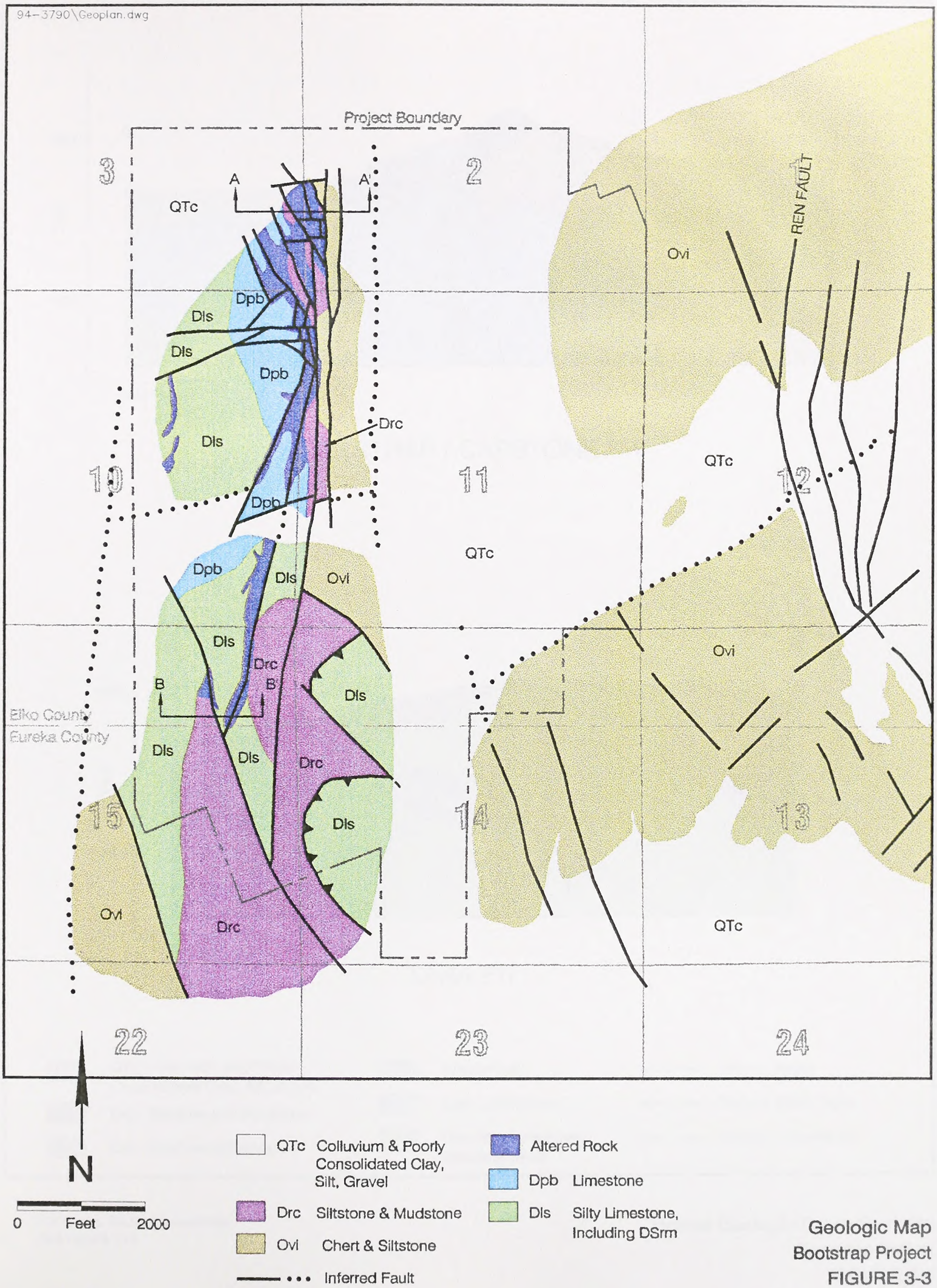
Ovi - Ordovician-age Vinini Fm. Upper portion: dense, nodular, green-black chert and wavy-laminated siltstone, 200-1500 feet thick. Lower portion: wavy-laminated, dolomitic siltstone with minor green chert and bioclastic limestone, 100-600 feet thick.

Drc - Devonian-age Rodeo Creek Unit: Upper portion: thin laminated, interbedded, limey siltstone and limestone with minor chert, 0-400 feet thick. Middle portion: rhythmically bedded sandy siltsone and chert with minor limestone, 100-800 feet thick. Lower portion: rhythmically bedded, cherty, dolomitic, limey siltstone with minor limestone, 40-200 feet thick.

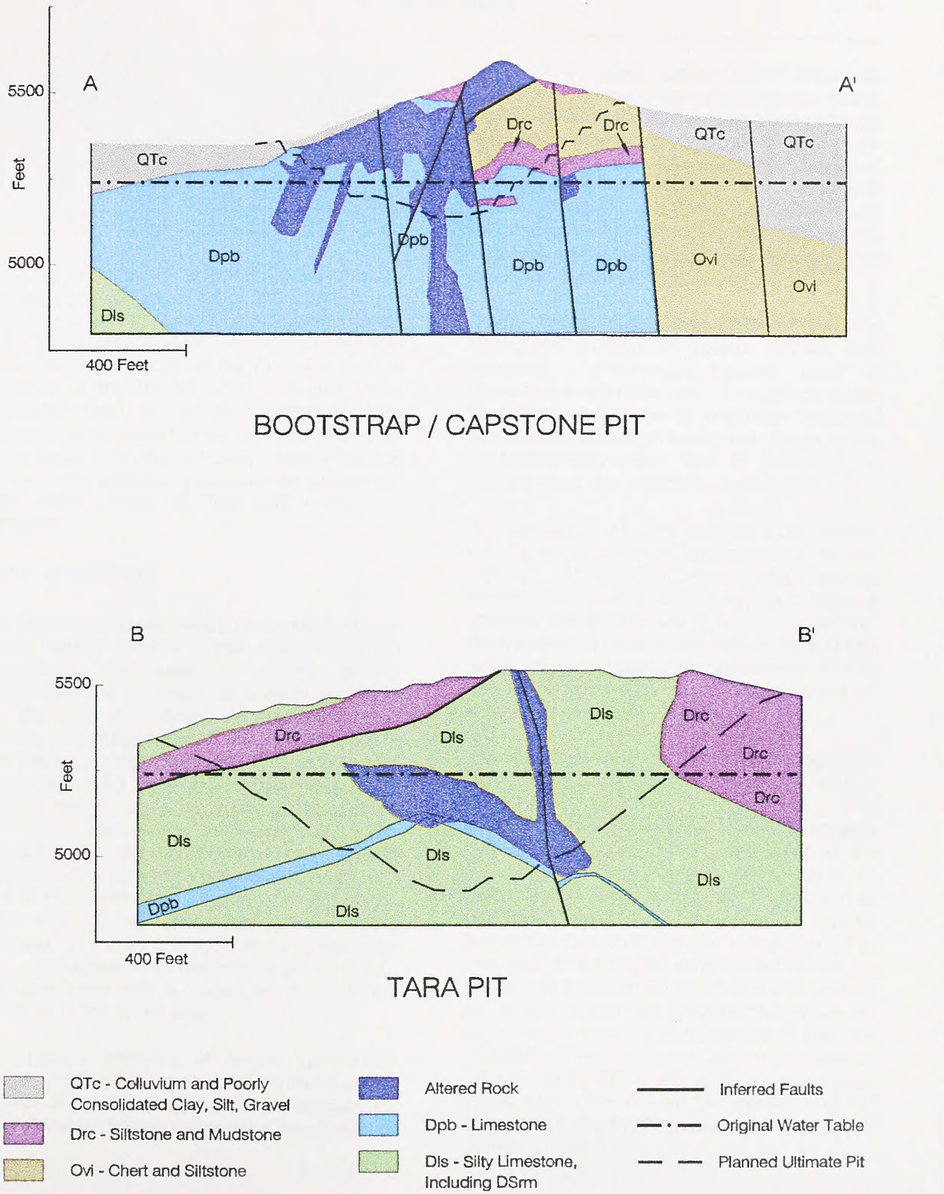
Dpb - Devonian-age Popovich Unit: massive clast- supported limestone conglomerate, 40-200 feet thick; interbedded bioclastic, pelletal limestone and minor silty limestone, 350-400 feet thick; thin bedded, silty limestone with minor micritic limestone, 50-150 feet thick; thin bedded, laminated, silty limestone, 150-200 feet thick; interbedded, laminated silty limestone and oolitic limestone, 600-700 feet thick.

DSrm - Devonian/Silurian-age Roberts Mountains Fm.: thin bedded, laminated silty limestone-limey siltstone, 1500 feet thick. DSrm is a subset of Dls shown on other geologic figures.

Stratigraphy
Bootstrap Project
FIGURE 3-2



Geologic Map
Bootstrap Project
FIGURE 3-3



For Cross Section Locations,
See Figure 3-3.

Typical Geologic Cross Sections
Bootstrap Project
FIGURE 3-4

The lower elevations and valleys in the project area are covered by Tertiary- and Quaternary-age deposits that mantle the Paleozoic lithologies. The Tertiary-age Carlin Formation is composed of lacustrine deposits and water-laid ashes, tuffs, and gravel. Quaternary-age sediments in the project area include alluvium, colluvium, and landslide deposits (Baker 1991).

The Paleozoic-age rocks and faults are offset by Tertiary-age high-angle faults (**Figures 3-3** and **Figure 3-4**). Ore zones of the Bootstrap Project are concentrated along north-striking high-angle faults in the limestone of the Popovich unit, in siltstone of the Rodeo Creek unit and Vinini Formation and in igneous dikes of late-Cretaceous or early-Tertiary age (LaPoint et al. 1991; Baker 1991; Kofoed 1995). Gold occurs as microscopic particles, predominantly associated with rocks altered by heat and mineralized solutions.

Area Seismicity

The Bootstrap Project area is located in the Great Basin seismic zone, a region characterized by moderately high rates of seismic activity (Algermissen et al. 1982). A study of seismicity for the area (Slemmons 1983) indicated that historic earthquakes (post-1872) within 30 miles of the site have ranged from barely detectible to a magnitude of 5.1. Within a 90-mile radius of the project, the strongest earthquake occurred on October 3, 1915 with a magnitude of 7.8. The epicenter of this earthquake was located approximately 80 miles southwest of the project site in Pleasant Valley, Nevada. For the period 1903-1977, Askew and Algermissen (1983) mapped 12 events with magnitude of less than 4.0, eight events with magnitudes of 4.0 to 5.0, and one event with a magnitude of 5.0 to 6.0 within 62 miles of the area.

The closest evidence of historic (post-1872) surface faulting is approximately 62 miles from the project site at the location of the October 15, 1915, Pleasant Valley earthquake (Chen-Northern 1988). The nearest surface-rupture faults with prehistoric Holocene-age displacement (active faulting between 12,000 years ago and 1870), as mapped by Slemmons (1983), are located in the Boulder Valley, 7.5 miles south of the project. The Boulder Valley faults were estimated to have had displacement within the last 2,000 years (Slemmons 1983). No active faults (faults with Holocene-age surface offset) have been detected within the Bootstrap Project area.

During project design, the potential effect of earthquake shaking on project facilities was assessed. Parameters typically used to characterize seismicity are: 1) magnitude of the controlling earthquake; 2) maximum horizontal acceleration induced in bedrock at the site by the controlling earthquake; and 3) probability of occurrence of the controlling earthquake.

Any disruption to mine facilities from seismic activity would be from liquefaction or surface rupture. Liquefaction occurs when seismic shaking causes earth material to lose its inherent strength and behave like a liquid. In general, liquefaction can occur where earth material is fully water saturated, loose, unconsolidated, and/or sandy. Surface rupture may occur along an active fault during an earthquake.

The maximum predicted earthquake magnitude (M) for the area, as determined by several researchers, is shown in **Table 3-2**. The researchers used two separate methods to assess seismicity in the region: 1) estimation of the maximum credible earthquake (MCE) based on determination of active faults in the area, and 2) probablistic estimation of the risk of earthquake occurrence based on regional seismic modeling. The MCE is the largest earthquake that can be reasonably expected to occur on a fault or over an area. Using the probablistic approach, Algermissen et al. (1982) estimated that the probability of not exceeding bedrock acceleration of 0.15 gravity (g) in any given 10-year period would be 90 percent, and the probability of not exceeding 0.20g in 250 years would also be 90 percent (**Table 3-2**).

TABLE 3-2 Seismic Characterization for the Bootstrap Project Area			
Assessment Method	Maximum Earthquake Magnitude (M)	Maximum Horizontal Acceleration (g)	Probability of Occurrence
Maximum credible earthquake from active faults (Slemmons 1983)	7.2	0.42	Not applicable
Regional probablistic assessment (Algermissen et al. 1982, 1990)	7.3	0.15	90% probability of not being exceeded in 50 years
	7.3	0.20	90% probability of not being exceeded in 250 years

For the design of Mill #4, Tailings Impoundment #2, the heap leach facility, and the waste rock disposal facilities, a magnitude 7.0 earthquake was used for the MCE, based upon past regional seismicity and the apparent lack of continuous Holocene-age fault scarps within the site area (Knight Piesold 1989; MacGillivray 1995). However, since epicenters are not closely associated with identified faults in this region, the epicenter of an MCE could occur anywhere within the area (Knight Piesold 1989).

In accordance with Nevada Division of Environmental Protection (NDEP) requirements, the heap leach and waste rock storage facilities were designed with a factor of safety greater than or equal to 1.2 (Newmont 1995a; MacGillivray 1995). The facilities were designed to withstand a maximum horizontal acceleration of 0.20g, in accordance with the probablistic approach of Algermissen et al. (1982). As shown in **Table 3-2**, a 0.20g (i.e., 0.20 times the acceleration of earth's gravity) horizontal acceleration has a 90 percent probability of not being exceeded in 250 years.

Acid Rock Drainage

As described in Chapter 4, Geology and Minerals and Water Quality and Quantity, acidic discharges during or after mining are not expected. Test results are consistent with geology of the deposit (PTI 1995). Mineralization in both the Bootstrap/Capstone and Tara pits is hosted primarily by the silty limestone of the Popovich unit, a carbonate-rich rock that tends to neutralize sulfide acid generation. Quality of pit lake water that would develop in the two pits after cessation of mining is described in Chapter 4, Water Quantity and Quality.

Geologic Resources

Although gold mining has been the primary activity at the project site since 1958, the first recorded mining in the Bootstrap area was in 1918, when approximately 500 tons of antimony ore were hauled to the railhead at Dunphy, Nevada, but were never shipped (Baker 1991). Gold mining was initiated in the general area in 1907, when placer gold deposits were discovered along Lynn, Sheep, and Rodeo creeks (BLM 1992a). Gold mining commenced in 1958, when a small dike was mined west of the present Bootstrap pit. Total production through 1960 using vat cyanide leaching was approximately 10,000 troy ounces of gold, 134 ounces of silver, and 600 pounds of zinc. Other minerals present included antimony, copper, and lead (LaPoint et al. 1991; McQuiston and Shoemaker 1981).

After acquiring the property in 1967, Newmont removed 717,000 tons of ore from an open pit, and trucked it to the Carlin mill conventional cyanide vat-leach plant (McQuiston and Shoemaker 1981). In 1974, heap leach ore processing began and mining continued intermittently within the higher grade zones until 1984. From 1974 to 1984, 124,000 ounces of gold were produced (Kofoed 1995). Newmont continued exploration of the Bootstrap/Capstone and Tara deposits between 1985 and 1995 to delineate additional ore reserves. **Table 3-3** presents anticipated production for the Bootstrap Project as a result of the Proposed Action.

TABLE 3-3
1995 Minable Resources - Bootstrap Project Area

Deposit Area	Oxide Leach Ore (tons)	Oxide Mill Ore (tons)	Refractory Ore (tons)	Waste Rock (tons)	Gold (ounces)
Bootstrap/ Capstone	28,500,000	4,600,000	0	28,600,000	837,738
Tara	4,100,000	1,400,000	1,600,000	87,400,000	292,162
Total	32,600,000	6,000,000	1,600,000	116,000,000	1,129,900

Source: Newmont 1995a; Kofoed 1995.

PALEONTOLOGICAL RESOURCES

Paleontological resources in northeastern Nevada consist of vertebrate, invertebrate, and paleobotanical fossils. Fossils known in the study area have a relatively broad regional distribution, and are not restricted to the project area or northeastern Nevada. No vertebrate fossils have been found within the Bootstrap Project area (Firby and Schorn 1983).

Most invertebrate fossils that have been found in the region of the Bootstrap Project are of Paleozoic age. Invertebrate fossils occur in Ordovician-, Silurian- and Devonian-age rocks and include:

- Graptolites and conodonts in the Vinini Formation (Rubens et al. 1967; Stewart and McKee 1977);
- Coral, bryozoa, brachiopods, and crinoid fragments in limestone of the Popovich unit (Baker 1991); and,
- Coral, bryozoa, brachiopods, mollusks, trilobites, tenticulitids, graptolites, conodonts, and crinoid fragments in the Roberts Mountains Formation (Firby 1993; Coates 1987).

Although uncommon, invertebrates of Tertiary-age have been found in the Humboldt and Carlin Formations, which are synonymous to some authors (Eaton 1994). Mollusks and leaf floras have been collected from the Carlin Formation (BLM 1992a), whereas ostracodes occur in the Humboldt Formation (Firby 1992).

Although vertebrate fossils are usually found in Tertiary-age sediments rather than Paleozoic-age sediments, the Roberts Mountains Formation has the potential for vertebrate fossils of Paleozoic age. Mammalian fossils of Tertiary-age discovered in Elko and Eureka counties include prehistoric horses, camels, rhinos, and rodents (Firby and Schorn 1983; Regnier 1960). These fossils have been found in the Carlin and Raine Ranch Formations, which are known as the Humboldt Formation by some authors (Eaton 1994). Devonian-age fish fossils have been recovered in the Roberts Mountains Formation about 75 miles south of the Bootstrap Project (Firby 1992).

AIR RESOURCES

The study area for Air Resources consists of the Project Area and data from nearby weather stations, including the towns of Beowawe, Elko, and Tuscarora, and the Betze/Post and Carlin mines.

Meteorology

The project area is subject to large daily temperature fluctuations, low relative humidity, and limited cloud cover. The terrain of the study area directly affects temperature, precipitation, and wind. Winds are predominantly from the southeast, but are influenced by daily heating and cooling of hills and drainage areas.

The Tuscarora Mountains, rising to approximately 8,800 feet AMSL directly east of the project area, markedly influence winds, precipitation, and temperature. After sunset, cool mountain air flows downslope across the project area. As temperatures increase after sunrise, warm valley air rises upslope until midday, when ground heating causes instability and variable wind directions.

Temperature

Temperature data over a number of years are available from the Carlin Mine and the towns of Elko, Beowawe, and Tuscarora. Limited temperature data are available for the Betze/Post Mine (**Table 3-4**). Temperatures in the study area have relatively wide daily and seasonal variability, with daily fluctuations of 30 to 40 degrees Fahrenheit (F) common due to high elevation, proximity to mountains, and limited cloud cover. Temperatures are warmest in July and August, and coldest in January and February. The average annual temperature recorded at Elko and Beowawe between 1941 and 1993 are 47 and 48 degrees F, respectively. Similarly, average annual temperatures for the Carlin Mine (1966-95) and Tuscarora (1956-93) were 45 and 44 degrees F, respectively.

Precipitation

Mean annual precipitation at Elko and Beowawe for the period 1941 through 1993 was 9.9 and 8.8 inches, respectively (**Table 3-4**). Tuscarora, which is closer in elevation to the Bootstrap Project area, has an average annual precipitation of 12.3 inches. Average annual precipitation at the nearby Carlin Mine is 13.5 inches for the period 1966-1995 (Western Regional Climate Center 1995). These stations show similar trends, with heaviest precipitation falling from November through January as snow and May and June as rain. Summer precipitation occurs mostly as scattered showers and thunderstorms that contribute relatively little to overall precipitation.

TABLE 3-4
Bootstrap Project Area Temperature and Precipitation

Station	Elevation in Feet	Period of Record		Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
Maximum, Minimum, and Mean Temperature (degrees F)																
Beowawe	4,684	1941-93	Mean	25	33	38	45	54	69	71	69	56	48	38	26	48
Elko	5,050	1941-93	Mean	25	31	38	44	53	62	71	69	56	48	38	26	47
Tuscarora	6,170	1956-93	Mean	25	30	38	40	49	56	67	65	56	47	38	28	44
Betze/Post Mine	5,500	1989-90	Max Min Mean	57 6 30	53 2 28	64 16 41	77 26 50	77 28 51	94 34 64	95 45 74	97 44 71	92 44 68	76 20 48	65 12 38	52 15 32	97 2 53
Mean Monthly Precipitation (inches)																
Beowawe	4,684	1941-93		0.65	0.60	0.77	0.81	1.15	0.92	0.34	0.60	0.59	0.66	0.82	0.89	8.80
Elko	5,050	1941-93		0.98	0.80	0.96	0.62	1.00	0.91	0.33	0.65	0.62	0.65	1.11	1.10	9.93
Tuscarora	6,170	1956-93		0.77	0.77	0.95	0.94	1.21	1.09	0.63	0.54	0.79	0.93	1.46	1.42	12.27

Source: NOAA 1993; BLM 1991.

Wind

Wind data collected at Newmont's North Area Leach Facility indicate the most common wind direction is from the southeast due to site specific drainage winds. West-northwest winds are also common, especially in summer. The average wind speed is 8.4 miles per hour (mph) (McVehil-Monnett Associates, Inc. 1993; 1994).

Air Quality

The Bootstrap Project is located in Nevada Interstate Air Quality Region No. 147 which covers most of the state except for the Las Vegas, Reno, and western state boundary areas. Air quality in the study area generally is considered good. The project area is designated as unclassified for air pollutants other than 10-micron or smaller (PM-10) particulates due to lack of ambient data on gaseous pollutants (nitrogen oxides, sulfur dioxide, carbon monoxide, and photochemical oxidants). The project area is also designated as a Class II area under the Prevention of Significant Deterioration (PSD) regulations. The PSD Class II designation allows for moderate growth or degradation of air quality within certain limits above baseline air quality. Designation as PSD Class I allows little or no growth or degradation of air quality. The nearest Class I area is located approximately 50 miles northeast of the study area (Jarbidge Wilderness).

PM-10 particulates have been measured for several years at the Betze/Post Mine air monitoring station in the North Operations Area. Data from 1990 through 1992 are summarized in **Table 3-5**. The maximum PM-10 concentration, 142 micrograms per cubic meter ($\mu g/m^3$), was recorded on a day with wind gusts greater than 50 mph. However, the concentration is still within the Nevada and federal 24-hour PM-10 standard of 150 $\mu g/m^3$ (**Table 3-6**). The second highest 24-hour PM-10 concentration measured was 61 $\mu g/m^3$. Average annual PM-10 concentrations for 1990-92 ranged from 12.8 to 19.4 $\mu g/m^3$ which are below the Nevada and federal annual PM-10 standard of 50 $\mu g/m^3$.

Existing mining and ore-processing operations in the Bootstrap Project area are sources of particulate matter and gaseous pollutants. **Table 3-7** lists permitted point sources of air pollutants in the Bootstrap Project area. Drilling, blasting, ore and waste rock removal, hauling, dumping, and crushing are the major sources of particulate emissions. Carbon monoxide (CO) and nitrogen dioxide (NO_2) are emitted from propane-fired kilns and boilers used in processing operations and from mining equipment and other vehicles that burn diesel fuel and gasoline. Sulfur dioxide (SO_2), hydrogen sulfide (H_2S), sulfuric acid mist, and particulate sulfur are emitted during ore processing in autoclaves. SO_2 and hydrocarbons are also emitted during diesel and gasoline combustion by mining equipment. Hydrogen cyanide (HCN) is emitted during leaching of ore.

TABLE 3-5
Air Monitoring Data for Betze/Post Mine

PM-10 Concentration	1990	1991	1992
Maximum	142	27	64
Second highest	61	26	44
Arithmetic annual average	16.8	12.8	19.4

Note: Concentrations in micrograms per cubic meter.
Source: Barrick Goldstrike Mines, Inc. 1993.

TABLE 3-6
State Of Nevada and Federal Ambient Air Quality Standards

Pollutant	Averaging Period	Concentration[1]
Total suspended particulates	Annual * 24-Hour +	75 150
PM-10 suspended particulates	Annual * 24-Hour +	50 150
Nitrogen dioxide	Annual *	100
Carbon monoxide	8-hour * 1-hour +	10,000 40,000
Sulfur dioxide	Annual * 24-Hour + 3-Hour +	80 365 1,300

* Not to be exceeded.
\+ Not to be exceeded more than once per year.
[1] Concentrations in micrograms per cubic meter.

TABLE 3-7
Existing Permitted Point Sources Of Air Pollutants

Dee Gold Mine - Boulder Creek	Jaw crusher, screen, cone crusher Conveyor, ore bin Carbon regeneration kiln Induction furnace Lime storage bin Cyanide storage bin Cement storage bin
Newmont Mill #4	Gyratory crusher, hopper, feeder Cement silo Reclaim tunnel apron feeder Lime bin Secondary cone crusher
Barrick and Newmont Betze/Post Mine	Mill crusher, reclaim hopper Mill lime silo Heap leach crushing system Carbon reactivation kiln Cement silo Melting furnace (electric) Autoclaves (6) Steam boiler Lime silo ADR furnace (electric) ADR carbon reactivation kiln
Newmont North Area Heap Leach	Gyratory crusher Cone crushers (2) Screens (2) Cement bin
Newmont Mill #1	Primary crusher Cone crushers, screens Ore bins (3) Lime bin Chlorination Process boiler Facility boilers (2)

Source: McVehil - Monnet Associates, Inc. 1993; 1994.

Air Pollution Potential

Air pollution potential is defined as the ability of air to disperse or cleanse itself of air pollutants. Factors that directly affect air pollution potential are wind speed, mixing height, and atmospheric stability. Atmospheric stability is a measure of the atmosphere's ability to disperse a pollutant. Unstable atmospheric conditions allow maximum dispersion, whereas stable atmospheric conditions represent minimum dispersion. Mixing height is the atmospheric height to which pollutant concentrations are readily mixed or dispersed.

Mixing heights vary daily and seasonally; they are highest during summer afternoons when solar heating is strongest, and lowest during periods of low wind speeds and temperature inversions. The latter conditions (commonly called stagnation episodes) do not occur frequently over extended periods in the Elko and Carlin area. Temperature inversions occur frequently at night, but are readily removed by increased wind speeds during the day. Dispersion data collected in the North Operations Area for 1993 show that unstable conditions occurred 31 percent of the time, neutral conditions 38 percent of the time, and stable conditions 31 percent of the time (McVehil-Monnett Associates, Inc. 1993; 1994).

WATER QUANTITY AND QUALITY

The Bootstrap Project study area for water resources shown on **Figure 3-1** consists of the upper portions of the Boulder Creek drainage. The Humboldt River is not included in the study area but is described in this section because of its proximity to the study area.

Surface Water Quantity

The Bootstrap Project area is located on the west side of the Tuscarora Mountains north of the Humboldt River in the Boulder Valley (**Figure 3-5**). The project area falls within Hydrographic Area No. 61 (Boulder Flat). Boulder Creek, the primary stream draining this hydrographic area, flows southwest to the Humboldt River. Major tributaries of Boulder Creek include Rodeo, Bell, and Brush creeks. The Tuscarora Mountains to the east of the project site separate Boulder Creek from Maggie Creek within Hydrographic Area No. 51 (Maggie Creek Area). The Boulder Valley is bounded on the west by the Sheep Creek Range, which separates Boulder Creek from Rock Creek to the west. Rock Creek is located within Hydrographic Area No. 62 (Rock Creek Valley).

Surface water from the proposed Bootstrap Project drains radially from the hills (Round Mountain) that are the center of the proposed mine pits. This drainage system enters Bell and Rodeo creeks to the east and south, and Boulder Creek to the north and west (**Figure 3-5**). Boulder Creek extends along the north and west sides of the Bootstrap Project area, flowing southwest to the Humboldt River approximately 35 miles from the project area. Bell Creek extends along the southeast side of the Bootstrap Project area and joins Rodeo Creek approximately 1 mile south of the project area. Rodeo Creek then flows southwest and joins Boulder Creek approximately 1.5 miles from the confluence of Bell and Rodeo creeks.

Most drainages in the project area are ephemeral or intermittent, flowing primarily in response to snowmelt runoff and significant precipitation events. Some relatively short stream sections maintain perennial or yearround flow in the upper reaches of the drainage. Streamflows are supplied by springs and seeps that discharge from bedrock in the mountain areas or from alluvium/colluvium along the drainage bottom. Peak flows typically occur during March, April, or May.

Some drainages surrounding the Bootstrap Project area have been disturbed by existing mines and related facilities, including those associated with the Genesis/Bluestar Mine, the Betze/Post Mine, and the Dee Gold Mine. A description of stock ponds in the project area is in the Grazing Management section of this chapter. One pond within the Bootstrap Project area in Section 10, T36N R49E, is associated with the existing Bootstrap mine disturbance.

The TS Ranch Reservoir is located approximately 2 miles south of the Bootstrap Project area near Boulder Creek (**Figure 3-6**). This reservoir is used to store excess water from the Betze/Post Mine dewatering program. Water from the reservoir is consumed via evaporation, infiltration, and irrigation withdrawals, with the major portion of the water infiltrating via a fault in the bottom of the reservoir. Several new springs have formed approximately 4 to 5 miles south of the TS Ranch Reservoir as a result of water infiltration.

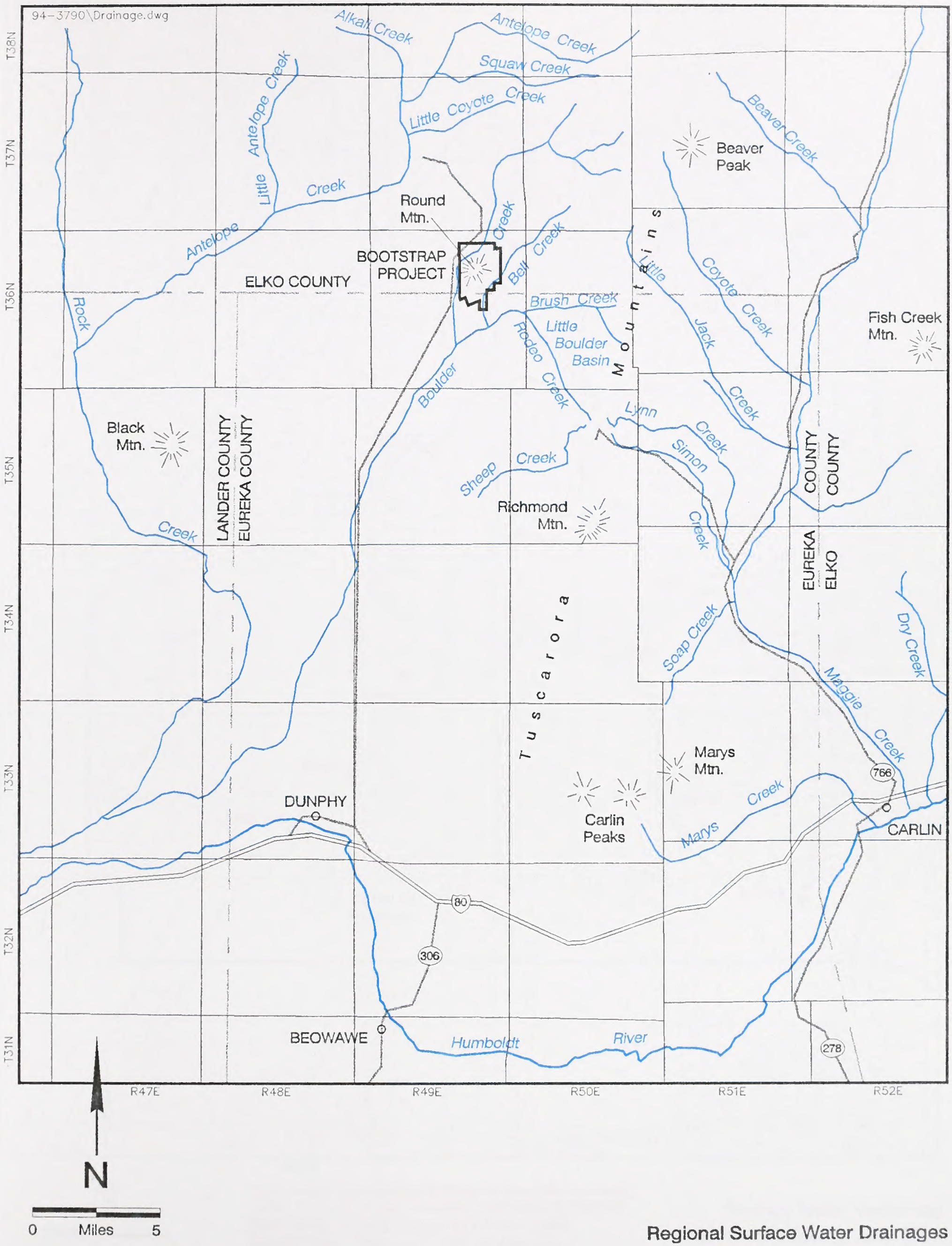
Boulder Creek

The upper reaches of Boulder Creek generally are perennial as a result of springs that discharge in the Tuscarora Mountains. Boulder Creek becomes ephemeral approximately 2 miles above its confluence with Rodeo Creek (near the Bootstrap Project site) and remains ephemeral until its confluence with Rock Creek approximately 25 miles southwest of the Bootstrap Project site (BLM 1993b). Flow in Boulder Creek generally decreases downstream, indicating that water infiltrates into the Boulder Valley alluvium. Surface flow in Boulder Creek rarely reaches the confluence with Rock Creek (BLM 1993b).

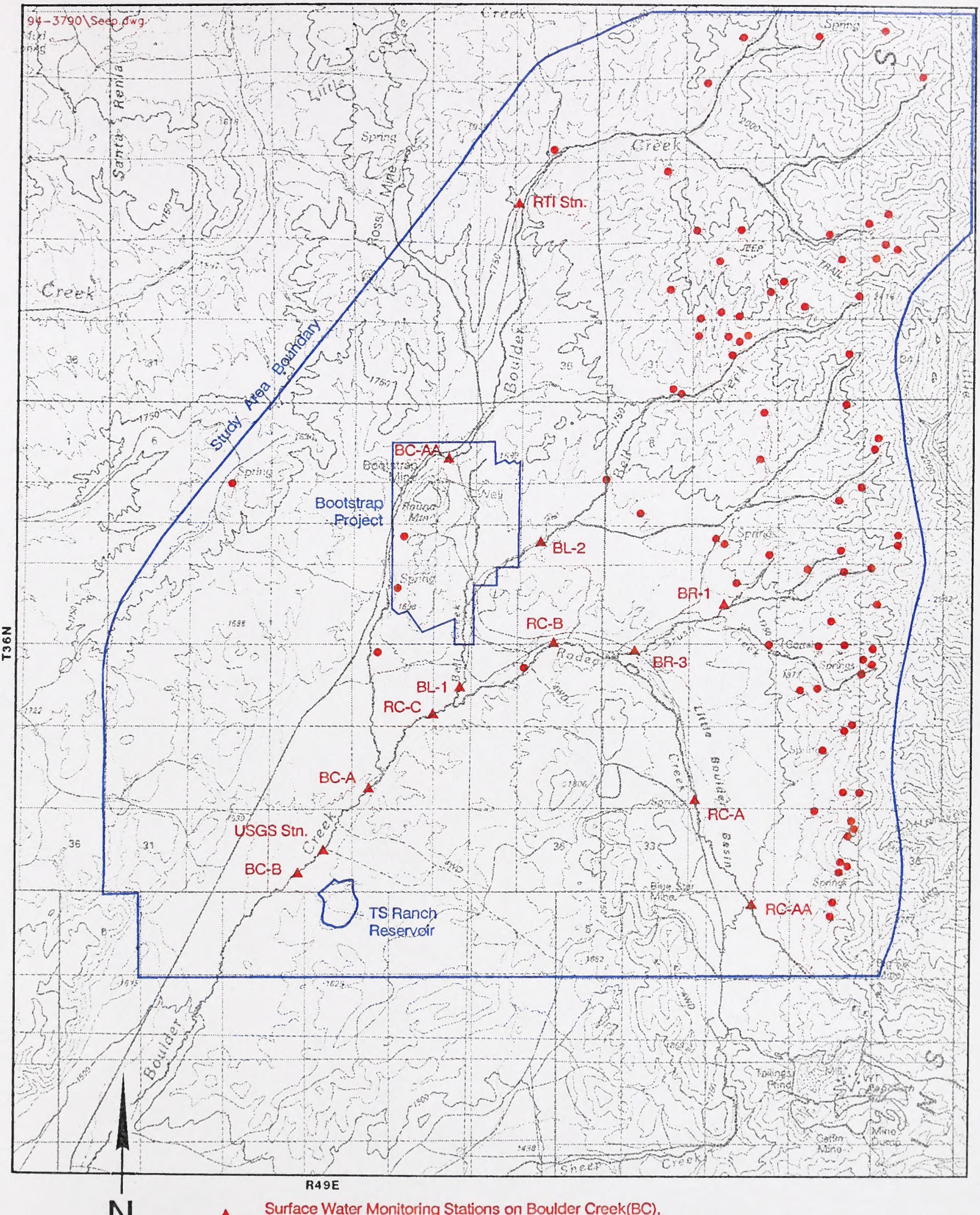
The USGS operated a gaging station (No. 10324700) on Boulder Creek approximately 1 mile downstream of the Rodeo Creek confluence from February 1991 to June 1993 and from January through June 1994 (Figure 3-6). The drainage area for this station is 76.7 square miles. There is typically no flow at this station from July through January. Average monthly flows for February, March, April, May, and June for the period of record are 3.0, 14.4, 6.8, 5.9, and 0.2 cubic feet per second (cfs), respectively (USGS 1995). From January through June 1994, no flow occurred at this Boulder Creek station. The instantaneous peak flow recorded was 141 cfs on March 17, 1993 (USGS 1995). A hydrograph showing flow variations in Boulder Creek at the USGS station from February 1991 through June 1993 is shown on **Figure 3-7**. Annual mean flow at the gaging station for the period of record was approximately 0.09 cfs (USGS 1995). The Boulder Creek channel is about 3 feet deep and 50 feet wide just downstream of its confluence with Rodeo Creek. The channel consists primarily of cobbles and gravel with minor amounts of silt (BLM 1991).

Peak flows for the 2-, 5-, 10-, 25-, 50-, and 100-year floods for Boulder Creek just above its confluence with Rodeo Creek have been calculated by JBR Consultants Group (1990a). These calculated peak flows are: 2-year = 1,200 cfs; 5-year = 3,300 cfs; 10-year = 4,400 cfs; 25-year = 7,000 cfs; 50-year = 9,500 cfs; and 100-year = 12,700 cfs.

Barrick has been measuring flow on Boulder Creek at four stations, the first three of which are shown in **Figure 3-6**: 1) BC-AA located at the north end of the Bootstrap Project site; 2) BC-A located just below the confluence with Rodeo Creek near the south end of the Bootstrap Project site; 3) BC-B located approximately 1 mile downstream from BC-A; and 4) BC-C located 5 miles downstream from BC-B (Barrick 1995). The USGS station on Boulder Creek discussed above is located near station BC-B (**Figure 3-6**). Flow measurements are performed by Barrick approximately monthly; results since 1993 are summarized in **Table 3-8**. These flow data show there was significant runoff in March, April, and May of 1993, with flow detected at all four stations (maximum of about 85 cfs at stations BC-A and BC-B). In 1994, flow occurred only at upper station BC-AA (February through June), ranging from approximately 0.2 to 9 cfs. Significant flows also occurred in Boulder Creek in May of 1995 of up to 54 cfs.



Regional Surface Water Drainages
Bootstrap Project
FIGURE 3-5



▲ Surface Water Monitoring Stations on Boulder Creek(BC), Rodeo Creek(RC), Bell Creek(BL), and Brush Creek(BR).
Note: Station BC-C is located on Boulder Creek approximately 1 mile south of figure boundary.

● Spring/Seep

Surface Water Monitoring
Stations and Spring/Seep Sites
Bootstrap Project
FIGURE 3-6

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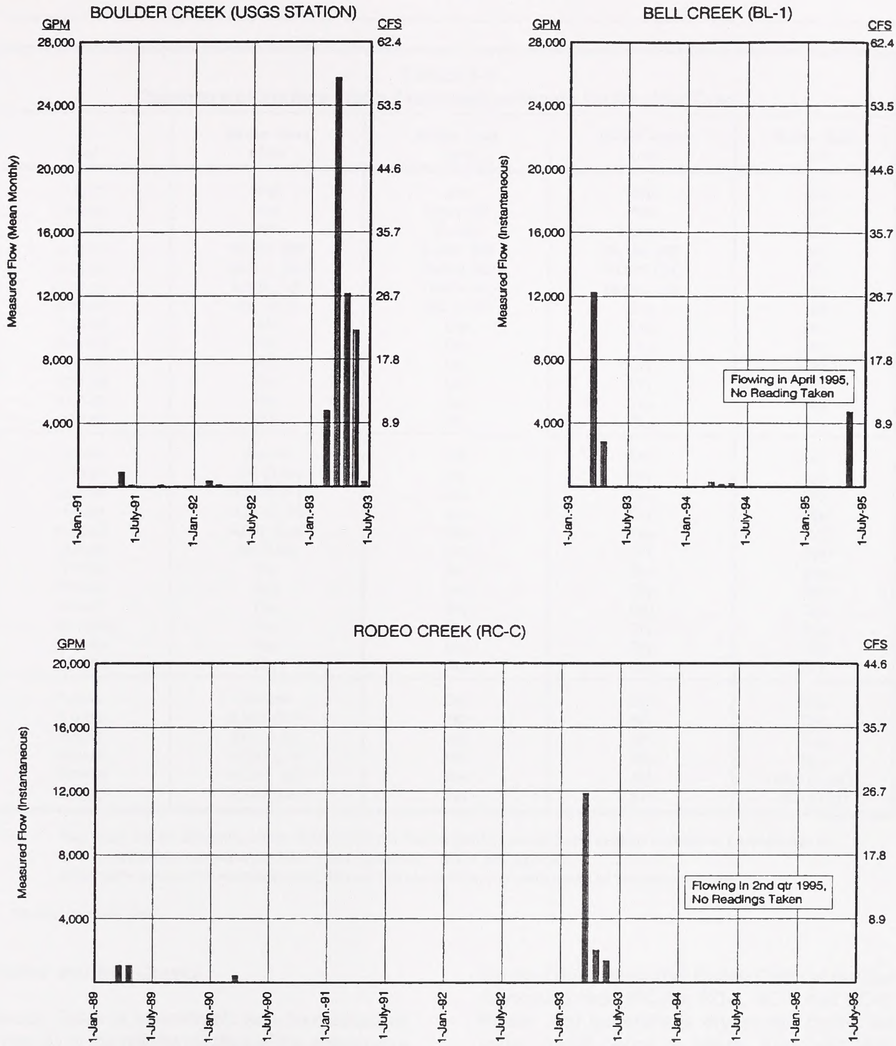


Note: GPM = Gallons Per Minute; CFS = Cubic Feet Per Second

See Figure 3-6 for station locations.

Hydrographs of Boulder Creek,
Rodeo Creek and Bell Creek
Bootstrap Project
FIGURE 3-7

TABLE 3-8
Summary of Surface Water Flow Measurements for Boulder Creek[1]

Date[2]	Boulder Creek BC-AA	Boulder Creek BC-A	Boulder Creek BC-B	Boulder Creek BC-C
1-5-93	NM	Dry	Dry	NR
2-8-93	NM	4,614 (10)	NR	NR
3-1-93	NM	Frozen	Frozen	NR
3-10-93	29,038 (65)	37,957 (85)	38,198 (85)	NR
4-23-93	22,512 (50)	13,679 (30)	15,076 (34)	NR
5-27-93	5,736 (13)	17,904 (40)	16,093 (36)	NR
6-24-93	991 (2.2)	295 (0.66)	Dry	NR
7-12-93	NM	Dry	Dry	Dry
8-24-93	NM	Dry	Dry	Dry
9-21-93	NM	Dry	Dry	Dry
10-1-93	Dry	Dry	Dry	Dry
11-1-93	Dry	Dry	Dry	Dry
12-1-93	Dry	Dry	Dry	Dry
1-1-94	Frozen	Dry	Dry	Dry
2-16-94	128 (0.29)	Dry	Dry	Dry
3-7-94	410 (0.91)	Dry	Dry	Dry
4-8-94	322 (0.72)	Dry	Dry	Dry
5-10-94	4,007 (8.9)	Dry	Dry	Dry
6-6-94	99 (0.22)	Dry	Dry	Dry
7-1-94	Dry	Dry	Dry	Dry
8-1-94	Dry	Dry	Dry	Dry
9-1-94	Dry	Dry	Dry	Dry
10-17-94	Dry	Dry	Dry	Dry
11-8-94	Dry	Dry	Dry	Dry
12-5-94	Dry	Dry	Dry	Dry
1-3-95	Frozen	Dry	Dry	Dry
2-1-95	3,892 (8.7)	NR	NR	Dry
3-9-95	374 (0.83)	NR	NR	Dry
3-30-95	4,390 (9.8)	NR	NR	Dry
5-16-95	24,201 (54)	NR	NR	23,513 (52)
6-6-95	3,840 (8.6)	NR	NR	228 (0.51)

1 See Figure 3-6 for sampling sites; first number is flow in gallons per minute, second number in parentheses is flow in cubic feet per second; NM = not measured; NR = not reported.
2 All stations were not necessarily sampled on the same date, but were close to the reported date.

Source: Barrick 1995.

Rodeo and Bell Creeks

Rodeo Creek is intermittent, with flow occurring primarily in the middle reaches of the stream as a result of groundwater discharge via springs and seeps (Welsh Engineering 1989). Newmont and Barrick constructed a diversion on Rodeo Creek in 1993 to allow expansion of the Betze/Post pit. A Section 404 Permit was obtained from USCOE prior to construction. Flow data reported by Barrick (1995) show that Rodeo Creek at the four monitoring sites (RC-AA, RC-A, RC-B and RC-C; **Figure 3-6**) generally is dry except during the spring runoff period of March, April, and May. **Table 3-9** summarizes flow measurements obtained at stations RC-A and RC-C in 1993-95, and **Figure 3-7** includes a streamflow hydrograph at station RC-C from 1989 through mid-1995. Heavy precipitation in the spring of 1993 resulted in

TABLE 3-9
Summary of Surface Water Flow Measurements for Bell and Rodeo Creeks[1]

Date[2]	Bell Creek BL-1	Bell Creek BL-2	Rodeo Creek RC-A	Rodeo Creek RC-C
1-5-93	NR	NR	Dry	Dry
2-8-93	NR	NR	Dry	Dry
3-1-93	NR	NR	Dry	Dry
3-10-93	12,118 (27)	23,076 (51)	984 (2.2)	11,968 (27)
4-23-93	2,783 (6.2)	4,905 (11)	1,436 (3.2)	2,019 (4.5)
5-27-93	Dry	147 (0.3)	99 (0.2)	1,279 (2.8)
6-24-93	Dry	14 (0.03)	2 (0.0045)	Dry
7-12-93	Dry	Dry	Dry	Dry
8-24-93	Dry	Dry	Dry	Dry
9-21-93	Dry	Dry	Dry	Dry
10-1-93	Dry	Dry	Dry	Dry
11-1-93	Dry	Dry	Dry	Dry
12-1-93	Dry	Dry	Dry	Dry
1-1-94	Frozen	Dry	Dry	Dry
2-16-94	Frozen	Dry	Dry	Dry
3-7-94	275 (0.6)	Dry	Dry	Dry
4-8-94	113 (0.25)	Dry	Dry	Dry
5-10-94	101 (0.23)	Dry	Dry	Dry
6-6-94	Dry	Dry	Dry	Dry
7-1-94	Dry	Dry	Dry	Dry
8-1-94	Dry	Dry	Dry	Dry
9-1-94	Dry	Dry	Dry	Dry
10-17-94	Dry	Dry	Dry	Dry
11-7-94	Dry	Dry	Dry	Dry
12-5-94	Dry	Dry	Dry	Dry
1-3-95	Dry	Dry	Dry	Dry
2-1-95	Dry	808 (1.8)	Dry	Dry
3-10-95	Dry	146 (0.33)	NR	Dry
3-30-95	Dry	689 (1.5)	Dry	Dry
5-16-95	4,609 (10)	6,109 (14)	NR	NR
6-6-95	Dry	694 (1.5)	NR	Dry

[1] See **Figure 3-6** for sampling sites; first number is flow in gallons per minute, second number in parentheses is flow in cubic feet per second; NM = not measured; NR = not reported.
[2] All stations were not necessarily sampled on the same date, but were close to the reported date.

Source: Barrick 1995.

streamflow rates of up to about 27 cfs in Rodeo Creek. In 1994, no flows were recorded at stations RC-A and RC-C. In 1987-88, flows measured by JBR Consultants Group (JBR 1988) ranged from 0.15 to 5.72 cfs. The Rodeo Creek channel is narrow and deeply entrenched to depths of 4 to 24 feet. The lower reaches of Rodeo Creek show evidence of sedimentation (BLM 1991). This creek drains an area of approximately 19.4 square miles.

Bell Creek enters Rodeo Creek from the north approximately 1.5 miles upstream of the confluence of Rodeo Creek with Boulder Creek (**Figure 3-5**). Perennial flow in Bell Creek is confined to the upper reaches, with ephemeral flows in the middle and lower reaches where the gradient decreases and the streambed widens. The drainage area for Bell Creek is approximately 14 square miles.

Monthly flow data for the two stations on Bell Creek (BL-1 and BL-2) for 1993-95 are shown in **Table 3-9**. Significant runoff occurred in the spring of 1993 and 1995, with highest measured flow rates of approximately 51 cfs. Flow generally was higher at the upper station (BL-2) than at the lower station (BL-1) located near the mouth of the stream, indicating infiltration of surface water as it travels down the stream channel. In 1994, low flows were recorded during spring at the lower station (BL-1) in Bell Creek, and no flow was measured at upper station BL-2 (**Table 3-9**). A hydrograph for Bell Creek at BL-1 for 1993-95 is included in **Figure 3-7**. Mean annual runoff for Bell Creek at its mouth is approximately 10,000 acre-feet (JBR 1990a). Peak flows calculated for the 2-, 5-, 10-, 25-, 50-, and 100-year floods for Bell Creek at its mouth are 330; 950; 1,400; 2,200; 3,200; and 4,300 cfs, respectively (JBR 1990a).

Humboldt River

The nearest downstream USGS gaging station on the Humboldt River is located near Battle Mountain, approximately 2 miles below the confluence of Rock Creek and the Humboldt River. Average annual flow at this station for the period 1897 to 1994 was 338 cfs (USGS 1995). This period of record includes 44 years of data, of which pre-1969 data are considered poor. Average baseflow measured during the month of October was 26 cfs (USGS 1995). The Humboldt River loses water to diversion and consumption, evaporation, and riverbed seepage. The Battle Mountain gaging station is located between the Dunphy gage (upstream) and Comus gage (downstream) on the Humboldt River. Baseflow data indicate that flow increases in the Humboldt River between the Dunphy and Comus gaging stations (USGS 1995).

Boulder Creek Diversion

Boulder Creek is located approximately ¼-mile north of the existing Bootstrap Mine pit. The proposed Bootstrap/Capstone Mine pit would extend across a portion of Boulder Creek. As a result, Newmont received USCOE approval to construct a diversion to move Boulder Creek a short distance to the north. Newmont was issued Permit No. 199300369 from USCOE, pursuant to Section 404 of the Clean Water Act, in order to divert Boulder Creek around the proposed mine pit (see Chapter 2, Previous and Current Operations). The diversion ditch was completed in 1995 and involved relocating 2,800 feet of channel, constructing a diversion dike, installing two culverts, and relocating a portion of the existing roadway. The Boulder Creek diversion ditch can accommodate a 100-year/24-hour storm event.

Floodplain

Flood-prone areas (i.e., floodplains) along Rodeo and Boulder creeks below their confluence have been delineated by the Federal Emergency Management Agency (FEMA 1982) and the BLM (1991). The floodplain generally is flat ground adjacent to the streams that may be inundated during extreme floods. The 100-year floodplain for these drainages south of the project area is relatively narrow, typically less than 500 feet wide. The 100-year floodplain of Boulder Creek has not been delineated by FEMA or BLM; however, the floodplain in this area appears to be similar in extent to the southern drainage channel. Floodplains in the lower sections of Bell and Brush creeks have been delineated by JBR Consultants Group (JBR 1988) and are also typically less than 500 feet in width.

Surface Water Quality

Barrick (1995) currently collects water samples from four surface water stations on Rodeo Creek (RC-AA, RC-A, RC-B, and RC-C), four stations on Boulder Creek (BC-AA, BC-A, BC-B, and BC-C), and two stations on Brush (BR-1 and BR-3) and Bell (BL-1 and BL-2) creeks on a monthly basis (**Figure 3-6**; BC-C not shown on figure). In addition, the USGS collects water quality data at its station on Boulder Creek located approximately 1 mile downstream of the Rodeo Creek confluence near station BC-B (**Figure 3-6**).

Riverside Technology, Inc. (RTI 1994) collected samples from Boulder Creek at a site approximately 3 miles upstream of the Bootstrap Project site. Surface water in the Bootstrap Project area generally is a calcium-bicarbonate type with pH in the range of 7.5 to 8.5. Surface water in Boulder Creek in the vicinity of the Bootstrap Project typically is of better quality than water in Rodeo and Bell creeks (**Tables 3-10** and **3-11**).

Boulder Creek

Representative water quality data collected from Boulder Creek are presented in **Table 3-10**. Total dissolved solids (TDS) range from about 100 to 200 milligrams per liter (mg/L), and pH ranges from 7.6 to 8.4. The uppermost site sampled on Boulder Creek (RTI Station; **Figure 3-6**) generally has higher concentrations of dissolved and total constituents, including TDS, alkalinity, common ions, and sulfate. Alkalinity and hardness range from approximately 100 to 200 mg/L and 50 to 100 mg/L, respectively (BLM 1991; JBR 1988).

Sulfate ranges from about 20 to 100 mg/L and concentrations of metals generally are low in Boulder Creek. Concentrations of arsenic, iron, manganese, and nitrate in Boulder Creek stations located below the confluence of Rodeo Creek (BC-A and BC-B) are higher than at stations upstream from the confluence (**Table 3-10**). These elevated concentrations probably are associated with higher total suspended solids (TSS) levels in this reach of Boulder Creek coming from mining-related disturbances in the Boulder Creek drainage above the Rodeo Creek confluence and/or the Rodeo Creek drainage (Little Boulder Basin). None of the primary drinking water standards included in **Table 3-10** are exceeded in Boulder Creek; however, the secondary standards for iron and mangagnese are exceeded at most of the Boulder Creek stations.

Water quality of two samples collected from Boulder Creek by Dee Gold near the Bootstrap Project site also was generally good (BLM 1993c). Dee Gold monitors for cyanide in the vicinity of its mine just west-southwest of the Bootstrap Project as a result of seepage that occurred from a tailings dam. Concentrations of up to approximately 0.10 mg/L weak acid dissociable (WAD) cyanide were detected during 1990 in Boulder Creek in the Dee Gold Mine area (BLM 1993c). Dee Gold has remediated the tailings seepage using groundwater recovery wells with no adverse effects detected or observed in Boulder Creek (BLM 1993c).

Rodeo and Bell Creeks

Table 3-11 contains representative analytical results from surface water in Rodeo and Bell creeks. Concentrations of TDS and sulfate typically are 200 mg/L and <40 mg/L, respectively, for Bell Creek. Concentrations of the following parameters from **Table 3-11** are significantly higher in Rodeo Creek than Bell Creek; TDS, TSS, chloride, nitrate, arsenic, iron, and manganese. Surface water in Rodeo Creek probably is affected by mining-related disturbances in the Little Boulder Basin. Total suspended solids (TSS) of up to 290 mg/L in Rodeo Creek reflect increased sedimentation in this drainage. Alkalinity for all stations is in the range of 70 to 120 mg/L, and pH is between 7.6 and 9.0. Concentrations of arsenic (0.11-0.30 mg/L) in Rodeo Creek have exceeded the primary drinking water standard of 0.05 mg/L, and TDS, iron, and manganese have exceeded the secondary standards (**Table 3-11**).

TABLE 3-10
Boulder Creek Water Quality[1]

Parameter[2]	Boulder Creek BC-AA	Boulder Creek BC-A	Boulder Creek BC-B	Boulder Creek USGS Station	Boulder Creek RTI Station	Drinking Water Std.[3]
Sample date	6-6-94/5-16-95	5-7-93/5-11-95	5-7-93/5-11-95	3-9-93	10-3-93	--
Flow (gpm)	99/24,201	17,900/NR-high flow	16,100/NR-high flow	16,600	45	--
TDS	190/130	120/150	130/170	121	310	500-1000(s)
pH (std units)	8.4/7.6	7.6/7.9	737/8.0	7.9	8.0	6.5-8.5 (s)
TSS	<5/60	40/210	42/220	--	8	--
Alkalinity as $CaCO_3$	100/40	46/60	52/60	53	160	--
Calcium (Ca)	29/12	13/19	14/18	17	55	--
Sodium (Na)	11/6.9	6.9/8.4	7.6/8.2	9.3	16	--
Magnesium (Mg)	11/4.6	5.0/8.0	5.7/7.3	5.7	25	125-150(s)
Potassium (K)	3.3/2.9	2.2/4.0	2.5/3.8	2.8	4.7	--
Chloride (Cl)	4/3	3/7	4/6	4	7	250-400(s)
Fluoride (F)	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	0.20	--	2.0(s)-4.0
Sulfate (SO_4)	42/22	18/27	11/25	--	100	250-500(s)
Nitrate as NO_3-N	<0.05/0.12	0.24/0.18	0.16/0.18	2.8	<0.05	10
Arsenic (As)	<0.005/0.005	<0.005/0.01	<0.005/0.01	0.003	<0.05	0.05
Iron (Fe)	0.03/3.8	2.0/6.7	2.4/6.8	0.065	0.22	0.3-0.6(s)
Manganese (Mn)	<0.005/0.14	0.062/0.22	0.072/0.22	0.007	0.016	0.05-0.10(s)
Data Source	(a)	(a)	(a)	(b)	(c)	(d)

[1] See Figure 3-6 for sampling sites.

[2] All units in milligrams per liter (mg/L) unless otherwise specified; gpm = gallons per minute; TDS = total dissolved solids; TSS = total suspended solids; NR = not reported by Barrick (1995).

[3] All concentrations reported are primary drinking water standards in mg/L, unless followed by an (s) indicating secondary standards (see NAC 445A.453 and 445A.455).

Source: (a) Barrick 1995; (b) USGS 1994; (c) Riverside Technology, Inc. 1994; (d) NAC 445A.453 and 445A.455.

TABLE 3-11 Bell Creek and Rodeo Creek Water Quality[1]					
Parameter[2]	Bell Creek BL-1	Bell Creek BL-2	Rodeo Creek RC-A	Rodeo Creek RC-C	Drinking Water Std.[3]
Sample date	3-7-94/5-16-95	6-24-93/5-16-95	5-7-93/5-11-95	5-7-93/5-11-95	--
Flow (gpm)	275/4,609	14/6,109	99/NR	1,279/NR	--
TDS	250/230	240/180	1,200/530	160/320	500-1000(s)
pH (std units)	8.0/7.6	9.0/8.0	7.9/7.9	8.0/8.2	6.5 - 8.5(s)
TSS	10/14	<5/<5	290/170	10/190	--
Alkalinity as $CaCO_3$	120/80	120/70	110/90	80/100	--
Calcium (Ca)	40/24	34/24	120/68	21/42	--
Sodium (Na)	14/10	14/10	56/34	9.6/16	--
Magnesium (Mg)	16/9.2	13/9.3	86/35	8.2/25	125-150(s)
Potassium (K)	3.9/3.2	9.8/8.0	11/7.0	2.3/5.0	--
Chloride (Cl)	7/8	5/6	290/150	4/50	250-400(s)
Fluoride (F)	<0.5/<0.5	0.6/<0.5	<0.5/<0.5	<0.5/<0.5	2.0(s)-4.0
Sulfate (SO_4)	80/36	36/37	110/92	20/56	250-500(s)
Nitrate as NO_3-N	<0.05/0.06	<0.05/0.05	6.4/3.1	0.06/0.43	10
Arsenic (As)	<0.005/0.005	<0.005/0.005	0.30/0.21	<0.005/0.11	0.05
Iron (Fe)	0.07/0.83	0.46/0.94	15/5.6	0.77/5.5	0.3-0.6(s)
Manganese (Mn)	0.007/0.018	0.048/0.021	0.55/0.14	0.031/0.15	0.05-0.10(s)

[1] See **Figure 3-6** for sampling sites.
[2] All units in milligrams per liter (mg/L) unless otherwise specified; gpm = gallons per minute; TDS = total dissolved solids; TSS = total suspended solids; NR = not reported by Barrick (1995).
[3] All concentrations reported are primary drinking water standards in mg/L, unless followed by an (s) indicating secondary standards (see NA 445A.453 and 445A.455).

Source: Barrick 1995.

Springs and Seeps

The majority of springs and seeps in the project area are located to the east of the Bootstrap Project area on the western flank of the Tuscarora Mountains in the headwaters of Rodeo, Brush, Bell, and Boulder creeks (**Figure 3-6**). Most of the springs flow at rates of 1 to 5 gallons per minute (gpm) or less. The source for springs in the mountains (i.e., above elevation 6,500 feet AMSL) is believed to be primarily perched groundwater not connected to the regional groundwater table (BLM 1991 and 1993b; Leggette, Brashears & Graham, Inc. 1993). Some faults in this region appear to have a major influence on spring and seep locations, acting as barriers or conduits for groundwater flow and directing water to the surface (Adrian Brown Consultants, Inc. 1992).

The most comprehensive spring and seep inventory in the Bootstrap Project area was conducted by Riverside Technology, Inc. (RTI 1994) during September and October 1993. The study area for this inventory encompassed approximately 600 square miles in Elko, Lander, and Eureka counties. Within this large study area, the following resources were identified: 285 springs and seeps with perceivable flows; 213 wet or muddy areas with no perceivable flow; and 119 previously identified spring or seep sites that were dry (RTI 1994). Seven springs have been identified within a radius of about 2 miles of the Bootstrap Project site (**Figure 3-6**).

Four springs or seeps have been identified within 1 mile of the Bootstrap Project site: 1) spring ½ mile southwest of the project area along Boulder Creek; 2) and 3) two spring/seep complexes along the western project boundary adjacent to Boulder Creek; and 4) spring approximately 1 mile southeast of the project area along Rodeo Creek (**Figure 3-6**). Two other springs are located approximately 1 to 2 miles east of the Bootstrap Project site in or near the Bell Creek drainage (**Figure 3-6**). The seventh spring identified on the USGS topographic map approximately 2 miles west of the Bootstrap Project site (**Figure 3-6**) was not flowing during the 1993 inventories by RTI. Flow in this spring and the two spring/seep complexes along the western project boundary may be affected by dewatering at the Betze/Post Mine. All other inventoried springs and seeps in the vicinity of the Bootstrap Project are located more than 3 miles to the north and east along the west side of the Tuscarora Mountains.

Quality of water from springs in the project area generally is good with a neutral pH (6.4 to 8.9), SC range of about 100 to 800 μmhos/cm, nitrate plus nitrite concentration of less than 3.2 mg/L, and sulfate ranging from <10 to 230 mg/L (RTI 1994). Total dissolved solids range from 30 to 550 mg/L, with the lowest concentrations at higher elevations in the Tuscarora Mountains. Concentrations of metals in spring water throughout the area generally are low. Temperature of springs in the area ranges from 38 to 78 degrees F.

Groundwater Quantity

Groundwater recharge in the project area stems primarily from precipitation in the mountain areas. Local groundwater discharge occurs in the upper tributaries (e.g., Rodeo, Brush, Bell, and upper Boulder creeks) of Boulder Valley, where it travels as surface flow with subsequent evaporation and infiltration in the Boulder Valley. Groundwater in the project area is present within shallow Quaternary-age alluvium, the Tertiary-age Carlin Formation, and Paleozoic-age sedimentary rocks. The Paleozoic-age sedimentary rocks are composed primarily of limestone, with some mudstone, siltstone, and chert. The Carlin Formation contains poorly consolidated lacustrine sediments of silt, clay, and gravel. Shallow alluvial deposits of interbedded sand and gravel are found adjacent to streams in the project area at thicknesses of up to about 50 feet.

The Bootstrap gold deposits are composed primarily of Paleozoic-age carbonate rocks. A complex system of north-south trending high-angle faults occurs in the Bootstrap Project area. These faults can act as both conduits and barriers to groundwater flow, depending on the openings and alteration associated with the structures.

Dewatering at the Betze/Post Mine began in 1990, averaging about 7,100 gpm in 1990 and increasing to an average of over 60,000 gpm in 1994 (Balleau Groundwater 1993; Barrick 1995). Much lower rates of groundwater pumping are occurring at other mines in the North Operations Area, including about 50 gpm at the Bluestar/Genesis Mine. Under current plans, dewatering will continue through year 2006 to dewater both the Meikle and Deep Post deposits. The Meikle deposit occurs on Barrick-controlled property and the Deep Post deposit occurs on both Barrick and Newmont controlled property.

Groundwater levels have been lowered by over 1,000 feet in the vicinity of the Betze/Post Mine and the proposed Bootstrap Mine project. The Bootstrap Project site is located in the northern portion of the groundwater cone of depression caused by Betze/Post Mine dewatering (**Figure 3-8**). As a result, current groundwater flow in the Bootstrap Project area is southeast toward the Betze/Post Mine. This groundwater drawdown will maintain the regional water table below the active Tara and Bootstrap/Capstone mine pits. A localized area of groundwater mounding is occurring in the vicinity of the TS Ranch Reservoir because of infiltration; however, this area does not affect the Bootstrap Project site. Prior to initiation of dewatering, groundwater generally flowed southwest from the west side of the Tuscarora Mountains to the Boulder Valley, and then southward along the Boulder Valley toward the Humboldt River.

The groundwater surface in bedrock in the Bootstrap Project area prior to initiation of dewatering at the Betze/Post Mine was at an elevation of approximately 5,250 feet AMSL (PTI 1995). **Figure 3-4** presents two geologic cross sections through the proposed Tara and Bootstrap/Capstone pits that show the approximate water table location prior to effects from Betze/Post Mine dewatering. Since initiation of Betze/Post Mine dewatering, however, the groundwater table in the Bootstrap Project area has been declining. The groundwater cone of depression for July 1, 1995 is shown in **Figure 3-8**. The groundwater elevation was approximately 4,000 to 4,100 feet AMSL in the Bootstrap Project area during mid-1995 (Barrick 1995).

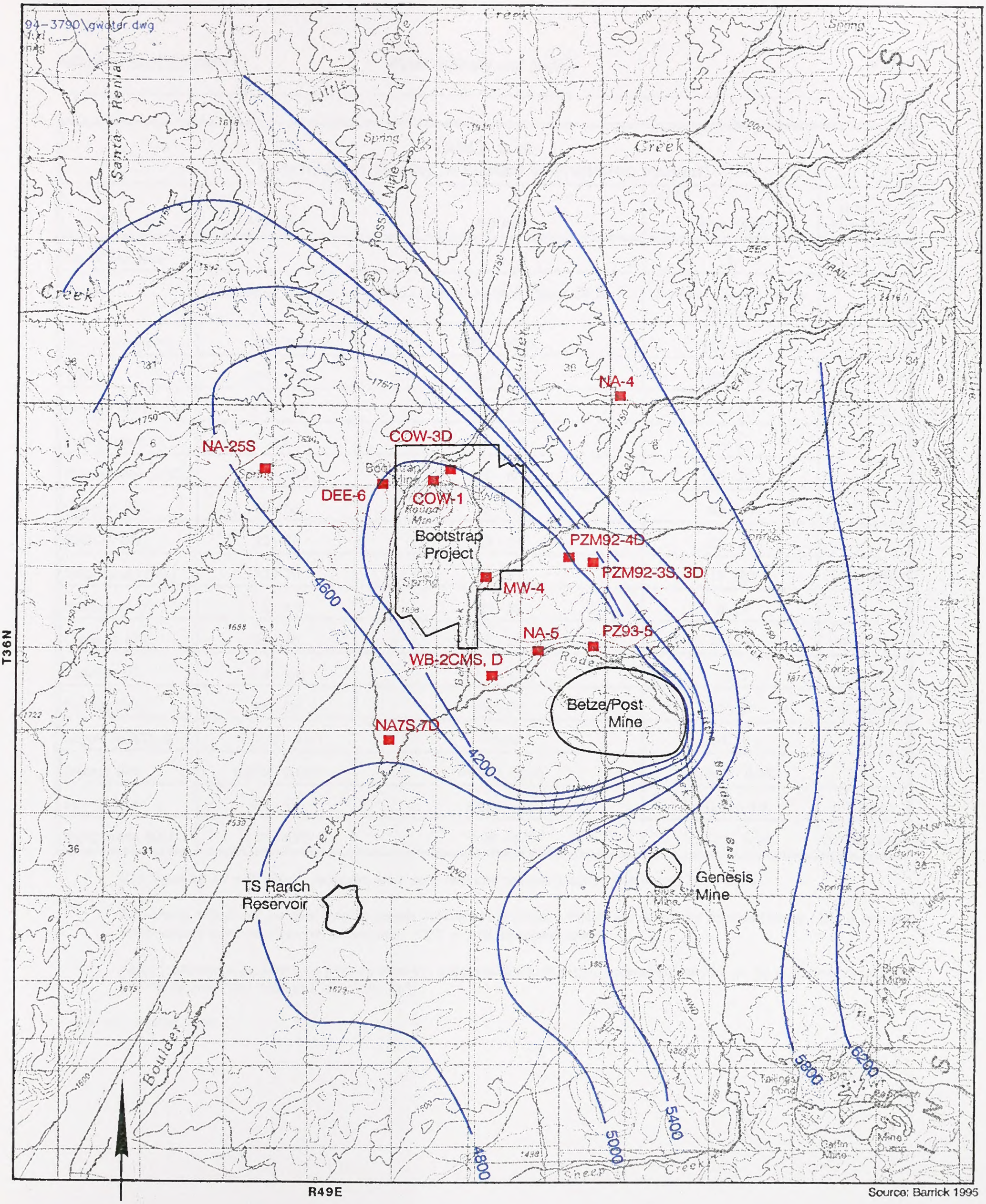
One monitoring well (COW-1; **Figure 3-8**) was completed in the northern portion of the proposed Bootstrap/Capstone Mine pit. This well was drilled to approximately 4,900 feet AMSL and is dry. The groundwater level in well DEE-6 (**Figure 3-8**) located near the northwest end of the Bootstrap Project area has been steadily declining, with a current elevation of approximately 4,000 feet AMSL. Another nearby monitoring well (COW-3D; **Figure 3-8**) northeast of the proposed Bootstrap/Capstone pit, however, has shown little change in groundwater levels probably due to perched water conditions, with an elevation remaining near 5,100 feet AMSL. The natural range of groundwater level fluctuations in bedrock material is about 10 feet in the valleys associated with regional flow systems. Water levels change up to 20 feet in mountainous regions such as the Tuscarora Mountains (Leggette, Brashears & Graham, Inc. 1993).

Permeability of subsurface materials in the project area is variable, with clayey units and some faults presenting barriers to groundwater flow. Alluvium and some Paleozoic-age sedimentary rocks provide the major water conduits. Higher hydraulic conductivity values range from about 10 to 80 feet per day (ft/day), and are less than 0.3 ft/day for the less permeable materials (Adrian Brown Consultants, Inc. 1992).

Groundwater Quality

Groundwater in the Bootstrap Project area has been characterized by samples collected and analyzed from several monitoring wells completed as part of Barrick's Boulder Valley Monitoring Plan. Approximately 10 monitoring wells exist within 2 miles of the Bootstrap Project site (**Figure 3-8**). Groundwater in bedrock formations generally is of good quality and classified as a calcium-bicarbonate type (BLM 1993b). A representative groundwater quality sample from bedrock (well NA-4; **Figure 3-8**) is presented in **Table 3-12**. Concentrations of all parameters from thls bedrock groundwater sample are relatively low.

Groundwater quality from two wells completed in alluvium along Rodeo Creek and Boulder Creek south of the Bootstrap Project site is summarized in **Table 3-12**. The water sample from shallow alluvium in Boulder Creek (well NA-7s; **Figure 3-8**) is similar to the sample obtained from bedrock (well NA-4). The groundwater sample obtained from alluvium and upper Carlin Formation in the Rodeo Creek drainage (well NA-5; **Figure 3-8**) contains higher concentrations of common ions and some metals (**Table 3-12**). All the groundwater samples have a neutral pH (6.8 to 8.1) and low sulfate concentrations (47 to 87 mg/L). The Rodeo Creek sample has TDS of approximately 600 mg/L, whereas, TDS ranges from 280 to 360 mg/L in bedrock and Boulder Creek alluvium. Iron and manganese concentrations are higher in the Rodeo Creek alluvium samples.



N

0 Feet 8000
Approximate

■ Groundwater Monitoring Well

—— Groundwater Elevation (feet) July 1, 1995

Note: Groundwater levels in some of the wells are perched (e.g., COW-3D) and therefore do not match contour lines.

Groundwater Potentiometric Surface
Bootstrap Project
FIGURE 3-8

TABLE 3-12
Groundwater Quality in Vicinity of Bootstrap Project[1]

Parameter[2]	Well NA-4	Well NA-5	Well NA-7s	Drinking Water Std.[3]
No. of samples	7	3	5	--
Aquifer	Siliceous bedrock	Rodeo Creek alluvium & Upper Carlin Fm	Boulder Creek shallow alluvium	--
SC (μmhos/cm)	480 - 600	930 - 1000	440 - 480	--
TDS	310 - 330	590 - 600	280 - 360	500-1000(s)
pH (std units)	6.8 - 7.2	7.0 - 7.2	7.0 - 8.1	6.5-8.5(s)
Carbonate (CO_3)	<5	<5	<5	--
Bicarbonate (HCO_3)	200 - 260	460 - 600	140 - 200	--
Calcium (Ca)	49 - 63	96 - 300	43 - 54	--
Sodium (Na)	22 - 25	68 - 79	21 - 30	--
Magnesium (Mg)	23 - 25	29 - 91	14 - 23	125-150(s)
Potassium (K)	2.2 - 4.3	20 - 58	6 - 9	--
Chloride (Cl)	21 - 25	17 - 20	12 - 20	250-400(s)
Fluoride (F)	2.2 - 2.8	7.[illegible] - 7.2	<0.5	2.0(s)-4.0
Sulfate (SO_4)	47 - 59	78 - 82	60 - 87	250-500(s)
Nitrate as NO_3-N	<0.05 - 4.5	<0.05	0.34 - 4.8	10
Arsenic (As)	0.015 - 0.019	<0.005 - 0.02	<0.005 - 0.007	0.05
Iron (Fe)	1.4 - 4.7	<0.01 - 17	<0.01 - 1.3	0.3-0.6(s)
Manganese (Mn)	0.35 - 0.69	0.22 - 5.9	0.015 - 0.18	0.05-0.10(s)

[1] See Figure 3-8 for well sites. Samples were collected and analyzed during the period 1991-1994.

[2] All units in milligrams per liter (mg/L) unless otherwise specified. Metals are dissolved concentrations. SC = specific conductance in micromhos per centimeter; TDS = total dissolved solids.

[3] All concentrations reported are primary drinking water standards in mg/L, unless followed by an (s) indicating secondary standards (see NAC 445A.453 and 445A.455).

Source: Barrick 1995.

SOIL AND WATERSHED

The Bootstrap Project is located within the Basin and Range Physiographic Province, a region that extends over most of Nevada and parts of adjoining states. Range-front faulting in the province `has created north-south trending mountain ranges that are separated by broad valleys filled with alluvium.

Soil in the northern portion of the Bootstrap Project area is derived primarily from siltstone, mudstone, chert and limestone of Paleozoic-age bedrock Formations and Quaternary- and Tertiary-age sediments composed of silt, clay, gravel and volcanic detritus. Soil located on terraces and fans in the southeastern portion of the study area is derived from loess, alluvium, and lacustrine sediments. Soil in the area is also influenced by volcanic ash. In the pit area, outcrops of silicified rocks limit the quantity of soil that can be physically salvaged.

Soil mapping units within the projected disturbance area were identified from an Order 2 soil survey conducted in August 1995 by Grass Land Soils and Reclamation, Inc. (Grass Land). Soil mapping units outside the projected disturbances, but within the Bootstrap Project area (CC and BM), were identified from a published Order 3 Soil Survey of the Tuscarora Mountain Area (USDA 1980). Soil mapping units are listed in **Table 3-13** and shown in **Figure 3-9**. Disturbed areas, shown as DIS or a -DIS Complex, are a result of past exploration and mining activity.

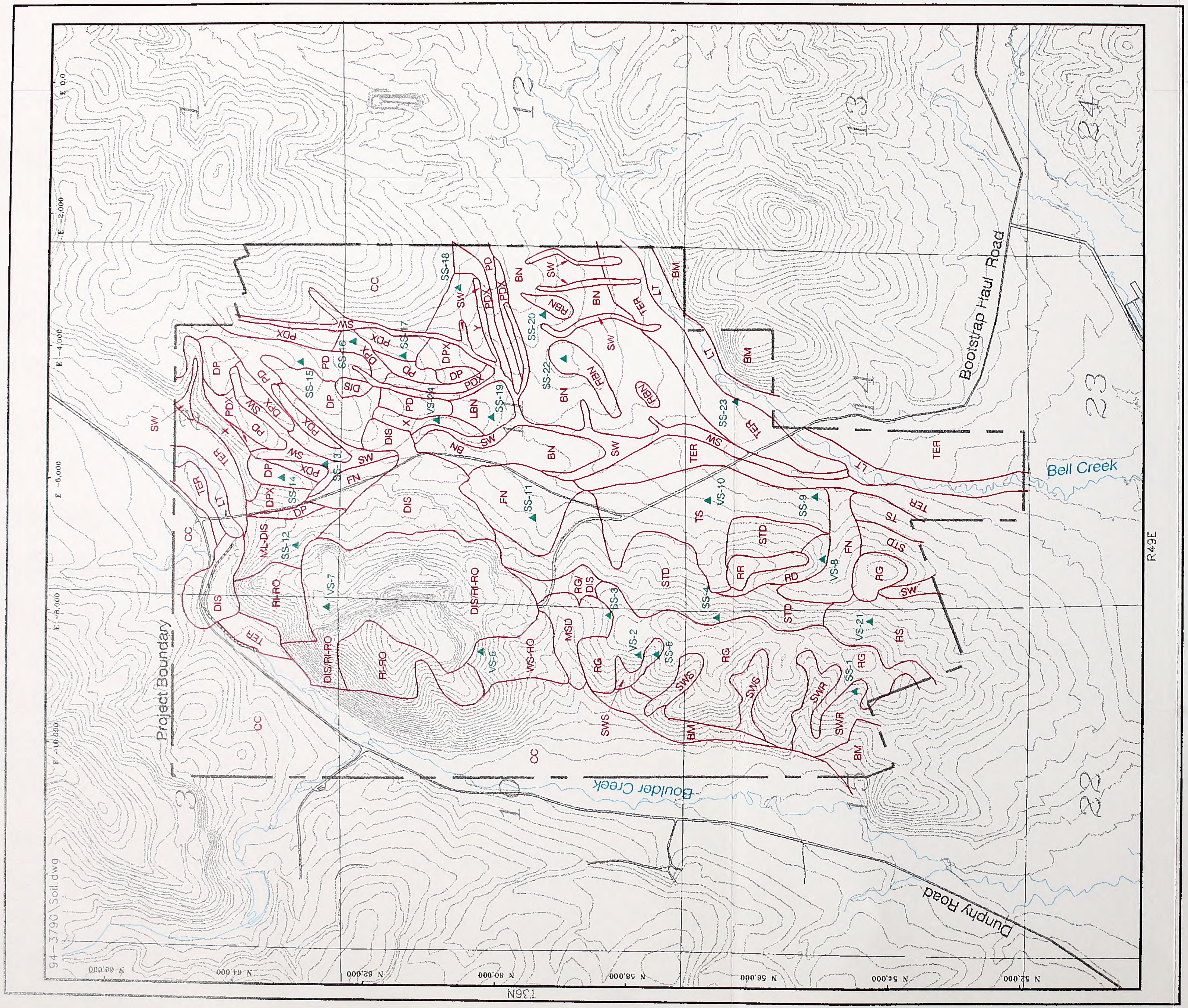
Data collected from the Order 2 soil survey include mapping unit, percent of mapping unit included in each complex, slope range, landform, area, depth to induration or bedrock, depth of soil suitable for reclamation, available water holding capacity (AWHC), root restricting depth (RRD), and parent material. Permeability, surface runoff class, and erosion class were estimated.

Depth of soil varies throughout the study area, as indicated in **Table 3-13**. Shallow soils, less than 20 inches to bedrock, are found along ridgelines and weathered slopes (**Figure 3-9**). These mapping units include DIS-RI-RO, RG, RG-DIS, FN, PO, RR, X, PDX, DPX, WS-RO and RS. Mapping units SWS, SWR, STD and MSD, although located in upland areas, have soil exceeding 15 inches in depth. Soils in lowlands derived from colluvium and/or alluvium sources, TS, FN, DP, X, SW, Y, BN, RBN, TER, LT and LBN, generally exceed 15 inches in depth.

Except for the low terraces, the soils in the Bootstrap Project area are well drained and not subject to flooding. Soils generally have low water holding capacity and moderate to rapid permeability (**Table 3-13**). Surface runoff is moderate to rapid.

Potential growth medium salvage depths were determined from physical and chemical criteria listed in the National Soils Survey Handbook (USDA 1993). Suitability limitations and restrictive features used in evaluating soil for salvage purposes are listed in **Table 3-14.** Slope limitations and maximum salvage depth to cemented pan or bedrock were determined by equipment capabilities. The National Soil Survey Handbook (USDA 1993) was used to determine suitability criteria for texture, coarse fragments, pH, and organic matter. Because of the limited high quality soil resource present at the project site, "fair" limits were used in setting criteria.

Soil profile characteristics were determined from an Order 2 soil survey (Grass Land 1995). For each soil profile, the following information was determined: sequential horizons by depth, horizon boundary classification, coarse fragment content, texture, color, structure, consistency and plasticity, roots, and effervescence class. A K factor (soil erodibility factor) was determined using the RUSLE computer model (Version 1.03)(Soil and Water Conservation Society 1993). **Table A, Appendix A** presents soil profile characteristics that include soil type, sample or verification site number, and surface coarse fragments for each mapping unit.



SS-23 Soil Sample Location #23

VS-2 Soil Verification Site Location #2

Soil Mapping Unit	Landform	Depth of Soil (inches) Suitable for Reclamation
ML-DIS	Lower Slope-Disturbed	12-0
DIS-RI-RO	Disturbed Ridgeline/Rock Outcrop	0-0-0
MSD	Midslope	19
DIS	Varied-Disturbed	0
RG	Upper Slope	0
RG-DIS	Upper Slope-Disturbed	0
SWS	Upper Slope	0
SWR	Upper Slope	26
TS	Terrace	21
STD	Mid-Upper Slope	31
FN	Fan	10
PD	Fan	8
DP	Ridgetop	7
RR	Ridgetop	0
X	Lower Slope	0
PDX	Terrace	11
DPX	Lower Slope	6
SW	Drainage	18
Y	Fan	8
BN	Fan	24
RBN	Fan	10
TER	Terrace	33
LT	Terrace	33
WS-RO	Ridgeline	0-0
RD	Slope	0
LBN	Fan	20
RS	Fan	0
RI-RO	Ridgeline-Rock Outcrop	0-0
CC(1)	Upland	—
BM(1)	Foothill-Terrace	—

Source: Soil Survey of Tuscarora Mountain Area. USDA 1980

N

0 Feet 1500

Soils Map
Bootstrap Project
FIGURE 3-9

TABLE 3-13
Soil Mapping Unit Descriptions

Mapping Unit[1]	Percent of Unit[2]	Slope Range (%)	Landform	Area (Acres)[3]	Depth to Induration or Bedrock (in)[4]	Depth of Soil Suitable for Salvage (in)	AWHC[5]	RRD[6]	Permeability[7]	Surface Runoff Class[8]	Parent Material	Soil Types Included[9]	Comments
ML-DIS[10]	60-40	15-25	Lower slope	21.0	21	12/0	L	MD	R	M	Colluvium	RI-RO, TER, DPX	
DIS-RI-RO[10,11]	60-20-20	5-20	Mountain top	127.3	6	0/0/0	L	VS	R	VR	Residuum	RI-RO, WS-RO, MSD, RG, STD, ML-DIS	
MSD	--	10-20	Midslope	19.0	19	19	M	MD	MR	M	Mudstone	WS-RO, RI-RO, RG, CC, BM	
DIS[10]	--	-	-	76.7	-	0	-	-	-	-	-	-	Disturbed by prior exploration and mining activity.
RG	--	30	Upper slope	127.1	4	0	L	VS	R	M-R	Mudstone	BM, SWR, SWS, MSD, STD, RS	50% of surface covered with gravel and cobbles.
RG-DIS[10]	50-50	20	Upper slope	8.3	4	0/0	L	S	R	M-R	Mudstone	MSD, RI-RO, STD	50% of surface covered with gravel and cobbles.
SWS	--	35-40	Upper slope	14.6	28	0	L	MD	R	M-R	Colluvium	BM, RG, SWR	
SWR	--	30	Upper slope	21.2	26	26	L	MD	R	M-R	Colluvium	BM, RG, SWS	50% of surface covered with chert.
TS	--	5-15	Terrace	85.9	21	21	M	MD	MR	M	Alluvium	FN, RD, RR, STD, TER	
STD	--	30-40	Midupper slope	107.3	31	31	L	MD	R	M-R	Colluvium	TS, RR, RD, FN, RG, SW, BM, TER, RI-RO, RS	
FN	--	10	Fan	80.6	40	10	M	MD	MR	M	Alluvium	TER, TS, STD, RG, RS, STD, RD, BN, SW	Desert pavement present in eroded areas.
PD	--	5-10	Fan, slope	64.1	6	8	M	VS	MR	M	Alluvium	BN, PDX, X SW, DPX, DP, LBN	
DP	--	5	Ridgetop	16.8	15	7	L	S	R	VR	Residuum	PD, DPX, PDX, X, SW	70% of surface covered with fine gravel.
RR	--	10	Ridgetop	8.6	5	0	L	S	R	MR	Residuum	STD, TS, RD	
X	--	20-30	Lower slope	16.0	6-11	0	L	S	MR	VR	Alluvium	PDX, SW, DPX, X	70% of surface covered with rock.
PDX	--	5-10	Terrace	38.4	11	11	M	S	MR	M	Residuum	BN, CG, CC, PD, SW, DP, X	80% of surface covered with rock.
DPX	--	15-20	Lower slope	24.0	6-11	6	L	S	MR	R	Residuum	SW, PDX, DP, PD, X	50% of surface covered with rock.

TABLE 3-13 (continued)
Soil Mapping Unit Descriptions

Mapping Unit[1]	Percent of Unit[2]	Slope Range (%)	Landform	Area (Acres)[3]	Depth to Induration or Bedrock (in)[4]	Depth of Soil Suitable for Salvage (in)	AWHC[5]	RRD[6]	Permeability[7]	Surface Runoff Class[8]	Parent Material	Soil Types Included[9]	Comments
SW	--	5	Drainage	80.2	18	18	M-H	MD	S	S	Alluvium	TER, LT, BN, CC, PDX, DPX, LBN, PD, DP, X, FN	Profile variable in drainage. Some areas have clay close to the surface. Changes from very gravelly to nongravelly within 5 inches of the surface.
Y	--	5-10	Fan	14.3	18	8	M	S	MR	M	Alluvium	CC, SW	
BN	--	0-5	Fan	145.2	24	24	M	MD	M	S	Alluvium	SW, RBN, DPX, PDX, TER, PD, DP, FN, X, CC	
RBN	--	0-5	Fan, Ridgetop	15.7	16	10	M	S	M	S	Alluvium	BN, SW	50% of surface covered with gravel.
TER	--	0-5	Terrace	170.8	33	33	M	MD	M	S	Alluvium	LT, BM, BN, ML-DIS, TS, FN, X, CC, STD, SW, DPX, RI-RO	
LT	-	0-5	Terrace	47.0	>60	33	L-M	VD	MR-R	VS-M	Alluvium	TER, SW, BM, ML-DIS	Soil textures highly variable: Silty Loams to Extremely gravelly sands.
WS-RO[11]	80-20	30-35	Ridgeline	22.1	6	0/0	L	VS	MR	R	Residuum	CC, MSD, RI-RO	
RD	--	35-40	Slope	10.0	5	0	L	VS	R	R	Residuum	FN, STD, RR, TS	
LBN	--	0-10	Fan	6.0	20	20	M	D	R	R	Alluvium	SW, X, PD	
RS	--	20	Slope	39.2	8	0	L	D	M	M	Residuum	BM, RG, SW, STD, FN	
RI-RO	70-30	30-35	Ridgeline	48.4	6	0	L	VS	R	VR	Residuum	CC, TER, WS-RO, ML-DIS	30% rock outcrop.
CC[12]	--	15-30	Upland	--	17+	--	L	S	VS-S	R	Residuum		Outside of Proposed Disturbance
BM[12]	--	4-30	Foothill Terrace	--	14+	--	VL-L	S	S-MS	M-R	Alluvium Residuum		Outside of Proposed Disturbance

[1] See **Figure 3-9** for soil mapping units.
[2] Percentage of included map units in complexes. "--" denotes 100 percent.
[3] Acres reflect those included in the Order 2 soil survey (Grass Land 1995).
[4] Depth listed is to hard lithic materials as well as to Cr horizons of highly fractured, hard claystone as well as hard and soft, highly weathered conglomerate sandstone.
[5] Available water holding capacity: VH = very high; H = high; M = moderate; L = low; VL = very low.
[6] Root restricting depth: VS = very shallow (<10 in); S = shallow (10-20 in); MD = Moderately Deep (20-40 in); D = Deep (40-60 in); VD = very deep (≥ 60 in).
[7] Permeability: VR = very rapid; R = rapid; MR = moderately rapid; M = moderate; MS = moderately slow; S = slow; VS = very slow.
[8] VR = very rapid; R = rapid; M = moderate; S = slow; VS = very slow.
[9] Soil types which may appear as inclusions in the mapping unit. Inclusions make up less than 15% of mapping unit. Disturbance may be found in most soil mapping units.
[10] -DIS indicates disturbance included in mapping unit.
[11] -RO indicates rock outcrops included in soil mapping unit.
[12] Source: Soil Survey of Tuscarora Mountain Area. USDA 1980.
BM = Bucan - Havingdon association
CC = Chen - Pie Creek - Ramires association

TABLE 3-14
Criteria Used to Determine Soil Salvage

Parameter	Unsuitable Limits	Restrictive Feature
Slope	>30%	Too steep for equipment
Depth to cemented pan or bedrock	<6 inches	Equipment capability
Texture	Sand, sandy clay, silty clay, clay	Excessive sands or clays
Coarse fragments	>50% by weight or >35% by volume	Excessive gravel, cobbles, or boulders
pH	<4.0 or >8.5 standard units	Excessive acidity or alkalinity
Organic matter content	<0.5%	Low fertility

Note: Slope and depth to cemented pan or bedrock parameters are based on standard equipment capability. Even though the USDA SCS lists the minimum depth of soil for suitability as 20 inches, equipment constraints for salvaging soil are about 6 inches.

Source: USDA 1993.

Surface coarse fragments range up to 80 percent of ground cover and are expected to be included in salvaged soils (**Table A, Appendix A**). Soil textures are generally loamy. Soil color for surface horizons are dark approaching a mollic epipedon.

Particle size analysis and organic matter content were determined in the laboratory. Particle sizes include sand, fine sand, silt, and clay. Texture was determined using the National Soils Survey Handbook (USDA 1993) and values for pH were measured in the field. Silt is the dominant particle size followed by sand, resulting in a loamy texture classification. Organic matter content for surface horizons ranges from 0.6 to 2.8 percent. The soil is moderately acid to neutral, an acceptable range for reclamation. Laboratory data, textures, and pH for soil in the Bootstrap Project area are presented in **Table B, Appendix A**.

Wind erodibility group (WEG) was determined based on texture using the national Soils Survey Handbook (USDA 1993). Wind erosion hazard was determined using information from the Soil Survey of Tuscarora Mountain Area (USDA 1980) which based erodibility on soil texture and coarse fragment content. Mapping units with coarse fragment contents exceeding 15 percent are not subject to wind erosion. The mapping units MSD, TS, STD, SW, and TER will have a wind erosion hazard which varies from none, under undisturbed conditions, to moderately erodible, depending upon mixing of coarse fragments at time of disturbance. The BN mapping unit is listed as moderately erodible by wind. The LT (low lying terrace) mapping unit has a slight wind erodibility hazard. **Table C, Appendix A** lists soil erosion characteristics of the project area.

The K factor and hazard of water erosion listed in **Table C, Appendix A** are for the undisturbed surface horizon. The K factor is a relative index of susceptibility of bare, cultivated soil to water erosion. The hazard to water erosion was determined using the K factor, surface coarse fragment content, slope steepness and landform position. The higher the coarse fragment content and/or the lower the slope steepness, the lower the hazard of water erosion. Overall, the project area is rated as moderate to high for water erosion hazard. In general the uplands are more erosive than the lowlands. Soil that is salvaged and stockpiled would be mixed with other soil types. Therefore, the resulting soil K factors would change after mixing occurs in the stockpiles.

Soil salvage depths and growth medium constraints are listed for each mapping unit in **Table 3-15**. Soil mapping units which have less than 6 inches of salvageable soil include RG, RG-DIS, RB, RS and RD. Soils within mapping units DIS-RI-RO, SWS and WS-RO cannot be salvaged due to slopes in excess of 30 percent. Excessive coarse fragments exclude soil salvage in mapping unit X. All other soil mapping units contain some quantity of soil suitable for reclamation.

Soils were classified to the series level using Keys to Soil Taxonomy (USDA 1994) and are listed in **Table C, Appendix A**, along with soil sample sites by legal description.

TABLE 3-15
Soil Salvage Depths and Growth Medium Constraints

Mapping Unit[1]	Soil Depth (inches)	Available Soil Salvage Depth (inches)	Limiting Suitability Criteria[2]
ML-DIS			
ML 60%	21	12	Excessive clay below 12 inches.
DIS 40%	0	0	Less than 6 inches to bedrock.
DIS-RI-RO			
DIS 60%	0	0	Less than 6 inches to bedrock.
RI 20%	6	0	Less than 6 inches to bedrock.
RO 20%	0	0	Less than 6 inches to bedrock.
MSD	19	19	Rock below 19 inches.
RG	4	0	Less than 6 inches to bedrock.
RR	8	0	Less than 6 inches to bedrock.
SWS	28	0	Slopes > 30%.
SWR	>26	26	>35% coarse fragments below 26 inches.
RS	8	0	<6 inches of suitable soil.
TS	21	24	Indurated below 21 inches.
STD	>31	31	Excessive gravel and clay below 31 inches.
FN	>10	10	Excessive clay below 10 inches.
PD	8	8	Rock below 8 inches.
RR	>15	[illegible]	Excessive coarse fragments below 7 inches.
X	11	0	Excessive coarse fragments.
PDX	11	1[illegible]	Excessive coarse fragments below 11 inches.
DPX	>11	6	Excessive coarse fragments below 6 inches.
SW	>18	19	Excessive clay and gravel below 18 inches.
Y	18	8	Excessive clay below 8 inches.
P[illegible]	>24	24	Excessive rock below 24 inches.
RBN	16	10	Excessive rock and clay below 10 inches.
LT	33	33	Bedrock below 33 inches.
TER	33	33	Bedrock below 33 inches.
WS-RO			
WS 80%	6	0	Slopes >30%
RO 20%	0	0	Slopes >30%
RD	5	0	<6 inches of suitable soil.
LBN	20	20	Rock below 20 inches.

[1] See **Figure 3-9** for soil mapping units.
[2] See **Table 3-14** for criteria descriptions.

Source: Grass Land 1995

VEGETATION

Upland vegetation of the Bootstrap Project area is dominated by sagebrush/grassland communities. Big sagebrush (*Artemisia tridentata*), bluebunch wheatgrass (*Agropyron spicatum*), and Thurber needlegrass (*Stipa thurberiana*) are the predominant plant species on most of the area. Shallow, rocky soils on exposed ridges are vegetated by a shrub community dominated by both big sagebrush and low sagebrush (*Artemisia arbuscula*) with a grass understory of Thurber needlegrass, Sandberg bluegrass (*Poa secunda*) and other grasses and forbs. **Appendix B** lists plant species identified for the Bootstrap Project area.

Riparian plant communities grow on the floodplains of Boulder and Bell creeks and moist sites adjacent to springs and seeps. Floodplain areas along Boulder and Bell creeks are dominated by willow (*Salix* spp.), big sagebrush, green rabbitbrush (*Chrysothamnus viscidiflorus*), Sandberg bluegrass, Great Basin wildrye (*Elymus cinereus*), cheatgrass, and western wheatgrass (*Elymus smithii*). Soils are deep and the sites potentially productive (JBR 1990a). Small patches of deciduous shrubs, primarily serviceberry (*Amelanchier* spp.) and chokecherry (*Prunus virginiana*), occupy shaded sites on the slopes of Round Mountain where precipitation and surface runoff increase soil moisture levels.

Vegetation in the project area reflects repeated disturbance from mining, grazing, and wildfires. In the Bootstrap Project area, 620 acres disturbed by wildfires, mining, and exploration activity are now dominated by big sagebrush, rubber rabbitbrush (*Chrysothamnus nauseous*), cheatgrass (*Bromus tectorum*), and Sandberg bluegrass. In addition, approximately 1,325 acres in low-lying areas have been burned as a result of wildfires and reseeded. These areas have revegetated to big sagebrush, bottlebrush squirreltail (*Elymus elymoides*), crested wheatgrass (*Agropyron cristatum*), and cheatgrass (Culwell 1995; JBR 1990a).

Because past livestock use and wildfires have reduced or eliminated some species, many sites in the study area do not support the plant communities that would normally occur there. The SCS-BLM Standard Ecological Site Description Method (USDA 1983; 1991), which recognizes six ecological sites based on soil, precipitation, and topography, was used to determine potential upland vegetation communities in the Bootstrap Project area (**Table 3-16** and **Figure 3-10**).

TABLE 3-16
Bootstrap Project Ecological Site Descriptions (ESD)

ESD #	Range Site	Annual Precipitation (Inches)	Landform	Typical Slope (%)	Project Area (Acres)
25-14	Loamy	10 - 12	Hills, fans	4 - 15	112
25-18	Claypan	10 - 12	Fans, rocky sites	8 - 30	222
25-22	Cobbly claypan	8 - 12	Fans, hills, rocky sites	8 - 30	222
25-14	Loamy	8 - 10	Hills, fans	4 - 30	958
25-21	Shallow, loam	8 - 12	Hills, fans	<30	273
24-5	Loamy	8 - 10	Lower mountain sides	4 - 30	137

Source: USDA 1991 and 1992.

Nine wetland areas have been inventoried by JBR (1990b) within the Bootstrap Project area (**Table 3-17** and **Figure 3-10**). Seven of the nine wetlands are associated directly with Boulder or Bell creeks. The remaining two wetland areas are seeps located along the western project boundary near the east side of Boulder Creek.

Vegetation associated with wetlands is usually dominated by herbaceous species (grasses, sedges, rushes, and forbs) including fowl bluegrass (*Poa palustris*), saltgrass (*Distichilis* spp.), American threesquare bulrush (*Scripus americanus*), rushes (*Juncus* spp.) and sedges (*Carex* spp.) (JBR 1990b). Species composition and dominance vary depending on the environmental condition of the site (moisture, slope, aspect, and soil).

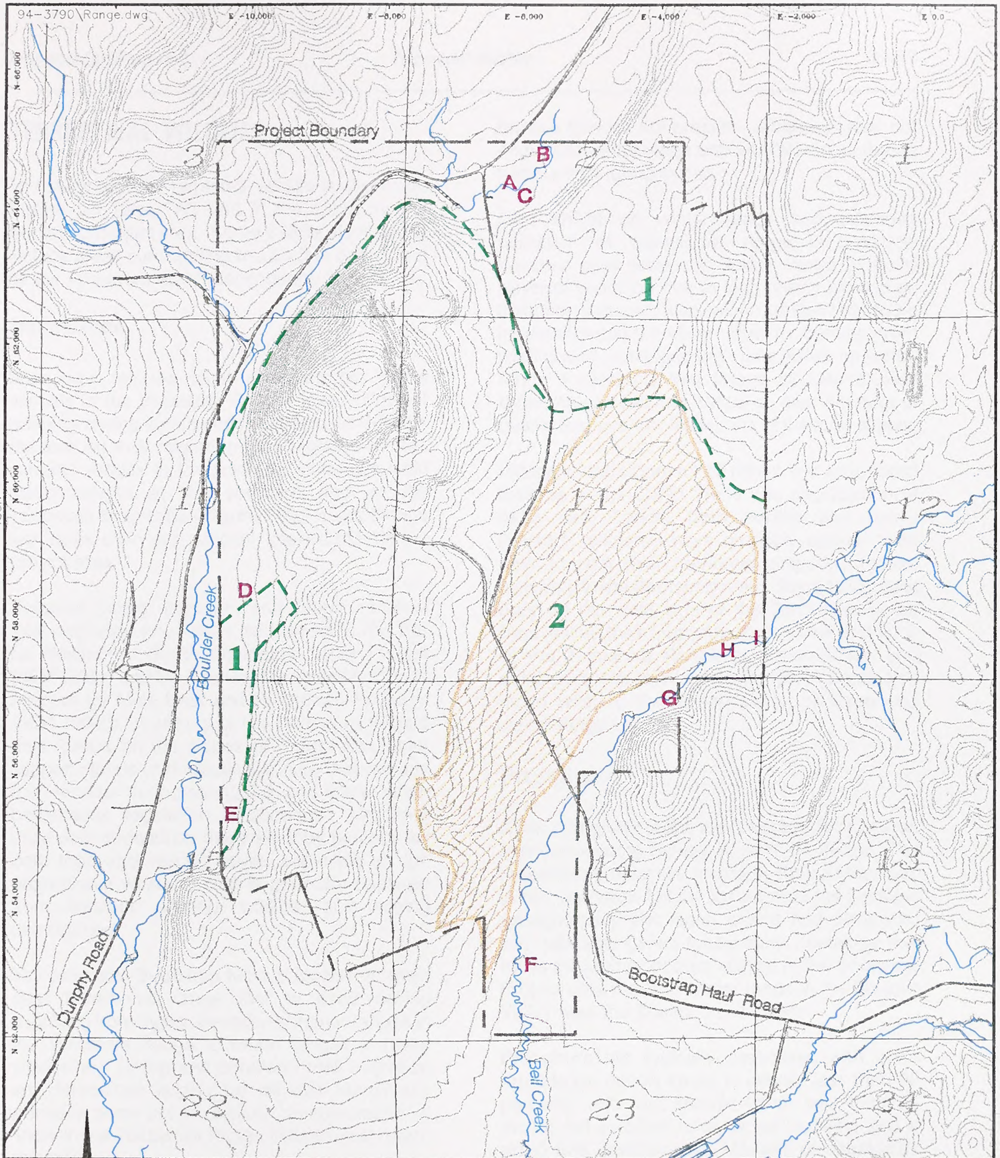
Although wetlands cover a relative small area in comparison to upland vegetation, they are important in contributing to surface water flow and providing water sources for livestock and wildlife. Also, there is a higher and more diverse production of vegetation in wetland areas than in upland areas.

TABLE 3-17
Wetland Areas Within the Bootstrap Project Boundary

Wetland[1] Mapping Unit	Size (Acres)	Location[2]	Description
A	0.1	NW SW Section 2	North side of Boulder Creek
B	1.3	SE NW Section 2	North side of Boulder Creek
C	0.6	NE SW Section 2	South of Boulder Creek
D	1.0	SW SE Section 10	Seep area near east side of Boulder Creek; currently may be affected by Betze/Post mine dewatering
E	7.3	N of center Section 15	Complex of seeps connected by wet meadows near east side of Boulder Creek; currently may be affected by Betze/Post Mine dewatering
F	16.0	SE SW Section 14 and NE NW Section 23	Grassy wet meadow on floodplain of Bell Creek includes stock pond 0.3 acre in size
C	0.5	NW NE Section 14	Grassy wet meadow on floodplain of Bell Creek
H	0.1	SE SE Section 11	Grassy wet meadow on floodplain of Bell Creek
I	0.5	SW SW Section 12	Grassy wet meadow on floodplain of Bell Creek

[1] See **Figure 3-10** for wetland areas.
[2] All sites located in T36N R49E.

Source: JBR (1990b)



- - - - Ecological Sites Delineation

Seeded Rangeland

1
Cobbly Claypan 10-12" p.z. (ESD 25-22) 40% Coverage
Claypan 10-12" p.z. (ESD 25-18) 40% Coverage
Loamy 10-12" p.z. (ESD 25-14) 20% Coverage

p.z.= Precipitation Zone. ESD=Ecological Site Description (SCS 1992, 1991).

2
Loamy 8-10" p.z. (ESD 25-19) 70% Coverage
Shallow Loam 8-12" p.z. (ESD 25-21) 20% Coverage
Loamy 8-10" p.z. (ESD 24-5) 10% Coverage

A Wetland (Source: JBR 1990)

Ecological Sites
And Wetland Areas
Bootstrap Project
FIGURE 3-10

TERRESTRIAL WILDLIFE

The study area for terrestrial wildlife is shown on **Figure 3-1** (area "A") and is the same as the Bootstrap Project area. Some wildlife discussions include areas surrounding the project area, such as the Tuscarora and Independence Mountains.

Mule Deer

Mule deer are the most abundant big game animals in the Bootstrap Project area. Present primarily during spring and fall, they pass through the area on their migration from higher elevation summer ranges in the north to lower elevation winter ranges at the southern end of the Tuscarora Mountains (**Figure 3-1**). In addition, a few mule deer are present year-round in the project area.

Seasonal timing, duration, and routes of mule deer migration have been addressed in the EIS for Newmont's South Operations Area Project (BLM 1993a) and the Dee Gold Cumulative Effects Analysis for Mule Deer and Pronghorn Antelope (BLM 1992b). Portions of the Bootstrap Project area (draws on the slopes of Round Mountain) support stands of deciduous shrubs that provide food for deer during spring, fall, and winter when herbaceous vegetation is dormant. Migrating mule deer depend on these shrubby patches for both food and resting cover, especially in the project area where habitat is generally depleted from livestock grazing, wildfire, and mining development.

The proposed Bootstrap Mine is located in mule deer transitional range that is used during migration from higher elevation summer ranges in the Tuscarora Range to winter ranges at lower elevations. Timing and duration of fall migration are determined largely by climatic conditions, primarily snow accumulation. Accumulation of snow in the Tuscarora Range initiates southward migration.

During winters with low amounts of snow, mule deer linger in transitional range because the topographic relief provides security and preferred browse species are present. Mule deer may not migrate to winter range until late December during winters with low snowfall.

Late arrival on winter range and extended utilization of transitional range is desirable because deer arrive on winter range in good physical condition due to high quality browse on transitional range. Also, winter ranges tend to be in deteriorated condition due to burning from wildfire and heavy grazing. Late arrival on winter range subjects limited forage species to less browsing and reduces stress on deer because of quality and quantity limitations of the food supply.

Extensive development of mines and associated facilities in the Carlin Trend and degradation of mule deer habitat from wildfire and heavy livestock utilization have probably caused mule deer to shift their traditional migration routes, including in the Bootstrap area. Since 1987, most deer on the west side of the Tuscarora Range have shifted their migration route to the east flank of the Tuscarora Range at Simon Creek and continue south to Welches Canyon. Some also move west to the Sheep Creek or Izzenhood winter ranges.

Pronghorn

A few pronghorn utilize the Bootstrap Project area and surrounding habitat as summer range. The immediate project site, including Round Mountain, is not important habitat for pronghorns because pronghorns prefer open prairie and shrubland with relatively gentle topography. Antelope that move through or occupy habitat in the Bootstrap Project area move to winter range in the Boulder Valley near the Sheep Creek Range.

Pronghorn are typically associated with open rangelands (shrub cover is usually less than 30 percent) with low shrubs (often less than 24 inches tall to allow unrestricted visibility) and a good forb component. Mosaics of shrublands and grasslands or open stands of low-growing sagebrush are preferred habitats. Areas devoid of shrubs due to frequent fires or large stands of tall-growing sagebrush that restrict visibility have little habitat value to pronghorn.

Other Mammals

The BLM's list of mammals recorded in the Elko District totals 76 species, including 5 shrews, 12 bats, 5 rabbits and hares, 33 rodents, 15 carnivores, and 6 ungulates. Of these, 2 to 3 shrews, 9 to 10 bats, 4 rabbits and hares, 22 to 27 rodents, 11 to 13 carnivores, and 2 ungulates (about 50 to 60 total species) could be expected in the Bootstrap Project area. Species whose presence has been documented in the upper Boulder-Bell Creek drainage are: mule deer, coyote, badger, kit fox, raccoon, short-tailed weasel, and yellow-bellied marmot.

Of the 50 to 60 species that could occur in the study area, a few, such as the house mouse, are generally restricted to human-related habitats such as houses or barns. Four species (river otter, mink, beaver, and muskrat) are essentially aquatic, although they may occasionally be observed away from water. Eight to nine species, including the vagrant shrew, montane vole, Nuttall's cottontail, and raccoon, are usually found in riparian or wetland habitats.

Most of the mammals that may be present in the project area are considered to be upland species, even though they may also occur in forest, riparian, or wetland habitats. For example, the Merriam's shrew, pygmy rabbit, several ground squirrels, and the sagebrush vole may be entirely restricted to sagebrush or grassland habitats, while the coyote, porcupine, mountain lion, and mule deer may be found in a wide variety of habitats. Some bats may roost in buildings, trees, mine adits, caves, or cracks and crevices in rocks in upland habitats even though they forage for insects in habitats near water.

Upland Game Birds

Three species of upland game birds (sage grouse, chukar, and Hungarian partridge) are year-long residents in the vicinity of the Bootstrap Project. The sage grouse is a native species normally associated with sagebrush habitats in rolling hills and benches along drainages. In spring they congregate at breeding sites called leks, where the males conduct displays to attract females. Two leks have been identified about 2 miles east of the project site.

Mesic habitats associated with streams, springs, seeps, or water developments are especially important to sage grouse in summer and autumn. Succulent forbs and abundant insects found in these habitats provide the diet required for growth of young sage grouse and feather molt of the adults. Sage grouse congregate in riparian areas along Boulder and Bell creeks during spring and summer.

In winter, sage grouse utilize sagebrush-dominated habitats, usually large areas having a mosaic of sagebrush species, heights, ages, and forage quality. Low-elevation sagebrush stands on benches or south- or west-facing slopes may be relatively more important, particularly during severe winters.

The chukar is an introduced species often found on rugged slopes and canyons and associated drainages. Water availability (i.e., springs, seeps, water developments) directly influences chukar occurrence within these habitats, since chukar regularly visit water sources to drink. Broods and adults feed extensively on succulent vegetation, seeds, and insects in mesic habitats during summer. Chukar are present on Round Mountain (JBR 1990a).

The Hungarian partridge, another introduced species, is often associated with complexes of grassland, shrubland, grain fields, and water sources. Hungarian partridge are widespread but not abundant in the study area. They are not as water-dependent as chukar, or as riparian-dependent as sage grouse, although they may consume insects, green vegetation, and perhaps water in mesic habitats.

The mourning dove is a native migratory game bird found seasonally in the project area. Doves generally nest in tall shrubs and trees. Mourning doves fly to Boulder and Bell creeks for water (JBR 1990a).

Raptors

Raptors include eagles, vultures, hawks, falcons, and owls. The BLM's bird species list for the Elko

District includes 1 vulture, 2 eagles, 11 hawks, 4 falcons, and 9 owls. Of these 27 species, the following 9 have been recorded in the study area (JBR 1990a): golden eagle, red-tailed hawk, Swainson's hawk, northern harrier, sharp-shinned hawk, Cooper's hawk, prairie falcon, kestrel, and turkey vulture.

All habitats within the project area are used for foraging by one or more raptor species. Because of abundance of perches and diversity and density of prey, riparian habitats may be used by the greatest diversity of raptors. Upland habitats, which predominate in the study area, provide the major foraging habitat for raptors.

Golden eagles have nested on a rock outcrop south of Round Mountain in Section 15. Another nest, located on a pit bench in the existing Bootstrap pit, was considered "new" in 1993 and was also possibly constructed by golden eagles. However, this nest was never occupied after its construction (JBR 1995). Based on observations made during a recent field survey (November 1995), this nest and a smaller raptor stick nest are no longer present. The unstable clay high walls in this pit have collapsed in several areas, and these nests have been obliterated in the process (JBR 1995).

Red-tailed hawks nest in cottonwood trees in the upper Boulder and Bell Creek drainages. Kestrel nesting has been observed in the Bootstrap pit and in trees in the upper Boulder and Bell Creek drainages (JBR 1990a).

Other raptors observed on or near the project site are thought to be migrants or nesting birds that occasionally visit the project area to forage from nest sites several miles away. Bald eagles have been observed along the Humboldt River (Bradley 1992). If the river is ice-free, they may prey on fish or waterfowl; however, their primary foods are jackrabbits and carrion (usually dead mule deer and pronghorn).

Waterfowl and Shorebirds

Although BLM's bird species list for the Elko District contains about 75 waterfowl and shorebird species, the number of species occurring in the Bootstrap Project area is smaller due to the relatively limited amount of water. Waterfowl and shorebird habitat is limited to Boulder and Bell creeks and stock ponds. Waterfowl and shorebirds recorded in the project area (JBR 1990a) include Canada goose, mallard, green-winged teal, blue-winged teal, cinnamon teal, bufflehead, ring-necked duck, common merganser, gadwall, solitary plover, killdeer, great blue heron, and black-crowned night heron. Most of these birds are present as seasonal migrants. Mallard, gadwall, and cinnamon teal nest in upland vegetation near ponds, and shorebirds such as killdeer and solitary plovers nest on streambanks and in wet meadows.

Other Nongame Birds

The BLM list for the Elko District contains 246 species of birds. A total of 67 species, including upland game birds, raptors, waterfowl, and songbirds were recorded in the project area during the baseline study (JBR 1990a). Species such as the belted kingfisher, yellow warbler, rough-winged swallow, American robin, yellow-rumped warbler, and house finch are generally restricted to riparian or wetland habitats. Species like the horned lark, pinyon jay, rock wren, sage thrasher, green-tailed towhee, and sage sparrow are found primarily in upland habitats. Other species, such as the black-billed magpie, house wren, European starling, and lark sparrow utilize a variety of habitats. Some nest in upland habitats and forage in riparian habitats, while others might nest in riparian habitats and forage in upland habitats. Still others nest and forage in both habitats.

Reptiles and Amphibians

Although diversity of amphibians and reptiles is limited by the cool, dry climate, 28 species have been identified in the Elko District. Of these, 5 amphibians (frogs and toads), 7 lizards, and 4 to 5 snakes could be expected in the Bootstrap Project area. Species observed in the project vicinity are western fence lizard, desert horned lizard, gopher snake, and western yellow-bellied racer. Most amphibians are dependent on water at some time during their life cycles, usually for breeding; some may be restricted entirely to permanent water sources. Reptiles generally do not require water but some species forage extensively in mesic or wetland habitats.

AQUATIC HABITAT AND FISHERIES

Boulder and Bell creeks are small, intermittent streams with perennial flows in the upper reaches within and near the Tuscarora Mountains. Seasonal flows during the spring following periods of snowmelt and precipitation can reach or exceed 30 cfs. Both streams have populations of Lahontan speckled dace, a common minnow found throughout central Nevada. These streams in the vicinity of the Bootstrap Project area historically have been impacted by concentrated livestock grazing. Aquatic invertebrate communities are low in species diversity and productivity, indicative of degraded aquatic conditions (JBR 1990b).

THREATENED, ENDANGERED, AND CANDIDATE SPECIES

Threatened and Endangered Species

No threatened or endangered species are known to be present in the Bootstrap Project area (Mendoza 1995; Cooper 1995). However, one species listed under the Endangered Species Act of 1973 (peregrine falcon), one threatened species (bald eagle), and 13 Category 2 species (candidates for listing as threatened or endangered) may occur in or near the Bootstrap Project area due to presence of suitable habitat. Category 2 species observed during field surveys or for which there may be suitable habitat are: spotted bat, Townsend's big-eared bat, long-legged myotis, long-eared myotis, Yuma myotis, small-footed myotis, pygmy rabbit, Preble's shrew, northern goshawk, ferruginous hawk, spotted frog, Nevada viceroy butterfly, and the plant, least phacelia.

Peregrine Falcon (Endangered)

Like bald eagles, peregrine falcons pass through Nevada as seasonal migrants. None have been reported in the Bootstrap Project area. No nest sites are known in the vicinity of the project area.

Bald Eagle (Threatened)

Bald eagles are periodic seasonal migrants and winter residents in Nevada. A few bald eagles occasionally may be present near the Bootstrap Project area as transient visitors or may winter near bodies of water that remain free or partially free of ice. Bald eagles usually winter near bodies of open water because fish and waterfowl are common prey and riparian areas often have cottonwood trees used as perches. Wintering bald eagles were observed in 1992 along the Humboldt River at five locations between Elko and Battle Mountain (NDOW 1992). No bald eagle nests or communal roosts are known in or near the project area.

Candidate and Sensitive Species

Habitat for the 13 candidate species may exist in the Bootstrap Project area, but their presence has not been documented. The following discussion outlines the occurrence and potential occurrence of each of the Category 2 species identified by the U.S. Fish and Wildlife Service (Mendoza 1995).

Spotted Bat

This species has not been reported for northeastern Nevada, but is typically found in rough desert terrain with limestone or sandstone cliffs (Zevaloff 1988). The spotted bat appears to favor cliffs and rocks near perennial watercourses (Clark 1987). Its range extends over most of the western United States and includes all of Nevada (Burt and Grossenheider 1976).

Townsend's Big-Eared Bat

Townsend's big-eared bats were observed in abandoned mine shafts in the upper Lynn Creek drainage. Two males in active breeding condition were captured in mine shafts, and bats suspected to be big-eared bats were observed flying over springs and ponds near the abandoned mine shafts (Butts 1992). This species hibernates during winter in caves, mine shafts, or sometimes in old buildings. Females with young roost in nursery or maternity colonies during the summer.

Long-Legged Myotis

This bat is a colonial species roosting in buildings, trees, and rocky crevices. This species has been observed in the Independence Mountains northeast of the Bootstrap Project area.

Long-Eared Myotis

This bat, individually or in small groups, roosts in trees, crevices, and occasionally in mines and caves. This species has been observed in the Independence Mountains and near Soap Creek, about 20 miles southeast of the project site.

Yuma Myotis

This bat roosts in caves and buildings and flies close to the ground. Its range includes all of Nevada and arid regions throughout the western United States.

Small-Footed Myotis

This bat is a colonial species nesting in caves, mines, buildings, and trees, usually at elevations below 6,500 feet AMSL. Observations of this species have been made about 25 miles northeast of the Bootstrap Project area in the Independence Mountains.

Pygmy Rabbit

Pygmy rabbits have not been observed in the Bootstrap Project area, but they occur within a few miles of the project site in big sagebrush communities (JBR 1992). This small rabbit usually excavates extensive burrow systems in big sagebrush habitat, often near springs. Its geographic range includes portions of Washington, Idaho, Montana, California, and Utah (Burt and Grossenheider 1976).

Preble's Shrew

Preble's shrews have not been found in the study area. Limited habitat for the species (i.e., moist sedge meadows and willow communities in riparian areas) may be present along Boulder and Bell creeks.

Northern Goshawk

This species commonly nests in the Independence Mountains in conifer forests and aspen groves. No goshawk nesting habitat is present in or near the project area.

Ferruginous Hawk

Ferruginous hawks are relatively common throughout northeastern Nevada. In the vicinity of the project area, they usually nest in juniper trees and prey on jackrabbits and other small mammals. No nests have been found in areas that would be disturbed by the Bootstrap Project.

Spotted Frog

Spotted frogs occur in and around permanent water southeast of the Bootstrap site in middle Maggie Creek, lower Coyote Creek, and lower Little Jack Creek. In the western United States, this species occupies wetland habitats ranging from subalpine forests to lower elevation shrublands and grasslands. It is not known to occur in the wetland or riparian area along Boulder or Bell creeks, the only potential habitat in the vicinity of the Bootstrap project.

Nevada Viceroy

This butterfly occupies riparian habitat along the Humboldt River in the vicinity of willows, which serve as host plants for the insect's larvae. Nevada viceroys have been observed south of the Bootstrap Project area along the Humboldt River and Maggie Creek. This species also has been reported from Dunphy, Beowawe, and Elko. Limited habitat for this species may be present along Boulder and Bell creeks, although it has not been observed.

Least Phacelia

This small, annual plant occurs at elevations of 6,000 to 7,000 feet AMSL in the Independence Mountains on gravelly soil and moist slopes. Habitat for this species, as described by

Cronquist et al. (1989) and Kartesz (1988), does not appear to be present in the Bootstrap Project area.

GRAZING MANAGEMENT

Historically, livestock grazing has been a dominant use in the Bootstrap Project area. The project area is covered by two grazing allotments: T Lazy S Allotment and 25 Allotment (**Figure 3-11**). Grazing within the allotments is administered by the BLM.

The T Lazy S Allotment covers 85 percent of the area within the Bootstrap Project boundary and has one permittee - the Elko Land and Livestock Company. Approximately 40 percent of the T Lazy S Allotment within the project boundary has been seeded with crested wheatgrass. Since 1990, the portion of this allotment within the project boundary (258 animal unit months or AUMs), has been under suspended use due to mining in the area (BLM 1995a).

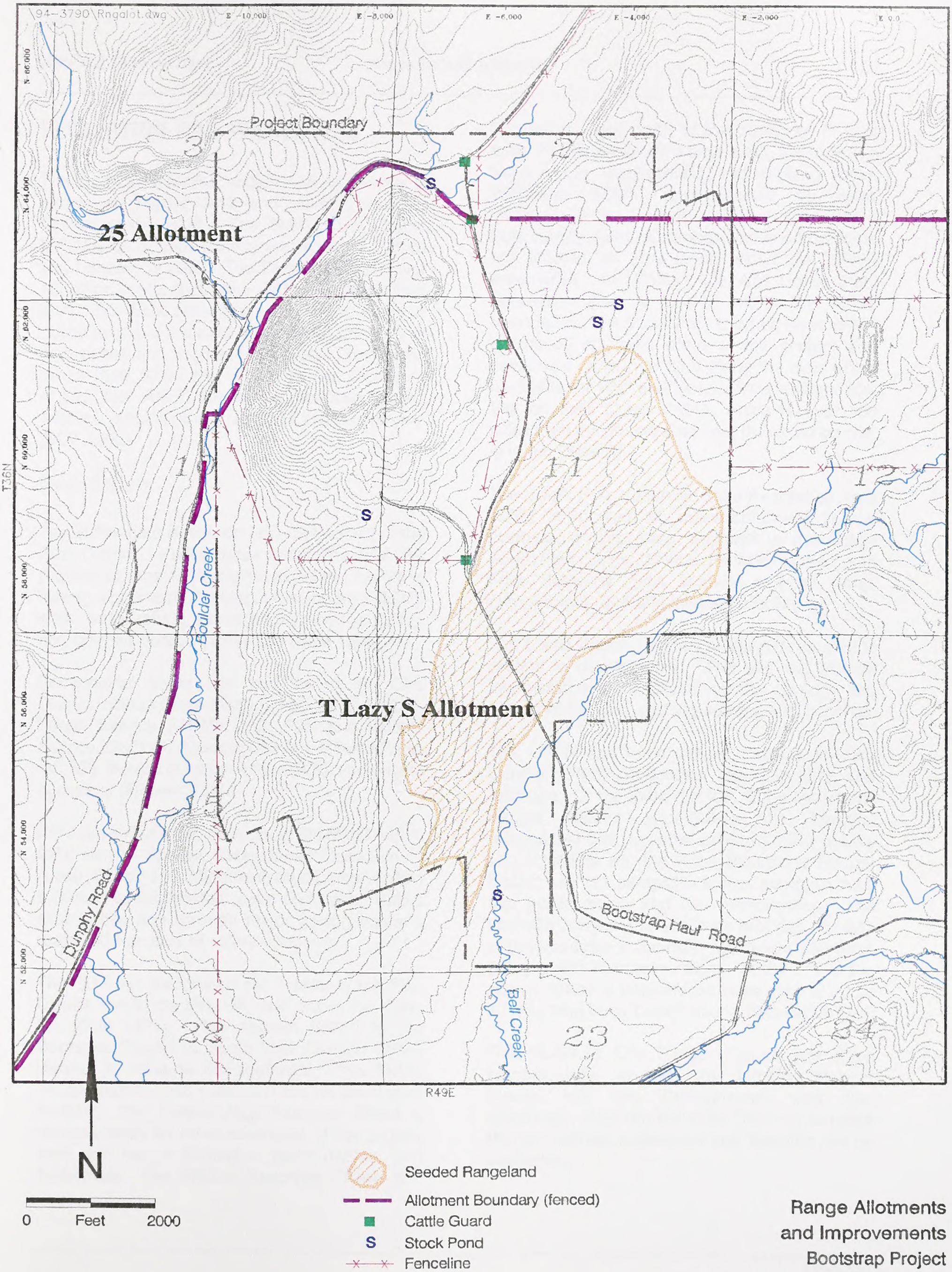
The 26 Ranch, a subsidiary of Western States Minerals, has the grazing permit for the 25 Allotment within the Bootstrap Project boundary. This allotment within the Bootstrap project boundary has 8 AUMs and is grazed under an Allotment Management Plan. Where the 25 Allotment boundary crosses Boulder Creek (T36N R49E, SW¼ of Section 3), the creek is used as a livestock watering source.

Range improvements within the Bootstrap Project area are shown in **Figure 3-11**. Improvements include stock ponds, seeded rangeland, fences, and cattle guards. Five stock ponds are located within the project area. A summary of water sources is shown in **Table 3-18**. All affected range improvements, with the exception of the allotment boundary fence, are within the T Lazy S Allotment. The improvements are currently not utilized because grazing has been suspended in the area. No plans exist for altering the allotment boundary fence.

TABLE 3-18
Stockwater Sources Within the Bootstrap Project Area

Source	Location	Allotment	Description
Boulder Creek	Section 2, 3, 10, 15	T Lazy S; 25	Flows during winter and spring
Bell Creek	Sections 11, 12, 14, 23	T Lazy S	Flows during winter and spring
Stock Pond	SE ¼ of Section 10	T Lazy S	<0.1 acre basin in saddle on Round Mountain
Stock Pond	SW ¼ of Section 14	T Lazy S	0.25 acre basin in floodplain of Bell Creek
Stock Pond	NW ¼ of Section 11	T Lazy S	0.2 acre basin in ephemeral drainage
Stock Pond	NW ¼ of Section 11	T Lazy S	0.1 acre basin in ephemeral drainage
Stock Pond	SW ¼ of Section 2	T Lazy S; 25	Diversion ditch on Boulder Creek has eliminated flow to this pond.

Note: See **Figure 3-11** for locations of stockwater sources. All sites located in T36N R49E.



Range Allotments and Improvements
Bootstrap Project
FIGURE 3-11

RECREATION AND WILDERNESS

The study area for Recreation and Wilderness is shown on **Figure 3-12** and consists of Elko District of the BLM. The BLM's Elko District includes all of Elko County and parts of Eureka and Lander counties. The District extends over 12 million acres, about one-sixth of Nevada's total area. The BLM administers 7.4 million acres of public land in the district that consist primarily of high desert and mountainous areas. Elevations range from 5,000 feet AMSL in the valleys to 11,000 feet AMSL on some mountain peaks. Average precipitation is 10 to 12 inches per year (BLM 1966).

Recreation

The BLM's Elko Resource Area (RA) is within the Elko District. Public lands within the Elko RA provide diverse recreational activities, including fishing, sightseeing, hunting, cross-country skiing, white water rafting, photography, rockhounding, and off-road vehicle (ORV) use (BLM 1985).

Recreational areas and facilities in the Elko District include those managed by the BLM, U.S. Forest Service (USFS), U.S. Fish and Wildlife Service (USFWS), Nevada Division of State Parks (NDSP), Bureau of Indian Affairs (BIA), and private operators (**Figure 3-12**).

ORV use is dispersed throughout the Elko District. ORV use in Special Recreational Management Areas (SRMA) and Wilderness Study Areas (WSA) is limited to designated roads and trails. Public access into and through major mining areas is restricted because of safety concerns.

The BLM has designated six SRMAs in the Elko District, five in the Elko RA, and one in the Wells RA (BLM 1987). The nearest SRMA to the Bootstrap Project is South Fork Canyon SRMA located 35 miles to the southeast. This SRMA encompasses 3,360 acres and has no developed facilities. The Zunino/Jiggs Reservoir SRMA is approximately 55 miles southeast of the project area and has a restroom, picnic tables, and barbecues. The Wilson Reservoir SRMA is located 45 miles north of the Bootstrap Project area. Facilities include a boat ramp, restrooms, a trailer dump, campground, and drinking water. Wildhorse SRMA, approximately 55 miles northeast of the Bootstrap Project area, has a BLM campground. A campground and boat ramp are located on BIA lands within the SRMA boundaries. In addition, the Wild Horse State Recreation Area is located within the SRMA boundaries. The South Fork Owyhee River SRMA is located 60 miles north of the project and contains a narrow corridor along the river which is eligible for Wild and Scenic River designation. Salmon Falls Creek SRMA, which is over 150 miles from the project area near the Idaho border, is in the Wells RA.

The South Fork Reservoir State Recreation Area (SRA) is located 35 miles southeast of the Bootstrap Project area, adjacent to the BLM's South Fork Canyon SRMA. Facilities at the South Fork Reservoir SRA include a boat ramp, campground, and administrative facility.

The Carlin Canyon Historical Wayside is a BLM project in development. This site will include interpretative signs describing the geology and history of the area, parking spaces, and benches.

The USFS has three ranger districts in Elko County: Ruby Mountains, Mountain City, and Jarbidge. Of the three districts, Ruby Mountains Ranger District experiences the heaviest recreational use. Located within 20 miles of Elko and Interstate 80, the Ruby Mountains Ranger District has 121 campsites in four campgrounds, two picnic areas, and two wildernesses. The Lamoille Canyon Scenic Byway provides 12 miles of paved access in the Ruby Mountains with three pullouts and interpretive signs. At the end of the scenic byway, a trailhead provides access to the 40-mile-long Ruby Crest National Recreation Trail.

The Mountain City Ranger District has three campgrounds, whereas the Jarbidge Ranger District has two campgrounds and one wilderness. Both the Mountain City and Jarbidge Ranger Districts experience their heaviest use on weekends.

The BLM Back Country Byways program identifies historical and scenic routes on public land. The Byways Program is designed to encourage greater use of existing backroads through greater public awareness. In the northeast corner of the Elko District, the California Trail provides over 80 miles of scenic travel parallelling the original California Trail. The trail was one of the major routes used by pioneers traveling from the Midwest to California and Oregon. Planning is underway for an additional Back Country Byway in north-central Elko County in the Wild Horse Reservoir/Charleston/Jarbidge area.

The Nevada Department of Conservation and Natural Resources (NDCNR) published the Statewide Comprehensive Outdoor Recreation Plan (SCORP) in 1987 and revised it in 1992. The SCORP plan projected the demand and supply of recreational facilities for years 1990, 1995, and 2000. The plan concluded that the supply of tent camping sites, picnic tables, and swimming pools exceeded the demand in Elko County. A moderate increase in baseball/softball fields (six more), golf courses (one more), and tennis courts (five more) would be required by year 2000. Demands for fishing streams, biking trails, cross-country ski trails, and hiking and backpacking trails exceeded the supply for all years evaluated. By 1995 the demand for swimming facilities exceeded the supply. An additional Olympic sized swimming pool is needed both for general public use and to host swim meets. Two more soccer fields are needed and are in the budgeting process. Two regulation football fields were built in the fall of 1995 (Beitia, 1995).

The communities of Carlin and Elko (including Spring Creek) have a number of recreational facilities. Carlin has an archery range, three baseball fields, a park and playground area, a moto-cross track, a tennis court, and a volleyball court. Elko has six baseball fields, a BMX track, two bowling alleys, fairgrounds, five gyms, two golf courses, indoor horse arena, moto-cross track, five movie theater screens, five parks, rifle and pistol range, two soccer fields, six tennis courts, trap and skeet range, and a swimming pool (SPPC 1994).

Wilderness

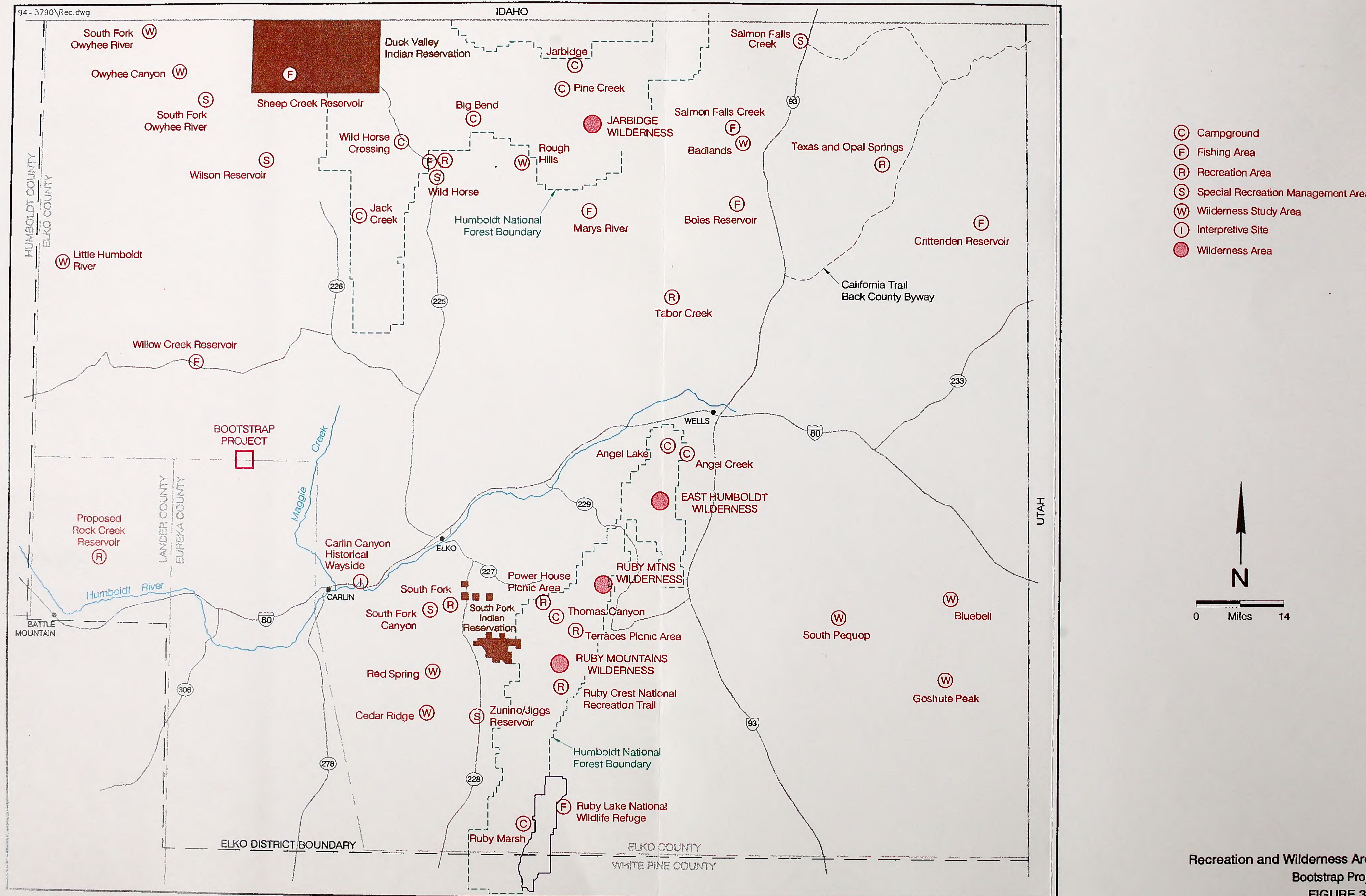
The Bootstrap Project area was not considered for a wilderness study area (WSA) due to past mining disturbance and extensive road systems. The BLM manages 10 WSAs in the Elko District (**Figure 3-12**), seven of which (all or portions of) have been recommended for wilderness designation. The Little Humboldt River WSA, approximately 30 miles northwest of the Bootstrap Project, is the closest. The upper drainage basin of the South Fork of the Little Humboldt River is included in the WSA. A wide variety of recreational opportunities are available in the Little Humboldt River WSA, including fishing, hiking, camping, hunting, rock climbing, and wildlife study. Portions of the Little Humboldt and Bullhead Wild Horse Herd Areas are located within this WSA providing for wild horse viewing and photographing. The BLM has recommended 29,775 acres of the Little Humboldt River WSA as suitable for wilderness and 12,438 acres as unsuitable for wilderness (BLM 1987).

Other WSAs in the Elko District recommended for wilderness designation are Badlands, Goshute Peak, Owyhee Canyon, Rough Hills, South Fork Owyhee River, and South Pequop. Red Spring, Cedar Ridge, and Bluebell WSAs were not recommended for wilderness designation (BLM 1987).

The USFS has three wildernesses within the Elko District (**Figure 3-12**): Jarbidge Wilderness, 70 miles northeast of the Bootstrap Project; East Humboldt Wilderness, 50 miles east of the project area; and Ruby Mountains Wilderness, 65 miles southeast of the project area.

ACCESS AND LAND USE

The primary study area for Access and Land Use is the Bootstrap Project area (area "A" on **Figure 3-1**); however, the discussion includes portions of Elko and Eureka counties.



Recreation and Wilderness Areas
Bootstrap Project
FIGURE 3-12

Access

The Bootstrap Project area is located 30 miles northwest of Carlin near State Highway 766. Interstate 80 is south of the project area and connects with Highway 766. The daily traffic on Highway 766 is estimated to be 2,900 vehicles (Nevada DOT 1993). The Dunphy Road (also known as Boulder Valley Road) extends north from the community of Dunphy and accesses the northwest portion of the Bootstrap Project area (**Figure 2-2**). Eureka County claims the Dunphy Road to the Elko County line. Elko County does not claim the road within its jurisdiction. Traffic count at the Dunphy ramp off Interstate 80 is 200 vehicles per day. There are no BLM-designated roads in the project area.

Land Use

The Bootstrap Project area is located in Elko and Eureka counties, Nevada (T36N R49E, portions of sections 2, 3, 10, 11, 14 and 15). Elko County is the second largest county in Nevada, encompassing approximately 17,181 square miles. Eureka County is considerably smaller at 4,182 square miles. Elko County is bordered on the west by Humboldt, Lander, and Eureka counties; on the south by White Pine County; on the north by Idaho; and on the east by Utah. Eureka County is bordered by Lander County to the west; on the north by Elko County; on the east by Elko and White Pine counties; and on the south by Nye County.

Approximately 71 percent of Elko County and 81 percent of Eureka County are managed by federal agencies, including the BLM, USFS, and BIA. The government land is fairly consolidated except for a checkerboard of private and federal lands on both sides of the Humboldt River and Interstate 80. This land pattern was created when alternating sections of land were granted to the Union Pacific and Central Pacific railroads as incentive to construct a transcontinental railroad.

Of the nearly 6 million acres in the Elko Resource Area, approximately half is administered by the BLM. The Elko Resource Area Management Plan regulates activities on these lands.

Land use in the vicinity of the Bootstrap Project is typical of the Elko RA, consisting of ranching, mining, and recreation. Mining is the major land use in the project area and will likely remain the principal activity for decades.

There are no state lands in the project area. The proposed Bootstrap Project involves both private and public lands. There are currently 234 acres of disturbed land in the project area: 99 acres of public land and 135 acres of private land.

All mining claims within the study area are owned or controlled by Newmont. Two rights-of-way have been established in the project area: 1) N-53160, a 90-foot-wide powerline and access road, granted to Sierra Pacific Power Company; and 2) N-7683, a 100-foot-wide tramroad granted to Newmont (**Figure 2-2**).

Water in the Boulder Valley is used for irrigation, stock watering, mining and milling, and domestic purposes. Irrigation and stock watering uses are scattered throughout the Boulder Valley, whereas mining and milling occur primarily in the upper reaches of Boulder and Rodeo creeks where most of the active mines are located. Other nearby mining and milling water uses are located on the east side of the Tuscarora Mountains in the South Operations Area. Most domestic uses are associated with the various mine operations (BLM 1993a). Specific water rights are not listed in this document because any potential impacts associated with mine dewatering and discharge would occur from the Betze/Post Mine and not the Bootstrap Project.

NOISE

Because of the remote location of the Bootstrap Project area, no measurements or estimates of baseline sound were made at the mine site. The nearest residential area is Carlin, approximately 30 miles away. Noise generated by mining facilities and operations at the North Operations Area is audible at the Bootstrap site. Carlin is located along Interstate 80 and is affected by traffic noise from the highways as well as normal urban sounds.

Noise at the Bootstrap Mine would occur from blasting, heavy equipment operation, vehicle traffic, ore handling, and crusher operation. Noise generated by trucks, bulldozers, and other equipment generally ranges from 90 to 100 dBA (A-weighted decibel sound scale) at the source.

Sound levels from blasting range from 100 to 125 dBA at 900 feet. **Table 3-19** shows typical noise levels generated by mining equipment; for comparison, **Table 3-20** lists noises frequently experienced in daily activities.

TABLE 3-19
Average Sound Levels for Equipment and Mine Operations

Equipment/Operation	Sound Level[1]	Source of Information
Blasting	115-125 dBA @ 900 feet	U.S. Bureau of Mines 1976
Crusher	95 dBA @ source	CMC Inc. 1989
Haul Trucks	90 dBA @ 50 feet	EPA 1978
Loaders	87 dBA @ 50 feet	Reagan and Grant 1977
Blasthole Drilling	86 dBA @ 50 feet	Reagan and Grant 1977
Bulldozers	85 dBA @ 50 feet	Reagan and Grant 1977

[1] dBA = A-weighted decibel sound scale.

TABLE 3-20
Relative Scale of Various Noise Sources and Effect on People

Public Reaction	Reference Level	Noise Level (dBA)[1]	Common Indoor Noise Levels	Common Outdoor Noise Levels
		110	Rock band	
		105		Jet flyover @ 1000 ft.
Local committee activity w/ influential or legal action		100	Inside New York subway train	
		95		Gas lawn mower @ 3 ft.
Letters of protest	4 X as loud	90	Food blender @ 3 ft.	
Complaints likely	2 X as loud	80	Garbage disposal @ 3 ft., Shouting @ 3 ft.	Noisy urban daytime
Complaints possible	Reference	40	Vacuum cleaner @ 10 ft.	Gas lawn mower @ 100 ft.
		65	Normal speech @ 3 ft.	Commercial area, heavy traffic @ 300 ft.
Complaints rare	1/2 as loud	80	Large business office	
Acceptance	1/4 as loud	90	Dishwasher in next room	Quiet urban daytime
		40	Small theater, large conference room	Quiet urban nighttime
		35		Quiet suburban nighttime
		33	Library	
		28	Bedroom @ night	
		25	Concert hall (background)	Quiet rural nighttime
		15	Broadcast and recording studio	
		5	Threshold of hearing	

[1] dBA = A-weighted decibel sound scale.

Source: Hatano 1980.

VISUAL RESOURCES

The study area for visual resources includes all land surface areas from which the Proposed Action would be visible. This includes a large portion of Little Boulder Basin, as well as portions of Boulder Valley, western slopes of the Tuscarora Mountains, and eastern slopes of the Sheep Creek Range.

The landscape of the study area is characterized by broad, open vistas framed by scattered hills and mountain ranges. The project site is located on hilly terrain on the western slope of the Tuscarora Mountains, which rise abruptly to over 8,800 feet AMSL. To the southwest of the Bootstrap Mine lies the broad, flat Boulder Valley. To the southeast lies Little Boulder Basin, which is the site of numerous mining facilities.

Vegetation of the study area consists primarily of homogenous patterns of sagebrush-grassland. Natural vegetation patterns have been disturbed by active mining operations and reclaimed mining sites. Dominant vegetation colors are gray, gray-green, and olive green.

Soil and rock are exposed in numerous areas where vegetative cover is sparse or has been disturbed by mining activities. Soils range in color from chalky off-white to beige. Disturbed soils have a wider range of colors including dark gray, reddish brown, buff, and chalky white. Hues of disturbed soils are stronger than those of undisturbed areas, and contrast strongly with surrounding soils and vegetation. Rocks vary in color from light brown to dark brown to burnt orange.

At the Bootstrap Project site, straight, horizontal lines from exploration roads are the primary visible feature, creating moderate contrasts with the smooth-surfaced blocky and pyramidal forms of the mine pit and waste rock areas. Other visible disturbances at the mine site include drill pads and small pits.

Mining facilities in the Little Boulder Basin create moderate to strong contrasts with forms, lines, and colors of the existing landscape. This effect is enhanced by the extensiveness of the mining operations.

Views of the Bootstrap Project site are limited due to adjacent hilly terrain. Distant views are limited to Boulder Valley, Little Boulder Basin, and the upper regions of the Tuscarora Mountains. Access to the vicinity of the Bootstrap site via Dunphy Road would remain open. Gate houses would restrict access to the Bootstrap access roads at the north and south ends of the project site. Access to the area from the southeast would be limited to authorized personnel. Therefore, only mine workers would view the project site from the south and southeast.

Potential viewers of the project site include mine workers, supply haulers, and recreationists. The latter would view the project site from Dunphy Road and nearby mountain areas. Recreationists include hunters and, to a limited degree, sightseers.

Visual Resource Ratings

The BLM has developed a Visual Resource Management System (VRM) to classify visual resources based on scenic quality, visual sensitivity, and visual distance zones. Most lands in the study area are assigned to VRM Class III and IV (**Figure 3-13**). Of the four VRM classes, Class IV allows the greatest modification of the landscape by disturbance or development (BLM 1986a). The Bootstrap Project site is located in VRM Class IV lands.

Visual Resource Contrast Ratings (BLM 1986b) were established for the Bootstrap Project site based on existing visual characteristics compared with those resulting from the Proposed Action. These ratings, which characterize the visual quality of the landscape based on design elements of form, line, color, and texture, are based on the premise that visual quality of a landscape depends on the contrast created between a project and the existing landscape.

Key observation points (KOP) were selected for evaluating the visual contrast ratings presented in Chapter 4, Visual Resources. Factors considered in selecting KOPs included angle of observation, number of viewers, duration of view, relative apparent size of the project, season of use, and lighting conditions (BLM 1986b). The KOPs were selected to represent locations on roads approaching the project site from which a person may be expected to view project features. In addition, KOP 3 was chosen to represent the backcountry recreationist's perspective of the project site from the Tuscarora Mountains. In all, three KOPs were identified and evaluated (**Figure 3-13**).

KOP 1 is located along Dunphy Road, a road accessing the project site from Boulder Valley. This KOP represents views seen by supply haulers, workers traveling to the Dee and Rossi mines, and recreationists (**Figure 3-14**). KOP 1 is slightly lower in elevation than the project site and is approximately ½-mile distant. Surrounding hills limit distant views from KOP 1. The characteristic landscape is hilly, with complex, rounded forms. Exposed soil and rock colors are reddish brown to dark gray, with vegetation colors ranging from gray-green in the foreground to gray, tan, buff, and yellowish tan in the background. Textures are generally medium to coarse. Existing mining operations offer moderate contrasts in form and color. Waste rock facilities at Dee Mine, visible approximately 3 miles north, introduce horizontal and diagonal lines and chalky white and beige colors.

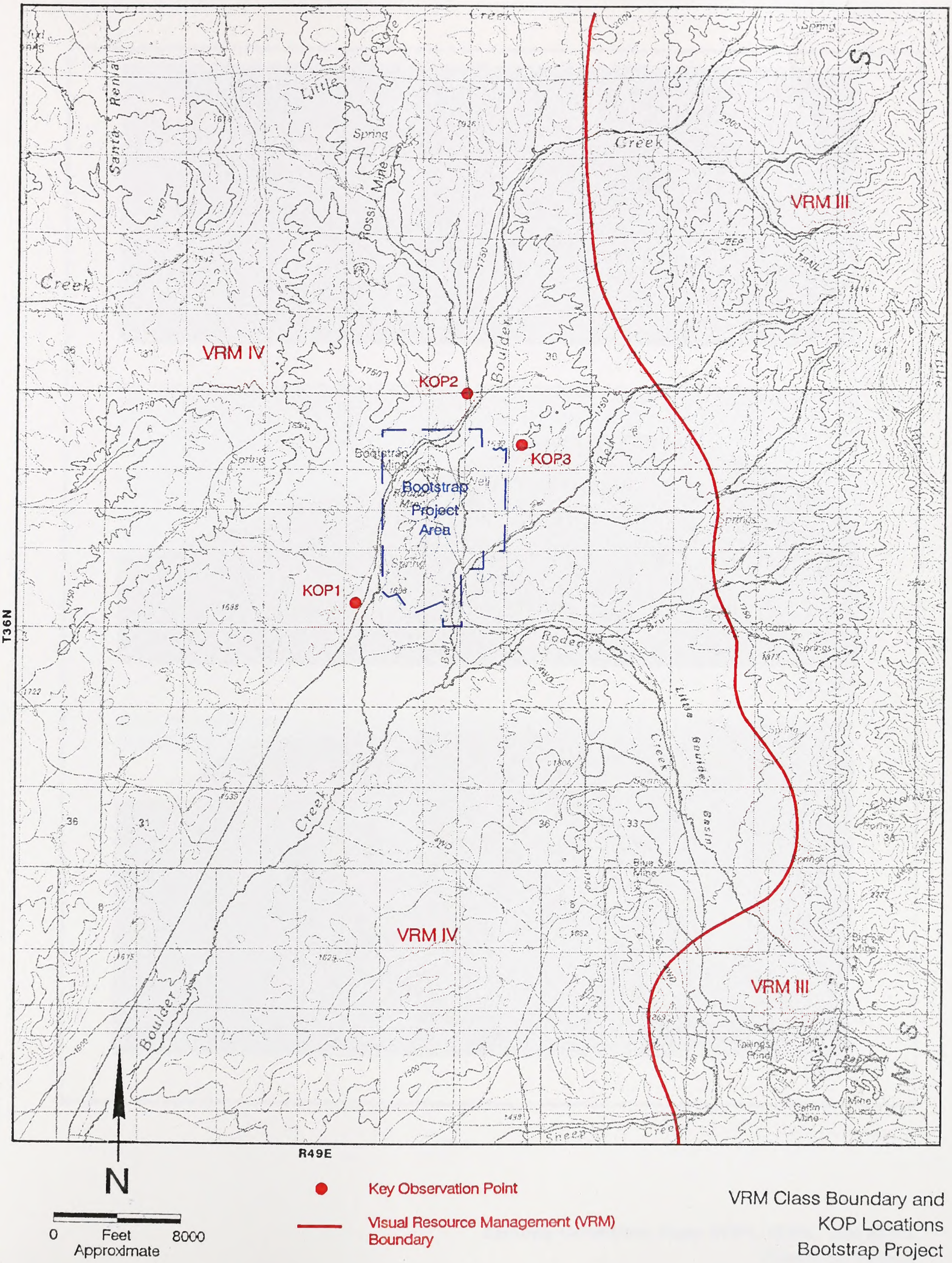
KOP 2 is located along the Dunphy Road approximately ¾-mile north of the project site (**Figure 3-14**). The characteristic landscape includes rounded, rolling, complex forms with rounded, irregular lines. Vegetation offers no distinct form. Colors of exposed soil and rock range from gray and dark brown to black. Vegetation colors are gray to gray-green with a smooth texture. Textures on the project site are rougher than surrounding areas. Waste rock facilities at Dee Mine are approximately 1 mile west of KOP 2, and thus are more visually dominant, offering moderate contrasts to existing forms, lines, and colors.

KOP 3, located on a ridge east of the project site, represents views by recreationists (**Figure 3-14**). Much higher in elevation, this vantage point allows views of the entire project site. The extensive mining facilities visible from KOP 3 provide strong visual contrasts, especially in form, line, and texture. In the foreground-middleground zone, rounded, rolling, complex forms grade into domed, angular forms in background mountains. Lines are complex, with horizontal, rounded, and weak to moderate diagonal lines in the background zone. Coarse, contrasting textures in the foreground-middleground zone grade into smoother textures in the background zone. Predominant colors are gray, buff, gray-green, and yellowish tan.

CULTURAL RESOURCES

The goal of cultural resource management is to maintain and enhance historic and prehistoric cultural resource values. Emphasis is placed on conservation of archaeological and historic sites to better understand the lifestyles and behavior of early societies. Although all cultural resources provide information collectively on the past, some sites contain information for research, public interpretation, and use by future generations. Prehistoric resources are physical locations with a cluster of features and artifacts resulting from human activities that occurred prior to written records. Historic resources are clusters of features and/or artifacts left by human activity after written records were common. These resources are recorded as sites or isolates/isolated finds (IF). Sites are clusters of artifacts and/or features with definable boundaries, while isolates represent minimal human activity characterized by one stone tool, one to several pieces of lithic debitage, or one to several historic artifacts.

The study area for Cultural Resources is shown on **Figure 3-1** and includes the Bootstrap Project area and a radius of approximately 1 mile around the project area. Prehistoric site types in the study area include lithic scatters, campsites, and isolated finds. Quarry sites are not known in the



VRM Class Boundary and
KOP Locations
Bootstrap Project
FIGURE 3-13

KOP1

KOP2

KOP3

Existing Conditions From KOP1, KOP2, and KOP3
Bootstrap Project
FIGURE 3-14

study area, but the Tosawihi quarries located about 12 miles to the northwest were an important source of stone for tools. Lithic scatters found in the study area are primarily composed of Tosawihi quarry rock.

Historic cultural resources in the study area are minimal, suggesting the area was little used by Euroamericans prior to recent mineral exploration and mining activity.

Cultural resource inventories have been conducted over the entire project area by several investigators since 1989. One of these inventories (Tipps 1989), included a detailed review of cultural inventories conducted previously in the area, as well as a review of pertinent literature and records on the history, prehistory, ethnohistory, and current Native American use of the area. Additional inventory and site re-evaluation was completed in 1995 by Newsome. This report provided an updated review of cultural resource projects conducted in and around the Bootstrap/Capstone area. Consultation with the Western Shoshone regarding their concerns about the Bootstrap project have been initiated by the BLM-Elko District. In addition, BLM-Elko District personnel have initiated consultation with the Western Shoshone regarding their concerns about the proposed project.

Cultural History

Human occupation in north-central Nevada and the Humboldt Basin began around 12,000 years ago and is divided into the Pre-Archaic (or Paleoindian), Archaic, Late Prehistoric, and Protohistoric periods. The prehistoric chronology presented below was developed by Elston and Budy (1990), based on excavations at James Creek Shelter. The Historic Period began in the early nineteenth century with the arrival of fur traders and later pioneers, emigrants, ranchers, and miners.

Pre-Archaic Period (10,000 to 6,000 B.C.)

Evidence from the Great Basin indicates occupation at this time included groups using Clovis, Folsom, and other Plains-style projectile points, as well as stemmed points of the Western Stemmed Tradition (Bryan 1980). While it is generally assumed these peoples subsisted largely on hunting of big game, the association of Pre-Archaic materials with marshland/dune situations suggests that some Great Basin groups may have farmed as well (Simms and Isgreen 1984). Although not common in north-central Nevada, some Pre-Archaic sites have been found southwest of the project area near Valmy (Elston et al. 1981) and Rye Patch Reservoir (Rusco and Davis 1982), to the southeast at Susie Creek (Armentrout and Hanes 1986), to the east at Smith Creek Cave (Bryan 1979), and on the project area (Popek and Tipps 1993). Pre-Archaic materials in the upper Humboldt River drainage system have been termed the Dry Gulch Phase by Elston and Katzer (1990).

Archaic Period (6000 B.C. to A.D. 700)

The Archaic Period traditionally has been characterized as the Desert Archaic where hunters and gatherers followed a seasonal route tied to resource availability, very similar to the historic Western Shoshone settlement pattern described by Steward (1938). However, recent archaeological investigations indicate that this prehistoric era was more complex. Elston and Katzer (1990) divide the Archaic period into three phases: the No Name Phase (5000 to 2500 B.C.), the South Fork Phase (2500 B.C. to 850 B.C.), and the James Creek Phase (850 B.C. to A.D. 700).

Although not well documented in the upper Humboldt Area, the No Name Phase is characterized by Elko Series points. The South Fork Phase is marked by the use of Humboldt, Pinto, and Gatecliff Series projectile points (Elston and Budy 1990; Elston and Katzer 1990), while the final phase, James Creek, is characterized by Elko points. The James Creek Phase represents a true archaic lifestyle. Archeological evidence from the Archaic Period has been recovered from numerous surface sites and from excavated caves and rockshelters throughout the central Great Basin and within and around the project area.

Late Prehistoric Period (A.D. 700 to 1300)

A change in material culture and subsistence took place in the Great Basin sometime about A.D. 500 to 700 with the changes persisting until about A.D. 1200 to 1300. Smaller projectile points used with the bow and arrow generally replaced large Archaic-style dart points. The subsistence base appeared to focus heavily on vegetable food and small game. Diagnostic artifacts of the Late Prehistoric era include Rosegate projectile points and Fremont gray ware pottery. Elston and Katzer include this period as part of the Maggie Creek Phase. Many sites from the Late Prehistoric Period are known in the Bootstrap Project area. This time period is represented by Eastgate-style points.

Protohistoric Period (A.D. 1300 to 1850)

Numic-speaking Western Shoshone peoples are thought to have moved into the area from the southwestern Great Basin around A.D. 1300. The settlement and subsistence patterns of these peoples, as described by Steward (1938), involved seasonal movement between different vegetation zones and exploitation of a variety of wild food sources. The size and structure of nomadic groups fluctuated depending on availability and abundance of food as well as season of the year. Pine nuts, gathered in the fall and cached for the winter, were often a major resource.

In spring, larger groups separated into nuclear families and foraged through the summer, assembling again in fall to hunt communally and gather pine nuts. Because pine nuts were not as abundant in the Boulder Valley and the Tuscarora Mountains as they were in areas farther north, groups living close to the Humboldt River probably consumed fish, as well as the seeds and roots abundant in the river valley (Thomas et al. 1986).

Groups farther from the river, lacking dependable, regularly recurring food sources, no doubt endured cycles of plenty and starvation (Harris 1940). The White Knives, for example, were forced to cover a wider range in their search for plants, seeds, roots, and wild game than some other Western Shoshone groups. They hunted rabbits, antelope, deer, and mountain sheep when possible, but these animals were often in short supply. Roots, seeds, berries, and occasionally insects formed the bulk of the food supply. They foraged nomadically as long as possible each year, often 7 or 8 months, since winter frequently became a battle against time. Food caches, limited to small surpluses that could be accumulated during summer, were replenished only by rabbit hunting and sporadic fishing during winter. The harshness of the environment and limited availability of food, combined with the simple devices the White Knives relied on for procuring, transporting, and storing food, made survival a constant struggle (Harris 1940).

Archaeologically, the Western Shoshone are often characterized as having crude brownware pottery and using small side-notched projectile points. Elston and Katzer (1990) refer to the local Numic occupation as the Eagle Rock Phase. Several Eagle Rock Phase sites are known in the project area and surrounding vicinity, including a cache of four triangular and two Desert Side-Notched projectile points, and Carrora's Camp, an excavated site several miles northeast of the Bootstrap Project area (Tipps 1988).

Historic Period

Fur trappers were the first Euroamericans to enter Western Shoshone territory during the early nineteenth century, followed by explorers (e.g., Fremont, Gunnison, Simpson), settlers, and miners in the mid to latter half. As conflicts arose between Euroamericans and Native Americans, the government established reservations for the Gosiutes, Southern Paiutes, and Western Shoshone.

Stage roads, railroads, and eventually highways followed settlement, connecting the Rocky Mountain region with the West Coast. Today, the primary economic activities in north-central Nevada are gold mining and cattle grazing.

Cultural Resource Surveys and Results in the Area of Potential Effect and a One Mile Radius

Cultural resource inventory work, in compliance with regulations established under the National Historic Preservation Act (NHPA), 36 CFR 800, has been completed in the area of potential effect (APE). The area of potential effect includes those areas which would be disturbed by the Proposed Action. Fifty-six sites have been recorded within the project area and haul road, sixteen of which are eligible for inclusion in the National Register of Historic Places (NRHP). Additionally, 56 small sites or isolated finds have been recorded in the area of potential effect.

In 1989, Tipps (BLM Report CR1-1268) completed a Class II and Class III inventory over most of the project area (1,202 acres). Lands (about 80 acres) around Round Mountain, which had been the scene of relatively intensive exploration and mining activity, were badly disturbed and hence were inventoried at a less intensive Class II level because of the disturbance. To the east of the Class II survey, about 80 acres had been totally disturbed by mining and hence were not subject to inventory. In 1993, Newsome et al. (BLM Report CR1-1800) conducted an inventory of selected lands along Bell, Boulder and Rodeo creeks that covered some of the southern portion of the Bootstrap Project area. As expected, numerous large prehistoric sites were located, many of which were recommended eligible for the NRHP.

In 1994, Jones (BLM Report CR1-1947) completed an inventory along Boulder Creek for the proposed creek diversion and Dunphy Road realignment. This inventory located three prehistoric sites, all of which were recommended eligible to the NRHP. In 1995, Newsome (BLM Report CR1-1988) inventoried 560 acres for the proposed Bootstrap project as well as surrounding properties, re-evaluated 35 selected prehistoric sites, and completed a data recovery plan for sites to be adversely effected by the Bootstrap Project. A total of 28 new prehistoric cultural properties, 10 of which are in the area of potential effect, were recorded. Three of these newly recorded sites are in the APE and are recommended eligible under Criterion 'd' of the NRHP. Other inventory sites within the project area include a transmission line (BLM CR1-1687, Mires 1992); an access road (BLM CR1-1203, Rafferty 1988); an overlapping inventory for the Ren parcel on the project area's northeast corner (BLM CR1-1664, Newsome et al. 1992); and a fenceline (BLM CR1-284, Armentrout and Gardetto 1980). Additional inventories within the APE (BLM CR1-1687, -1203, -1664, and -284) found no sites that had not previously been reported by Tipps (1989) or Newsome et al. (1993).

Figure 3-15 shows the areas inventoried with reference to BLM report numbers. All areas were inventoried at a Class III level, with the exception of 160 acres previously disturbed by mining and mineral exploration; 80 acres of which were inventoried at a Class II level. **Table 3-21** summarizes the cultural resource inventory work conducted within the Bootstrap Project area and within a 1-mile radius of the project. **Table 3-22** provides a summary of cultural resources recorded within the area of potential effect by type of resource.

The haul road location was inventoried for other mine-related projects (BLM CR1-1244, Hicks 1989; BLM CR1-1643, Tipps and Popek 1992). Three sites, one of which is NRHP eligible, were recorded in the haul road corridor outside of the Bootstrap Project area.

Prehistoric Documentation. Archaeological inventories show that large occupation sites were located in the drainages, while smaller sites were on higher areas away from the drainages. Because of proximity to the Tosawihi chert quarries (about 12 miles), most lithic material on the sites is Tosawihi chert. Sites inventoried on the Bootstrap Project area were relatively shallow (less than 4 inches of soil) lithic scatters with three having associated groundstone artifacts. The sites vary in size from around 0.12 to 50 acres. Larger sites were generally occupied by a series of small groups with individual camps. Most sites within the project area appeared to be limited-use or short-term camps.

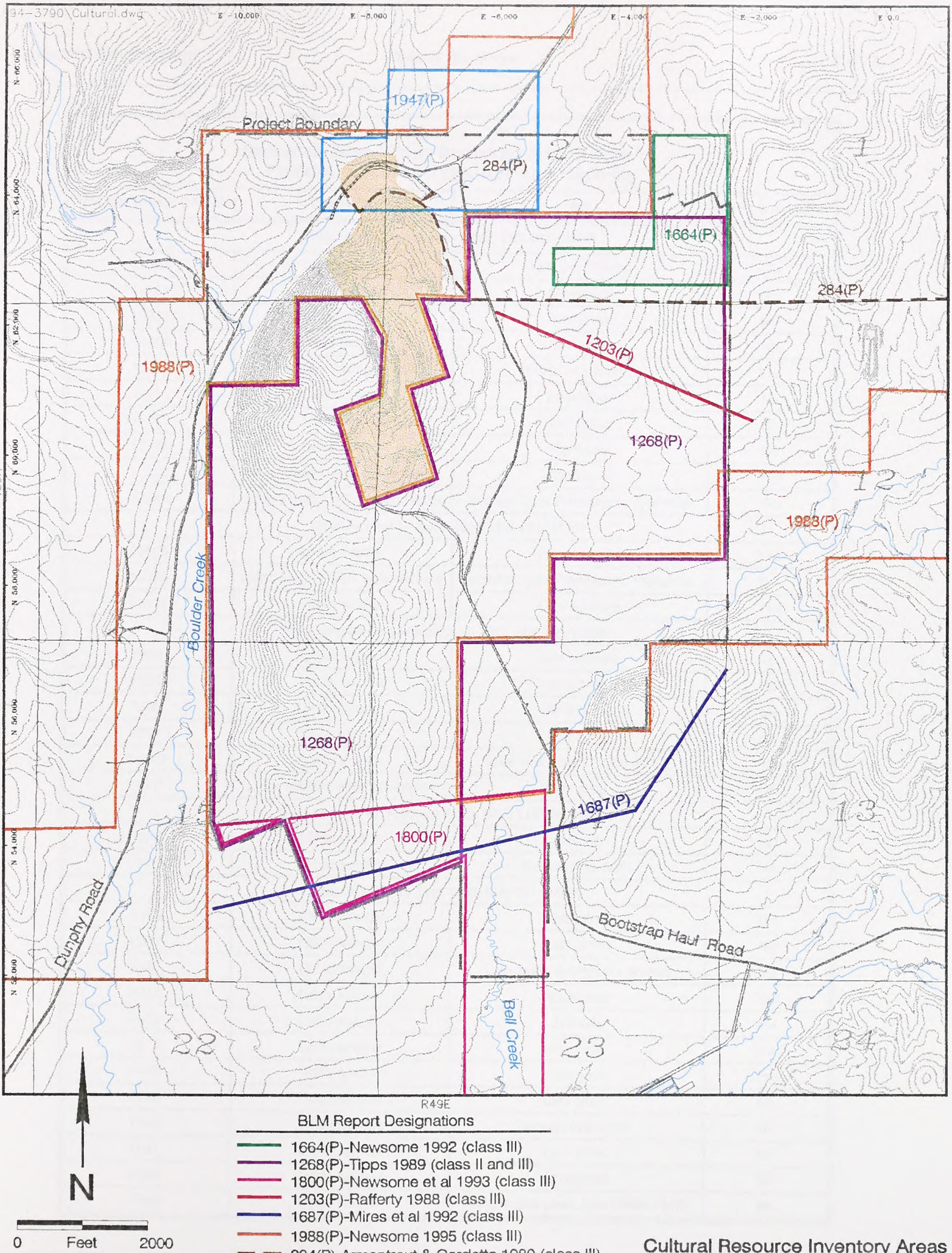
Table 3 - 21 Archaeological Investigations Within Bootstrap* Area				
BLM Report Number	**Report Title**	**Reference**	**No. of Sites & Isolates Within Bootstrap Area***	**No. of NRHP Eligible Sites Within Bootstrap Area***
BLM CR1-1988(P)	Inventory Bootstrap/Capstone Area & Site Reevaluation	Newsome 1995	25 preh. 2 preh. IFs 1 hist. IF	3 preh.
BLM CR1-1947(P)	Boulder Creek and Dunphy Road Realignments	Jones 1994	3 preh.	3 preh.
BLM CR1-1800 (P)	Lands along Bell, Boulder & Rodeo creeks	Newsome et al. 1993	19 sites - preh.	7 preh.
BLM CR1-1988(P)	Portions of Sec. 13 & 24 T36N R49E	Tipps & Popek 1992	7 sites - preh. (3 prev. recorded by Hicks 1989) 1 IF - preh.	4 preh.
BLM CR1-1687 (P)	120kV line from Coyote Creek to Bazz	Botti & Kautz 1992	3 sites - preh. 3 IFs - preh.	2 preh.
BLM CR1-1521 (P)	Reevaluation of 130 acres for Dee Gold	Newsome et al. 1992	7 sites - preh. 3 IFs - preh.	5 preh.
BLM CR1-1687 (P)	Bell Creek to Meikle trans. line for Sierra Pacific	Mires 1992	0	0
BLM CR1-1860 (P)	Ren parcel	Newsome et al. 1992	31 preh. 32 preh. IFs	6 preh.
BLM CR1-1342(P)	Site evaluations, Little Boulder Basin Area	Schroedl and Tipps 1991	0	0
BLM CR1-1407(P)	Diversion ditch for Dee Gold	Valentine 1991	3 sites -preh.	0
BLM CR1-1408(P)	Disposal facility expansion for Dee Gold	Johnson 1991	3 sites - preh. 1 IF - hist.	1 preh.
BLM CR1-1440 (P)	1,486 acres- Dee Gold expansion	Johnson 1991	20 preh. sites 31 IFs (2 sites have hist. comp. & 1 IF has hist.)	3 preh.
BLM CR1-1485(P)	Reevaluation of Dee Gold disposal facility expansion	Tipps & Popek 1991	28 sites - preh. 38 IFs	12 preh.
BLM CR1-1244 (P)	3698 acres for Barrick	Hicks 1989	59 preh. sites, 1 hist. 126 IFs	37 preh.
BLM CR1-1268 (P)	Bootstrap Operations Area	Tipps 1989	0	0
BLM CR-1-1203 (P)	520 acres & access for Dee Gold	Rafferty 1988	4 sites - preh. 2 isolates - preh.	1 preh.
BLM CR1-947(P)	Newmont Bell Creek Project	Spencer 1985	1 site - preh.	0
BLM CR1-484(P)	Cordex Mine plan	Jaynes 1983	9 sites - preh.	4 preh.
BLM CR1-709(P)	Site evaluations	Ellis 1983	5 sites - preh.	1 preh.
BLM CR1-284(P)	T Lazy S Allotment Fence	Armentrout & Gardetto 1980	0	0

1. NRHP = National Register of Historic Places; preh. = prehistoric; IF = isolated finds; hist. = historic; NA = not applicable.

2. Archaeological investigations in direct impact area: 284, 1203, 1268, 1687, 1664, 1800, 1947, 1988.

3. Bootstrap Area includes the area inside the project boundary and the Area of Potential Effect (APE). APE is the area which would be disturbed by the Proposed Action.

4. Many of the sites were re-evaluated by later projects and the original eligibility recommendations changed and/or in some cases site size, dimensions and/or numbers were altered. However, in most cases the sites on this table are listed by the project which originally located and recorded the site.



BLM Report Designations

- 1664(P)-Newsome 1992 (class III)
- 1268(P)-Tipps 1989 (class II and III)
- 1800(P)-Newsome et al 1993 (class III)
- 1203(P)-Rafferty 1988 (class III)
- 1687(P)-Mires et al 1992 (class III)
- 1988(P)-Newsome 1995 (class III)
- 284(P)-Armentrout & Gardetto 1980 (class III)
- 1947(P)-Jones 1994 (class III)
- Encompasses Previously Disturbed Areas (class II)

Cultural Resource Inventory Areas
Bootstrap Project
FIGURE 3-15

TABLE 3 - 22
Recorded Sites Within Bootstrap Project Area of Potential Effect by Type, Age and Eligibility

BLM Site Number CrNV-12	Type of Site	Age	Eligible to the NRHP
Sites recorded by Newsome 1995, BLM CR1-1988(P)			
12263	Lithic scatter	Late prehistoric	No
12267	Llithic scatter	Aboriginal	No
12283	Lithic scatter	Aboriginal	No
12285	Lithic scatter	Aboriginal	No
12285	Llithic scatter with groundstone	Mid to late Archaic	Yes
12281	Lithic scatter	Aboriginal	No
12283	Lithic scatter	Aboriginal	No
12285	Lithic scatter	Aboriginal	No
12285	Lithic scatter with groundstone	Aboriginal	Yes
12289	Lithic scatter with groundstone	Archaic, Late Prehistoric, Protohist.	Yes
Sites recorded by Jones 1994, BLM CR1-1947(P)			
10448	Lithic scatter	Protohistoric	Yes
12285	Lithic scatter with groundstone	Archaic, Late Prehistoric, Protohist.	Yes
12027	Lithic scatter	Late Archaic	Yes
Sites recorded by Newsome et al. 1993, BLM CR1-1800(P)			
7863	Lithic scatter	Late archaic	No
7864	Lithic scatter	Late preh.	No
7865	Lithic scatter	Aboriginal	No
7864	Lithic scatter	Aboriginal	No
11640	Lithic scatter	Late preh; hist. (1900-1910)	No
11641	Lithic scatter w/groundstone	Late preh.	Yes
Sites recorded by Tipps and Popek 1992, BLM CR1-1643(P)			
7345	Lithic scatter	Archaic	Yes
11125	Lithic scatter	Archaic late preh.	No
Sites recorded by Tipps 1989, CLM CR1-1268(P)			
7103	Lithic scatter	Aboriginal	Yes
7903	Lithic scatter	Late preh.	No
7926	Lithic scatter	Late preh. protohist.- Numic	No
7921	Lithic scatter	Aboriginal	Yes
7922	Lithic scatter	Archaic	No
7903	Lithic scatter	Late preh.	No
7923	Lithic scatter	Late preh.	Yes
7925	Lithic scatter	Late preh.	No
7926	Lithic scatter	Archaic late preh.	No
7927	Lithic scatter	Late preh.	No
7928	Lithic scatter	Aboriginal	No
7929	Lithic scatter	Archaic late preh. hist (1900-1915)	No

TABLE 3 - 22 Recorded Sites Within Bootstrap Project Area of Potential Effect by Type, Age and Eligibility			
BLM Site Number CrNV-12	**Type of Site**	**Age**	**Eligible to the NRHP**
Sites recorded by Tipps 1989, (BLM CR1-1268(P) (continued)			
7940	Lithic scatter	Archaic late preh. protohist.- Numic	Yes
7941	Lithic scatter	Late preh.	No
7942	Lithic scatter	Late preh.	No
7949	Lithic scatter	Late preh.	No
7949	Lithic scatter	Aboriginal	No
7945	Lithic scatter	Late preh.	No
7946	Lithic scatter	Late preh.	No
7947	Lithic scatter	Late preh.	No
7949	Lithic scatter	Archaic	No
7949	Lithic scatter	Aboriginal	No
7360	Lithic scatter	Aboriginal	No
7961	Lithic scatter	Aboriginal	No
736[illegible]	Lithic scatter	Aboriginal	No
7963	Lithic scatter	Archaic	No
7360	Lithic scatter	Archaic	No
7965	Lithic scatter	Late preh.	No
Sites recorded by Hicks 1989, BLM CR1-1244(P)			
7346	Lithic scatter	Aboriginal	No
7360	Lithic scatter w/groundstone	Aboriginal	No
7364	Lithic scatter	Aboriginal	Yes
7440	Lithic scatter	Late archaic late preh.	Yes
7441	Lithic scatter	Late archaic late preh.	No
7447	Lithic scatter	Late preh.	Yes

Note: NRHP = National Register of Historic Places; preh. = prehistoric; hist. = historic.

Tool manufacture and maintenance were major activities at most sites. The relatively large numbers of projectile points discovered suggests hunting was the primary activity, with animal and vegetable food processing minor activities. The sites can generally be assigned to the Late Prehistoric Period, with five Early Archaic sites and eight Middle to Late Archaic sites. Two Protohistoric sites were considered to be Numic (based on the recovery of points) dating from A.D. 1300 to 1800. Five Protohistoric sites (A.D. 1300-1800) were found, at least two of which are considered to be Numic based on projectile point style. One of these, CrNV-12-7889, contained a cache of projectile points.

Historic Documentation. Historic activity in the project area has been limited to ranching and mineral exploration. Only two historic artifacts were found. One artifact, (CrNV-12-7929), is a condensed milk can dating from ca. 1900-1915, and the other (CrNV-12-11640), is a cluster of aqua glass from one bottle dating ca. 1900-1910.

NATIVE AMERICAN RELIGIOUS CONCERNS

The general ethnographic background for the area of potential effect and the area of cumulative effects is similar and no distinction is made in the following discussion.

Historically, four groups of Western Shoshone lived in the Humboldt Valley. The traditional territory of the westernmost group - the Tosawihi or White Knives - included the Humboldt River Valley around Battle Mountain, the lands drained by Rock Creek, and other northern tributaries of the Humboldt from as far west as Golconda or Winnemucca and east to the Independence Mountains (Rusco and Raven 1991). This area is also within the geographic boundaries established under the Ruby Valley Treaty of 1863.

Tipps (1989) summarized the ethnographic information on the White Knife or Tosawihi Shoshone as follows:

- Western Shoshone territory stretched across north-central and northeastern Nevada and into northwestern Utah and a small portion of southeastern Idaho. Steward (1937, 1938) identified 43 groups, nine of which were considered bands and 34 of which were considered districts within this large area. Although Steward (1937, 1938, 1939, 1941) did not identify a specific group associated with the project area, he did discuss a group called the Tosawihi or White Knives that inhabited the area directly to the west. The White Knives reportedly wintered around Battle Mountain and ranged over the mountains bordering Rock Creek.
- The name "White Knife" has also been used more broadly (Harris 1940; Holeman 1852; Powell and Ingalls 1874; Steward 1939) to refer to groups inhabiting larger areas of north-eastern and north-central Nevada. Harris (1940), for example, refers to groups that inhabited the Humboldt River drainage between the Independence Mountains on the east and Winnemucca on the west as "White Knife Shoshone." He states they foraged as far north as the Snake River and as far south as Eureka and Austin during the summer months. Thus, his discussion of White Knife Shoshone applies to the Western Shoshone inhabitants of the project area.
- Due to scarcity of food, the White Knives foraged across a much larger area than the 20 to 25 miles typical for other Western Shoshone groups, and each group followed a more or less well-defined orbit ranging from 25 to 100 miles from its winter base camp (Harris 1940). Camp groups, the basic social unit, generally wintered along the Humboldt River and its tributaries and in sheltered areas to the north. These groups usually consisted of one to three families and seldom exceeded 20 persons. Winter settlements along the Humboldt and in areas to the north were small compared with those of other Western Shoshone groups.
- According to Harris (1940), population density of the White Knives was one person per 15 or 20 square miles, with a total population of about 800 to 1,000 individuals at historic contact. This number is much lower than Steward's (1938) estimate of one person to 3.3 to 5.2 square miles, but Steward's estimate probably applies to the more fertile band immediately adjacent to the Humboldt River.
- Steward (1938) did not identify any winter encampments in Boulder Valley during his work in the 1930s, but he did identify a winter village in the Independence Valley on the east side of the Tuscarora Mountains.

Land claim disputes, specifically interpreting The Ruby Valley Treaty, remain an ongoing social and political issue among the Newe/Western Shoshone. Although the U.S. Supreme Court in 1985 determined that the Western Shoshone had been paid for the lands covered by the Treaty of Ruby Valley, many Newe/Western Shoshone argue that the land has never been ceded to the U.S. Government. The ideology of this movement is further reflected through Newe/Western Shoshone traditionalism wherein there is a link to the aboriginal territories geographically defined by the Ruby Valley Treaty.

Newe/Western Shoshone Worldview

Newe believe that the world was first under water except the mountain peaks. As the water receded, the first human beings moved to the foothills and springs and from then on all the plants, animals, and spirits were relatives. This established the various economic, social, and kinship ties that the Newe continue to have with animals, plants, and spirits (Steward 1938).

Springs are important to the Newe/Western Shoshone not only for spiritual reasons but because many medicinal plants grow near them. Water sources are also believed to have Puha, a power that has an affinity for water, although it is also present on mountains and throughout the landscape and is important to the well-being of the Newe people. Puha is also found at prehistoric archaeological sites and graves. Prayer and other spiritual activities are designed to properly acquire and employ Puha and there are specific "power spots" where this can be done. These locations include springs, mountains, mountain passes, and caves. Of significance particularly to the Tosawihi is the white chert found at the Tosawihi quarries, as it is also a source of Puha (Miller 1983; Rusco and Raven 1991; Clemmer 1990a, 1990b; Harris 1963; Hultkrantz 1986; Janetski 1981; Liljebald 1986; Malouf and Smith 1947).

Consultation

As part of the NEPA process and under other federal regulations (e.g., the National Historic Preservation Act (NHPA), the Native American Graves Protection and Repatriation Act (NAGPRA), and American Indian Religious Freedom Act (AIRFA)), the BLM is responsible for consultation with Native Americans in regards to the Proposed Action and any potential conflicts.

For the Bootstrap Project, the consultation process was initiated by the BLM by contacting Larry Kibby, representative of the Western Shoshone Historic Preservation Society, the designated contact organization of the Te-Moak Tribe of the Western Shoshone. Consultant Lynn Fredlund, GCM Services, Inc. conducted ethnographic interviews with Western Shoshone individuals to gather additional information for BLM to use during consultation.

On March 22, 1995, Mr. Kibby noted that he was reviewing the mining plan and the area of impact with the tribal elders but had not reached any conclusions at that time. Alan Schroedl of P-III Associates, Salt Lake City, had participated in a videotape with one of the elders and Mr. Kibby planned to review that tape in regard to this project.

Another Western Shoshone group identified by BLM as having concerns is the Shoshone-Bannock Tribes (Sho-Ban) in Fort Hall. On March 23, 1995, Lynn Fredlund met with Diana Yupe, cultural resource coordinator, in Fort Hall. Yupe mentioned a number of areas of concern and planned to review the maps of the Bootstrap Project area with the elders to see if there were any specific locations of concern.

Concerns common to all Newe/Western Shoshone groups, including some of particular interest to the Sho-Ban, are as follows:

- Ground-disturbing activities associated with mining can disrupt the flow of spiritual power (Puha) as well as the distribution or disposition of spirits (e.g., Little Men and Water Babies). For example, because hunting is conducted with help of the Little Men, it is important to minimize changes in the land and habitat that could drive these spirits away. Maintaining access to undisturbed concentrations of Puha (power spots) and continuing relationships with the spirits is integral to spiritual life (Rusco and Raven 1991).

- Mine dewatering, although not proposed for the Bootstrap Project, has affected nearby springs and drainages. This has probably had an effect on the distribution or disposition of spirits associated with water. Thermal springs are of particular concern, although there are no thermal springs in the project area and the area of cumulative effects.

- Ground disturbance results in loss of plants gathered and used by Western Shoshone traditionalists, although many of these plants are rarely encountered because vegetation has been altered by grazing (Rusco and Raven 1991).

- Cultural resource inventories conducted by archaeologists prior to mining activities often result in collection of artifacts that Western Shoshone traditionalists consider to be objects with possible power (e.g., complete projectile points and special types of knives of Tosawihi chert). Tools made by medicine men or other gifted persons could become objects with significance, as opposed to the tools made by people who used the material on a daily basis.

- In addition to Tosawihi chert, a red-and-white, chalky rhyolitic tuff called "aipin" is of particular concern to the Sho-ban elders. The tuff, used for medicine and paint, is found in Tertiary-age rocks near the Tosawihi quarries and possibly in the northern Bootstrap Project area. The only Tertiary-age rocks in the Bootstrap Project area are beds of the Carlin Formation located near the Boulder Creek Diversion.

SOCIAL AND ECONOMIC RESOURCES

The socioeconomic study area for the Bootstrap Project includes Elko and Eureka counties and the communities of Elko, Carlin, Spring Creek, and the Elko Band Colony. Although the project is located within both Eureka and Elko counties, it is expected that most employees and their families would live in Elko County rather than commute longer distances to communities in Eureka County. Elko and Eureka Counties would receive increased tax revenues as a result of the project. Because social life and community services for Eureka County would be relatively unaffected by the project, they are not described.

Social Life

The socioeconomic character and cultural diversity of Elko County and surrounding northeastern Nevada reflects a history of occupation and nomadic use by Native Americans followed by the advancement of the railroad and an influx of explorers and settlers. The Western Shoshone were the dominant aboriginal people when trappers and explorers first arrived in northeastern Nevada in the early 1800s. Initial contacts between Indians and non-Indians resulted in isolated conflicts, but had little effect on Western Shoshone culture.

The Western Shoshone occupy two reservations in Elko County--the Elko Band Colony and a portion of the Te-Moak Reservation along the South Fork of the Humboldt River. The Elko Band Colony was formed by Indians pitching their tepees and wickiups near the outskirts of Elko in the 1920s. Although the encampment moved several times as Elko expanded, Elko Band Colony residents built housing and now occupy a permanent site within the city. The Elko Band fosters its cultural heritage and practices traditional activities. With increased appreciation of the Band's culture, community residents have supported two major cultural events (pow-wows) each year, for the past 4 years (Gonzales Sr. 1995). Pow-wows are a Native American celebration in which spiritual and traditional activities such as dancing, crafts, and drumming take place.

Carlin was first named "Chinese Gardens" for the earlier Oriental residents who planted large vegetable gardens in the area to serve railroad workers and cross-country travelers. The Chinese later worked on the railroad and then became employed as launderers and cooks. Little evidence of their cultural activities remains in Carlin today (Ellen and Glass 1983).

The railroad kept Carlin alive in the early and mid-twentieth century until the new era of mining came about in 1965. Today mining has become the economic mainstay of the community members (Ellen and Glass 1983).

The Central Pacific rails reached Elko in 1868, and within weeks gambling halls and houses of prostitution became prominent. Chinese laborers built a "Chinatown" south of the railroad tracks that eventually became more stable than those of other Nevada towns, contributing a number of prominent citizens to the area, especially in the restaurant business (Ellen and Glass 1983).

The wide-open spaces of Elko County held excellent grazing lands for cattle and sheep. Cattlemen and sheepherders eventually clashed over grazing rights until federal regulations limited the free and uncontrolled grazing of public lands. Nevada sheepherders came from a variety of ethnic backgrounds--Basques, Mexicans, Greeks, Chinese, and Europeans (Ellen and Glass 1983). The distinctiveness of the Basques has been retained in Elko County through language, customs, and shared historical experience and ancestry.

An important change in the Elko economy came with Nevada's legalization of casino gambling in 1931. Gaming and entertainment at Elko's casinos are highly visible social and economic institutions.

During the last decade, rapid population growth in Elko and Carlin resulting from mining and related development has shaped the socioeconomic character of these communities. The in-migration of new residents has led to changes in some aspects of daily life such as increased traffic, overcrowded parks, and higher crime rates. Low unemployment rates, a greater diversity of services, and increased business opportunities have also resulted from increased economic development.

Residents enjoy the small-town atmosphere of Elko, Carlin, and surrounding residential areas. They value the quiet neighborhoods, friendly neighbors, peaceful country living, the natural environment, and outdoor recreational opportunities. Some residents perceive negative features of the area as inadequate selection of goods and services, isolation from major urban centers, limited recreational activities for young people, severe climate, lack of trees, and environmental changes resulting from mining activities. Although social problems (domestic violence, alcohol or other drug abuse, and excessive gambling) are being dealt with primarily through law enforcement, residents perceive better access to counseling and more recreational opportunities are needed to further alleviate these problems (BLM 1993a).

Social stratification in the area is often associated with income, length of residence, educational attainment, and ethnicity. Local residents earning high incomes are considered to be the most influential in the community. Groups regarded by local residents as having the most power in deciding the future of the area include federal and state government, county commissioners, environmental organizations, and large corporations (BLM 1993a).

In spite of the growth that has occurred as a result of mining in the area, residents still perceive there is a sense of "community." Numerous charitable, civic, and recreational groups are active in the study area. Community cooperation is evident in residents' efforts to expand the local economic base, develop recreational facilities, and organize help for local families who have suffered hardships. Major community events are supported, such as the Basque Festival, Western Shoshone Pow-wows, and the Cowboy Poetry gathering (BLM 1993a).

Population Trends and Demographic Characteristics

The population of Nevada increased 54.4 percent during the 1980-90 decade, from 800,508 in 1980 to 1,236,130 in 1990 (Nevada Department of Administration 1995). The primary cause of the increase was in-migration related to jobs generated by the gambling-related service sector, the mining industry, and the construction sector. In 1994, the population was estimated to be 1,494,230, a 21 percent increase over the 1990 population (Nevada State Demographer 1995).

Elko County's population grew at an even faster pace than the state (95.6 percent) during the 1980-90 period, increasing from 17,269 in 1980 to 33,770 in 1990. Renewed exploration and mining activities along the Carlin Trend accounted for most of the population increase. The 1994 estimated population of Elko County was 41,050, approximately 21 percent higher than the 1990 population (Nevada State Demographer 1995).

During the 1980-90 period, the city of Elko increased by 68.3 percent to 14,736, the city of Carlin by 80.2 percent to 2,220, and the community of Spring Creek by 193 percent to 5,866.

Demographic characteristics of Carlin differed slightly from those of Elko County, Elko, and Spring Creek (**Table 3-23**). Carlin had a higher percentage of males, more residents in the 18- to 44-year-old age category, fewer residents 25 years old and older with more than a high school education, and fewer family households (U.S. Bureau of the Census 1991). These differences could be due to a larger population of miners in Carlin than in the other communities.

The Elko Band Colony, situated within the Elko city limits, increased from 844 in 1991 to 1,158 in 1993 (Bureau of Indian Affairs 1993, 1995). As of March 30, 1995 there were 1,306 enrolled members of the Elko Band Colony, with 512 people residing within the Colony and the remaining 794 residing in or around Elko or elsewhere in the United States (Gonzales Sr. 1995). In 1993, 27 percent of the Colony residents were under 16 years of age, 66 percent were between 16 and 64 years old, and 7 percent were 65 years and older (Bureau of Indian Affairs 1995).

The population of Nevada is forecasted to continue its upward trend, increasing to an estimated 3,013,820 by 2015. Similarly, Elko County is expected to continue to grow, increasing to an estimated 72,035 people by 2015. The high and low population forecast scenarios by year 2015 in Elko County are 87,381 and 47,434, respectively, based primarily on the gain or loss of jobs in the mining industry (Nevada State Demographer 1995).

Community Service Providers

Education

There are seven elementary schools in the socioeconomic study area (Elko County School District) serving kindergarten through grade 6. Four elementary schools are located in Elko (Elko Grammar School #2, Mountain View, Northside, and Southside), two in Spring Creek (Sage and Spring Creek), and one in Carlin. Elko Junior High School serves grades 7 and 8, while Elko High School provides education to students in grades 9 through 12. Spring Creek High School opened in school year 1993-94 for students in grades 7 through 10, with 11th and 12th grade students attending school at Elko High School. In school year 1994-95, Spring Creek High School added students in grade 11 and, by school year 1995-96, the school will provide education to grades 7 through 12. Carlin High School serves students enrolled in grades 7 through 12. Private educational facilities include the Ruby Mountain Christian School in Spring Creek and the Christian Academy of Elko.

The Elko County School District reported an increase of 2,800 students between 1986 and 1990, of which 2,100 were housed in portable classrooms. The increase was attributable to employment associated with extensive mining activity in the Carlin Trend (Nevada Department of Education, Planning, Research, and Evaluation Branch, no date). The trend toward use of modular classrooms continues in order to meet the ever-increasing demand for classroom space. Numbers of modular units currently used are: Mountain View Elementary, 8; Northside Elementary, 2; Southside Elementary, 4; Sage Elementary, 12; Spring Creek Elementary, 2; Elko Junior High, 8; Elko High School, 2; Spring Creek High School, 4; and Carlin Schools, 2. Elko Grammar School #2, the oldest school in Elko, is in an area of no growth; therefore, no modular units have been or will be added. Plans for constructing additional school facilities include Clover Hills Elementary (Elko) in fall 1998, serving kindergarten through grade 6; Bullion Elementary (Elko) in fall 1999, serving kindergarten through grade 6; and Spring Creek Junior High in fall 1997, serving grades 7 and 8 (Bandera 1995). Sage Elementary, an all-modular campus, also will add another modular unit to house 60 students in June of 1995.

TABLE 3-23
Demographic Characteristics -
Elko County and Cities of Elko, Spring Creek, and Carlin (1990)

Characteristic	Elko County	City of Elko	Community of Spring Creek	City of Carlin
Total Population	33,530	14,736	5,866	2,220
Urban	61.8%	100.0%	100.0%	0.0%
Rural	38.2%	0.0%	0.0%	100.0%
Gender	33,530	14,736	5,866	2,220
Female	46.8%	47.7%	48.4%	42.9%
Male	53.2%	52.3%	51.6%	57.1%
Age	33,530	14,736	5,866	2,220
<5 years	9.6%	9.5%	10.8%	7.1%
5 to 17 years	22.6%	21.1%	25.6%	20.5%
18 to 44 years	45.1%	45.4%	45.6%	59.9%
45 to 64 years	16.6%	16.2%	14.9%	6.8%
65+ years	6.1%	7.8%	3.1%	5.6%
Median age	29.4 years	30.0 years	28.5 years	30.7 years
Ethnicity	33,530	14,736	5,866	2,220
White	86.4%	89.2%	96.1%	93.1%
Native American, Eskimo or Aleut	6.3%	2.7%	0.7%	1.7%
Other	7.2%	8.0%	3.2%	5.3%
Educational Attainment (25+ Years of Age)	19,516	8,827	3,339	1,388
Less than 12th grade	21.5%	21.3%	14.4%	24.4%
High school graduate	34.1%	30.6%	34.1%	48.4%
Some college	23.3%	24.0%	26.3%	17.6%
Associate degree	7.8%	8.3%	8.9%	5.7%
Bachelor's degree	9.8%	11.0%	13.1%	2.9%
Grad./prof. degree	3.5%	4.7%	3.2%	1.0%
Households	11,777	5,419	1,811	799
Family households	72.1%	68.9%	86.5%	67.2%
Non-family households	27.9%	31.1%	13.5%	32.8%
Persons/household	2.79	2.69	3.24	2.61

Source: U.S. Dept. of Commerce, Bureau of the Census, 1991.

Table 3-24 presents the 1994-95 school enrollment and enrollment capacity of each school in the study area. Although most of the schools are near or over enrollment capacity, there are no grades in which the number of students per teacher exceeds the State of Nevada recommendations for student/teacher ratios. Administrators feel the school district has adequate teaching staff to provide students with the quality of education expected by the community (Bandera 1995). The primary problem of the school district, classroom space, has been temporarily solved by the addition of modular classroom units and the opening of Spring Creek High School. These actions have somewhat alleviated the overcrowded conditions of Elko Junior High and Senior High schools.

Education of children in kindergarten through grade 12 from the Elko Band Colony is provided through the Elko County School District. A Headstart Program is housed and operated at the Colony for children between the ages of 3 and 5, and a 5-week summer school for school-aged

TABLE 3-24 Elko County School District Enrollment and Capacity (School Year 1994-95)		
School	1994-95 School Enrollment	Enrollment Capacity
Carlin Elementary (K-6)	294	300
Elko Grammar #2 (K-6)	499	600
Mountain View Elementary (K-6)	1,011	750
Northside Elementary (K-6)	472	500
Sage Elementary (K-6)	638	750*
Southside Elementary (K-6)	651	600
Spring Creek Elementary (K-6)	685	600
Elko Junior High (7-8)	685	750
Carlin High (7-12)	277	350
Elko High (9-12)	1,344	1,300
Spring Creek High (7-11)	848	850

* Sage Elementary School in Spring Creek is an all-modular campus; however, enrollment should not exceed 750 even by adding more modular units.

Source: Nevada Dept. of Education, 1995; Bandera 1995.

Indian children is held at the Colony through the Elko County School District. Under contract with the BIA, the Elko Band Council provides higher education and an adult vocational program at the Colony (Gonzales Sr. 1995).

Law Enforcement

The Nevada Highway Patrol, Elko County Sheriff's Department, Elko City Police, Carlin City Police, and BIA Police provide law enforcement services to community residents. The highway patrol is responsible for law enforcement on state highway systems, while the sheriff's department is accountable for Elko County including the unincorporated towns (17,200 square miles). The Elko City Police is restricted to the Elko city limits (10 square miles), and the Carlin Police is responsible for Carlin city limits (9 square miles). The BIA Police is accountable for law enforcement at the Elko Band Colony. Law enforcement agencies within the socioeconomic study area are, in general, understaffed and in need of replacement patrol cars to adequately meet the increased demand for services (Harris 1995; Songer 1995; Stokes 1995).

The most frequently committed crimes in the study area include domestic violence, alcohol-related offenses, burglary, illegal drugs, and larceny (Harris 1995; Songer 1995; Stokes 1995). Between 1981 and 1994, the number of crimes in Elko County increased from 640 crimes in 1981 to 1,851 in 1990, then decreased to 1,611 in 1994. The number of patrol miles traveled by Elko County Sheriff's Department officers also increased during this period, from 263,263 miles in 1981 to 549,888 miles in 1994 (Harris 1995).

The Elko County Jail, operated by the sheriff's department, was constructed in 1987. The jail can house 106 adult male and 16 adult female prisoners. The average daily jail population in 1994 was 72 prisoners (Harris 1995).

Fire Protection

Fire protection in the socioeconomic study area is provided by the Elko Fire Department, Carlin Fire Department (a combined fire, ambulance, and rescue department), BLM, and the Northeastern Fire Protection Department of the Nevada Division of Forestry. The Elko and Carlin fire departments primarily serve residents within their respective city limits including the Elko Band Colony. However, both fire departments maintain mutual aid/cooperative agreements with other firefighting agencies such as the Nevada Division of Forestry, BIA, and BLM (Cash 1995; Johnston 1995). BLM is primarily responsible for fighting wildland fires.

The Elko Fire Department employs 18 firefighters who are also trained emergency medical technicians (EMTs) along with a 21-member volunteer firefighting unit administered by the Northeastern Fire Protection District. The fire department responds to an estimated 1,115 calls per year. Approximately two-thirds of the calls are for medical assistance and one-third are public assistance, fire, and gas spill calls. To meet the increased demand for fire protection in Elko, more firefighters and another fire engine are needed (Cash 1995).

The Northeastern Fire Protection District also administers fire protection for areas outside of the city limits and provides back-up services to city fire departments in Elko County. The district provides support through training, equipment, and funding (McCarty 1995). In the community of Spring Creek, the Fire Protection District has a three-member paid fire department. Spring Creek also has a 25-member volunteer fire department.

The Carlin Fire Department responded to approximately 300 calls in 1994 and is first to respond to fire calls from mines in the Carlin Trend (Johnston 1995). Twenty-one percent of the 23 firefighters are trained EMTs. The department has a sufficient number of firefighters to provide the service area with adequate fire protection if all of its volunteer members were active. Some firefighting vehicles and equipment are getting old and should be replaced. The firehall houses not only the fire department, but also the ambulance service and rescue team emergency vehicles, making it difficult to respond to a fire or medical emergency without moving vehicles. The crowded nature of the firehall increases the response time (Johnston 1995).

Insurance Services Office (ISO) Commercial Risk Services, Inc. inspects the adequacy of fire departments nationwide to determine ratings for property covered by insurance companies. On an ISO rating scale from 1 to 10, with class 1 being the highest rating and 10 being virtually unprotected, the Elko Fire Department has a split class rating of 5/9. Residences or businesses within 1,000 feet from a fire hydrant have a class 5 fire protection rating, while residences or businesses more than 1,000 feet from a fire hydrant have a class 9 rating. Carlin Fire Department has a class 6 fire protection rating (Kepler 1995).

Ambulance Services

The 34-member volunteer Elko County Ambulance Service operates out of Elko General Hospital. Thirty of the members are EMTs, four are EMT-IIs (qualifying them to operate defibrillator equipment), and five have received training in emergency mine rescue (Webb 1995). The ambulance service is adequately covered by the number of volunteers; however, when special events take place, more volunteers are needed.

The Elko County Ambulance Service is operated and financed through county funding and fees for service. The three emergency vehicles provided by the service are sufficient to serve the area and are in good working condition. No fixed-wing ambulance aircraft is available in Elko; however, aircraft from Salt Lake City or Reno are used to transport patients in need of specialized services (Webb 1995).

The Carlin Ambulance Service is a city-run operation, financed by the city and through fees for service. The 30 volunteers also serve as firefighters and as the rescue team for their service area, including the mines in the Carlin Trend. The EMTs have been trained in both underground and surface emergency mine rescue. No emergency aircraft are available in Carlin; however, aircraft from Salt Lake City and Reno are used to transport patients. Added to the response time required for aircraft to fly to and from Salt Lake City or Reno is refueling in Elko before returning (Johnston 1995).

Newmont and Barrick also maintain ambulances, EMTs, first responders, and firefighters at mine sites throughout the Carlin Trend.

Health Care

Elko General Hospital, the only licensed hospital within Elko County, has 50 beds, an adequate number to meet the public's needs. The hospital employs 272 workers: 6 physicians, 79 registered nurses, 7 licensed practical nurses, 13 certified nursing assistants, 6 ward clerks, 17 administrative personnel, and 144 "other" staff (Rieger 1995). In addition to the 6 employed physicians on staff, approximately 20 physicians with a variety of specialties have hospital privileges to provide medical care at the hospital. Specialties of the physicians include family practice, pediatrics, internal medicine, general surgery, orthopedic surgery, ophthalmology, and obstetrics/gynecology. Although the hospital staff is currently adequate to meet the health-care demands of the community, the Elko area has been designated by the State of Nevada as medically underserved and the hospital is still actively recruiting physicians (Rieger 1995).

The hospital offers full surgical and medical services and provides a full-service laboratory, intensive care unit, physical therapy, respiratory therapy, an obstetrics unit, a 24-hour emergency room, and diagnostic imaging including CATSCAN, MRI, mammography, and fluoroscopy. Since it is a community hospital, Elko General receives no tax revenues, except $30,000 in ad valorem for capital expenditures. The increased growth in the community due to mining exploration and operations has been positive for business; however, capital is needed for upgrade of equipment and expansion of the facility (Rieger 1995).

The Elko Clinic offers health-care services in family practice, pediatrics, internal medicine, obstetrics/gynecology, general surgery, urology, cardiology, pathology, and ears, nose, and throat. The clinic maintains a laboratory, pharmacy, radiology department, mammography unit, urgent care walk-in unit (not trauma cases), immunization unit, ultrasound equipment, and occupational health services. Currently, the clinic employs 12 physicians, 8 registered nurses, 8 licensed practical nurses, 12 certified nursing assistants, 3 nurse practitioners, 1 midwife, and 30 administrative personnel. All clinic staff have medical privileges at the Elko General Hospital (Smith, B. 1995).

"Established" patients of the Elko Clinic usually can get an appointment to visit a health-care provider within 24 hours; however, the provider may not be necessarily of the patient's choice. To meet the health-care demands of the community, the clinic is actively recruiting more staff, including primary care physicians and midlevels. An ambulatory surgery/urgent care/imaging center is planned for construction in 1995-96 to treat more health problems in an outpatient setting, which is more convenient and less costly for patients (Smith, B. 1995).

In addition to the Elko Clinic, a number of physicians are engaged in private practice in Elko. In Spring Creek, the only practicing physician specializes in pediatrics. Carlin Medical Care Center is a full-service, walk-in health-care facility. The medical care center employs five physicians from Elko, who rotate their working shifts so that one doctor is at the clinic 3 days a week. They specialize in emergency care and family practice.

Approximately 15 dentists offer dental services in Elko and one dentist offers family dental care in the community of Spring Creek. No dental services are available in Carlin. Eye care in the Elko area is provided by five optometrists/ophthalmologists. In addition to services provided by private mental health counselors, mental health services in the Elko area are offered by the Elko Mental Health Center and the Charter Counseling Center of Northeastern Nevada.

Elko General Hospital, under contract with Indian Health Service (IHS), provides medical care and emergency services to Native Americans. In addition, comprehensive medical care through IHS is provided at the Elko Band Colony by the Health Center which opened in July of 1992. The center houses a pharmacy, a two-chair dental operatory with a laboratory, and other support services such as a community health nurse, alcohol/drug prevention programs, and after-care programs (Gonzales Sr. 1995).

Public Assistance

Public assistance in Elko County is provided by Elko County Human Services and the Nevada Welfare Department. Friends in Service Helping also provides emergency and temporary food assistance and one-time utility assistance (Underwood 1995).

Services provided by Elko County Human Services include assistance with rent, utilities, transportation, groceries, and meals. Three staff (administrator, eligibility specialist, and administrative secretary) dispense the following services on a monthly basis: rent/utility assistance to approximately 30 to 35 people; grocery/meal assistance to 15 to 20 people; transportation assistance to 15 to 20 people; and medical/prescription assistance to 30 to 35 people. In addition to the clients listed above, an estimated 50 people a month inquire about public assistance and are referred to other agencies. The current number of staff is adequate to dispense these services; however, if the number of persons requiring assistance were to double, additional staff may be required (Underwood 1995).

The Nevada Welfare Department offers food stamps, Medicaid, Aid to Families with Dependent Children (AFDC), elder and child protection services, the MOM Program (a nurse who works with high-risk mothers), and food supplements to pregnant women and women with infants (WIC). Average monthly caseload is approximately 1,500 for all programs. The department is staffed by a director, five eligibility technicians, one social worker, two nurses, one investigator, and three secretaries. Because it is understaffed, the department has asked the 1995 Nevada Legislature to fund two more employees (Adams 1995).

The Elko Band Council, under contract with the BIA, provides eligible Native Americans with general welfare assistance, adult institutional care, Indian child welfare (including foster care and institutional placements), indigent burial assistance, counseling services, and assistance with social security benefits, disability benefits, death benefits, and state Medicare and Medicaid benefits. The Elko Band Council operates two nutrition programs at the Colony -- an Elders Nutritional Program and the Summer Food Service Program for Children (Gonzales Sr. 1995).

Water Supply

Elko city water is obtained from 18 deep-water wells. The maximum flow capacity of the system is 12 to 13 million gallons per day (mgpd), with peak summer usage of 12.5 mgpd and low January usage of 3 mgpd. Water is stored in eight storage tanks (five 3-million-gallon tanks, two 1.5-million-gallon tanks, and one 1-million-gallon tank). Although the existing system can support an additional 2,600 service connections, continued population growth would require system expansion (Vega 1995).

Natural springs and a deep well provide the city of Carlin with its public water supply. Water is stored in a 2-million-gallon tank. The system has a peak flow capacity of 980 gallons per minute (gpm), with an average flow of 450 gpm. The system currently serves 2,470 people, and has the capability to support an additional 5,000 people without expansion (Aiazzi 1995).

Seven wells located throughout the community of Spring Creek provide public water to these residents. Water is retained in six storage tanks. To comply with the Nevada Public Service Commission (PSC), Spring Creek Utilities will begin to install an additional 206 fire hydrants in 1996 to ensure adequate water for firefighting purposes. No water shortages for Spring Creek were reported during the summer of 1995 (Wiley 1995).

Wastewater Treatment Facilities

The Elko wastewater treatment facility is a "fixed-film" biological sewage plant constructed in 1983. The facility is near its designed capacity (3.3 mgpd) and is experiencing difficulty with winter effluent disposal. Peak usage of the system is at 3.2 mgpd, average usage is 2.47 mgpd, and minimum usage is 1.15 mgpd. The system currently serves an estimated 19,000 people, and cannot handle additional hookups without expansion (Williams 1995). NDEP issued a moratorium on new housing developments until the city has a plan in place to solve the winter disposal problem (Elko Daily Free Press 1995a). A possible long-term solution to the problem -- construction of a wastewater storage dam or treatment plant -- would cost an estimated $10 million (Williams 1995). Waste water treatment in Spring Creek consists of individual septic systems.

The Carlin wastewater treatment facility consists of two lagoons with a reservoir and rapid-infiltration basins. The designed operating capacity is 500,000 gallons per day; peak usage is 450,000 gpd and average usage is 350,000 gpd. The system currently serves approximately 2,470 people, and could serve an additional 5,000 without expansion (Aiazzi 1995).

Solid Waste

The city of Elko made application and has been approved for a regional landfill. Since October 1995, the entire county has been using the Elko landfill, which has a useful life of 30 years (Dodson 1995).

Housing

Housing in the Elko area continues to be difficult to find and expensive; however, new home construction is increasing to meet the demands. Major residential construction projects include up to eight four-plex rental houses in Spring Creek (Elko Daily Free Press 1995b) and three residential developments with a potential of 2,300 home sites in Elko (Elko Daily Free Press 1995c).

During 1994, Elko County experienced the third most vigorous year in county history in issuance of building permits (Elko County Free Press 1995d). Elko city building permits for construction in 1994 were valued at $20.9 million, twice the amount in 1993. The valuation of building permits in March 1995 was more than $7 million ($4,615,000 attributable to the new Walmart store), a 580 percent increase over March 1993 (Elko Daily Free Press 1995e). In Carlin, building permits increased in value from $522,665 in 1993 to $7,830,525 in 1994 (Elko Daily Free Press 1995f).

The Elko County Board of Realtors reported the average price of a three-bedroom home in Elko as $108,000 and in Spring Creek as $91,490. Complicating the affordability of housing, the Federal Housing Authority (FHA) will not loan more than $95,000 on a home in the Elko area (Elko Daily Free Press 1995b).

In 1990, there were 5,817 housing units in the city of Elko, of which 5,419 were occupied. Of the 5,419 occupied housing units, 61 percent were owner-occupied and 39 percent were renter-occupied. Fifty-one percent of the housing units were one-unit structures, 12 percent were two to four units, 10 percent were five or more units, and 27 percent were "other," including mobile homes (U.S. Bureau of the Census 1991).

In the unincorporated community of Spring Creek, there were 1,914 housing units in 1990, 86 percent owner- occupied and 14 percent renter-occupied. Forty percent of the housing units were one-unit structures, 2 percent were two- to four-unit structures, and 58 percent were "other," including mobile homes (U.S. Bureau of the Census 1991).

In the city of Carlin, 71 percent of the 888 housing units were owner-occupied and 29 percent were renter- occupied in 1990. Of these units, 42 percent were one-unit structures, 6 percent were two or more units, and 52 percent were "other," including mobile homes (U.S. Bureau of the Census 1991).

In 1995, there were 1,669 mobile home spaces in Elko County with 86.6 percent renter-occupied, 1.7 percent vacant, and 11.6 percent owned. Of the total number of spaces in Elko County, 56.9 percent were in Elko, 7.6 percent were in Carlin, and 35.5 percent were in other communities. In Elko, 92.2 percent of the 949 mobile home spaces were renter-occupied, 1.1 percent were vacant, and 6.7 percent were owned. In Carlin, 70.1 percent of the 127 spaces were renter-occupied, none were vacant, and 29.9 percent were owned (Nevada Department of Commerce 1995).

Housing is limited at the Elko Band Colony. There are 221 single-family housing units and a senior citizens/handicapped apartment complex with 10 apartments. Construction of 32 new rental units at the Colony has been approved; however, no date has been set for start of construction (Gonzales Sr. 1995).

Government and Public Finance

Major governing bodies in Elko County are the Elko County Commissioners, the Elko County Planning Commission, the Elko County School District, the city of Elko, the city of Carlin, and the Tribal Council of the Elko Band Colony - Te-Moak Tribe of the Western Shoshone Indians. Funds for community services and maintenance of the county are administered by the five elected Elko County Commissioners. The Elko County School District, governed by an elected board, administers the largest portion of the Elko County annual budget. The cities of Elko and Carlin are each governed by a mayor and council which administer funds for community services (e.g., water, sewer, streets, law enforcement, fire protection, parks, and recreation). The Te-Moak Tribe of the Western Shoshone Indians is comprised of four Bands: Elko Band Council, Battle Mountain Band Council, Southfork Band Council, and Wells Band Council. The Te-Moak Tribal Council (the parent council) is comprised of council members who are representatives of each of the four bands (Gonzales Sr. 1995).

The minerals industry is the only industry in Nevada that pays taxes to state and local governments on the basis of net proceeds. Mineral producers are allowed to deduct direct costs of production, such as mining and milling, and are taxed on the remaining amount (Nevada Department of Minerals 1991). All Nevada businesses pay sales and use taxes based on the purchase of goods.

Total assessed valuation of property collected by the state for Eureka and Elko counties for fiscal year (FY) 1993-94 was $607,638,851 and $666,876,740, respectively. In Eureka County, $300,789,523 of this amount was attributable to net proceeds of minerals tax, while in Elko County, $24,670,283 was attributable to net proceeds of minerals tax.

In FY 1994-95, net proceeds of minerals tax in Eureka County increased to $355 million and is projected to increase to $389 million in FY 1995-96. Net proceeds of minerals tax in Elko County remained stable in FY 1994-95 at $24 million, but is projected to increase to $30 million in FY 1995-96 (Glazner 1995). In 1994, Newmont Gold Company's taxes on the North Operations Area totalled $6,130,000, of which $900,000 was property tax, $5,000,000 was sales tax, and $230,000 was net proceeds of minerals tax (Conger 1995b).

The biggest share of FY 1993-94 revenues for Elko County, 52.5 percent, came from intergovernmental transfers from federal, state, and local sources (**Table 3-25**). Property taxes provided about 21 percent of Elko County revenues followed by miscellaneous (9.9 percent), charges for services (8.4 percent), fines and forfeitures (4.7 percent), and licenses, fees, and permits (3.3 percent). The majority of the expenditures were for public safety (24.1 percent), public works (21.7 percent), and general government (20.3 percent). Expenditures exceeded revenues in FY 1993-94 by $1,098,304 (Nevada Department of Taxation, Local Government Finance 1995).

Approximately 55 percent of Eureka County revenues was derived from intergovernmental transfers in FY 1993-94, followed by property taxes (36.9 percent) and charges for services (4.3 percent). The largest expenditures were for

TABLE 3-25
Revenues and Expenditures -
Elko and Eureka Counties and Cities of Elko and Carlin
(Year Ending June 30, 1994)

Revenues/ Expenditures	Elko County	% of Total	City of Elko	% of Total	City of Carlin	% of Total	Eureka County	% of Total
Revenues								
Property taxes	$ 4,412,350	21.2%	$ 1,061,236	11.9%	$ 192,135	14.8%	$ 5,223,478	36.9%
Licenses, permits, fees	675,855	3.3%	783,281	9.6%	56,625	4.4%	15,332	0.1%
Intergovernmental transfers	10,904,759	52.5%	6,844,642	62.3%	861,491	66.7%	7,802,375	55.1%
Charges for services	1,748,480	8.4%	1,164,169	6.1%	34,334	2.7%	608,944	4.3%
Fines & forfeitures	974,485	8.4%	172,711	1.6%	26,253	2.0%	86,419	0.6%
Miscellaneous	2,058,226	9.9%	1,698,362	9.6%	121,223	9.4%	430,089	3.0%
Total Revenues	**$20,774,155**		**$11,725,021**		**$1,292,061**		**$14,166,637**	
Expenditures								
General government	$ 4,444,471	20.3%	$ 840,828	6.3%	$ 277,063	21.7%	$ 2,966,771	28.1%
Judicial	3,370,458	15.4%	68,534	0.5%	--	--	500,137	4.7%
Public safety	5,270,704	24.1%	4,213,809	31.6%	423,476	33.2%	1,261,046	11.9%
Public works	4,743,135	21.7%	2,589,507	19.4%	--	--	2,499,450	23.7%
Intergovernmental	132,607	0.6%	965,767	7.2%	--	--	1,968,441	18.6%
Welfare	922,013	4.2%	10,178	0.1%	--	--	--	--
Culture & recreation	1,514,745	6.9%	1,492,374	11.2%	178,454	14.0%	700,984	6.6%
Miscellaneous	443,026	2.0%	2,470,154	18.5%	358,527	28.1%	603,115	5.7%
Debt service	1,031,300	4.7%	685,469	5.1%	38,572	3.0%	61,623	0.6%
Total Expenditures	$21,872,459		$13,336,620		$1,276,092		$10,561,567	
Excess (Deficiency) of Revenues Over Expenditures	**($ 1,098,304)**		**($1,611,599)**		**$ 15,969**		**$ 3,605,070**	

Source: Nevada Dept. of Taxation, Local Government Finance, Carson City, Nevada. 1995.

general government (28.1 percent), public works (23.7 percent), and intergovernmental transfers (18.6 percent). Revenues exceeded expenditures by $3,605,070 in FY 1993-94 (Nevada Department of Taxation, Local Government Finance, 1995).

Eureka County receives more revenues from property taxes than Elko County, primarily because of extensive mining development in Eureka County (**Table 3-25**). Many Elko County officials and residents consider the lack of sharing of Eureka County taxes with Elko County, where many of the mining families reside, a fiscal constraint and an inequitable distribution of tax revenues (University of Nevada, College of Human and Community Services 1991).

Intergovernmental transfers accounted for the largest share of revenues for the cities of Elko (62.3 percent) and Carlin (66.7 percent) in FY 1993-94 (**Table 3-25**). Public safety accounted for approximately one-third of total expenditures in both city governments. In Elko, expenditures exceeded revenues by $1,611,599, while in Carlin revenues exceeded expenditures by $15,969 (Nevada Department of Taxation, Local Government Finance 1995).

Employment

Employment in Nevada in 1994 was dominated by service industries, which accounted for approximately 44 percent of the state's jobs (**Table 3-26**). Wholesale and retail trade, the next largest employment sector, provided about 20 percent of jobs statewide. Almost 2 percent of jobs were in the mining industry (Nevada Department of Employment, Employment Security Research, no date).

TABLE 3-26
Average Annual Employment[1] By Major Industry - State of Nevada and Elko and Eureka Counties

Industry	1991	1992	1993	1994	% Change (1993-93)
State of Nevada					
Mining	13,345	12,938	12,600	12,300	-2.4%
Construction	39,822	39,213	46,900	55,000	+17.3%
Manufacturing	25,879	26,141	29,500	33,600	+13.9%
Transportation, communications, & public utilities	31,922	32,097	35,000	37,800	+8.0%
Wholesale & retail trade	127,831	129,771	132,800	144,100	+8.5%
Finance, insurance, & real estate	29,017	28,938	31,000	34,100	+10.0%
Service industries[2]	277,321	282,666	295,000	327,600	+11.1%
Government	81,125	85,347	88,600	92,200	+4.1%
All industries[3]	626,261	637,108	671,400	736,700	+9.7%
Elko County					
Mining	1,400	1,393	1,330	1,240	-6.8
Construction	1,050	815	890	990	+11.2%
Manufacturing	161	159	160	180	+12.5%
Transportation, communications, & public utilities	168	461	730	770	+5.5%
Wholesale & retail trade	2,907	3,006	3,070	3,260	+6.2%
Finance, insurance, & real estate	368	325	330	370	+12.1%
Service Industries[2]	6,510	6,867	6,920	7,230	+4.5%
Government	2,722	2,914	2,860	3,060	+7.0%
All Industries[3]	15,582	15,940	16,290	17,090	+4.9%
Eureka County					
Mining	3,510	3,637	3,910	3,780	-3.3%
Construction	168	282	200	750	+275.0%
Manufacturing; transportation, communications, & public utilities; finance, insurance, & real estate	31	10	20	20	No Change
Wholesale & retail trade	53	59	70	80	+14.3%
Service industries[2]	168	152	30	30	No Change
Government	180	186	200	230	+15.0%
All Industries[3]	4,106	4,326	4,440	4,890	+10.1%

[1] Includes firms that are covered under the provisions of Chapter 612 of the Nevada Revised Statutes on Unemployment Compensation.
[2] Includes agricultural services and firms not elsewhere classified.
[3] Totals may be slightly different when adding columns due to rounding.
Source: Nevada Dept.of Employment, Employment Security Research, no date.

The mining industry has always been and continues to be important to the economic well-being of Nevada. Over the years, Nevada has led the nation in the production of gold, silver, and barite. In addition to direct employment created by the mining industry, it is estimated that for every job in the mining industry, at least 1.25 indirect jobs are created in the state economy. This indirect employment is associated with goods and services needed by the mining industry and the spending of mining payrolls in the local economy. It is further estimated that indirect employment as a result of mining accounts for 0.75 jobs in the local economy and 0.5 jobs in the metropolitan economies (Clark and Washoe counties) of Nevada. Using the employment multiplier of 1.25 for indirect jobs and the Nevada 1994 mining employment total of 12,300, an estimated 15,375 indirect jobs were created in the state as a result of mining (Dobra 1988, 1989; Dobra and Thomas 1992, Nevada Department of Business and Industry, Division of Minerals 1995).

Elko and Eureka counties contribute substantially to Nevada's overall mining employment; collectively, mining jobs in Elko and Eureka counties made up 40.8 percent of the state's mining jobs in 1994 (Nevada Department of Employment, Employment Security Research, no date). In 1994, 7 percent of the 17,090 jobs in Elko County were in mining, compared with 77 percent of the 4,890 jobs in Eureka County (**Table 3-26**). It should be noted, however, that employment numbers collected and reported by the Nevada Department of Employment represent where jobs are located and not necessarily where employees live.

The mining boom along the Carlin Trend, primarily in Eureka County, has greatly contributed to increased commuting between Elko and Eureka counties (i.e., Elko County residents traveling to Eureka County for work). Although there are no known sources of data on commuting patterns between the two counties, the data presented in **Table 3-27** indicates that approximately 81 percent of the people who work in Eureka County commute to work from other areas of the state or outside of the state (i.e., 4,890 jobs in Eureka County with a labor force of only 920). To further evaluate the premise that many workers who live in Elko County work in Eureka County, a survey of mining developments in Elko and Eureka counties was conducted by Northwest Resource Consultants in 1995 (**Table 3-28**). The survey results showed that of the 3,704 mining employees in Eureka County, 96 percent reside in Elko County.

In 1994, the largest employer in Elko County was the service industries sector, representing 42 percent of the jobs in the county (**Table 3-26**). This was followed by the wholesale and retail trade sector (19 percent) and government (18 percent). In 1994, the unemployment rate for Elko County was 6.4 percent (**Table 3-29**), lower than the 1993 rate of 7.1 percent, but slightly higher than the 1994 statewide unemployment rate of 6.2 percent (Nevada Department of Employment, Employment Security Research 1995).

The major employer in Eureka County in 1994 was the mining industry (77 percent), followed by the construction sector (15 percent) and government (5 percent) (**Table 3-26**). The 1994 unemployment rate for Eureka County was 9.5 percent (**Table 3-29**), higher than the 1993 rate of 7.3 percent and the 1994 statewide unemployment rate of 6.2 percent (Nevada Department of Employment, Employment Security Research 1995). The high unemployment rate in Eureka County of 9.5 percent and the relatively low number of available labor force (**Table 3-27**) compared with the number of jobs in the county is another indicator that many jobs in the county are held by workers commuting from areas outside the county.

The Elko Band Council, the Te-Moak Tribe, the Te-Moak Housing Authority, the BIA, and the IHS are the basic employers at the Elko Band Colony (Gonzales Sr. 1995). The 1993 unemployment rate was 18 percent for the labor force 16 years of age and older, for those able to and seeking work (Bureau of Indian Affairs 1995).

TABLE 3-27
LABOR FORCE[1] VERSUS NUMBER OF JOBS IN COUNTY - ELKO AND EUREKA COUNTIES (1990-94)

Year	Elko County		Eureka County		Combined - Elko & Eureka Counties	
	Labor Force	Jobs Located in County	Labor Force	Jobs Located in County	Labor Force	Jobs Located in County
1990	17,660	15,130	850	3,890	18,510	19,020
1991	18,080	15,582	870	4,106	18,950	19,688
1992	19,070	15,940	840	4,326	19,910	20,266
1993	19,540	16,580	860	4,518	20,400	21,098
1994	20,070	17,090	920	4,890	20,990	21,980

[1] Labor force includes all people (non-institutionalized and 16 years of age and older) classified as employed or unemployed.

Sources: Columns 2 and 4: Nevada Department of Employment, Training and Rehabilitation, Employment Security Division, Nevada Labor Force Summary Data; Columns 3 and 5: Nevada Department of Employment, Training and Rehabilitation, Employment Security Division, Nevada Employment and Payrolls.

TABLE 3-28
MINING EMPLOYEES' PLACE OF RESIDENCE FOR MINES LOCATED IN ELKO AND EUREKA COUNTIES

Location of Mine by County	Number of Employees	Employees' Place of Residence		
		Elko Co.	Eureka Co.	Other
Elko County	898	741	3	94
Eureka County	3,704	3,569	18	117
Total	4,542	4,310	21	211
% of Total	100.0%	94.9%	0.5%	4.6%

Source: Number of employees and employees' place of residence are based on data provided in October and November 1995 by the following mining companies located within Elko and Eureka counties: Independence Mining Company (Big Springs Project and Jerritt Canyon Joint Venture); Rayrock Mines (Dee Gold Mine); Baroid Drilling Fluids (Rossi Mine and Dunphy Mill); Barrick Gold Corporation (Barrick-Goldstrike Mine); Newmont Gold Company (Newmont Gold Operations); and Atlas Gold Mining Inc. (Gold Bar Mine). Numbers were compiled by Northwest Resource Consultants, Helena, Montana.

TABLE 3-29
LABOR FORCE SUMMARY -
STATE OF NEVADA, ELKO COUNTY, AND EUREKA COUNTY

Labor Force Summary	1991	1992	1993	1994
State of Nevada				
Total Labor Force	693,000	715,000	739,000	779,000
Unemployment	38,000	47,000	53,000	48,000
Unemployment Rate	5.5%	6.6%	7.2%	6.2%
Total Employment	655,000	667,400	686,000	731,000
Elko County				
Total Labor Force	18,080	19,070	19,540	20,070
Unemployment	820	1,090	1,380	1,280
Unemployment Rate	4.5%	5.7%	7.1%	6.4%
Total Employment	17,260	17,980	18,160	18,790
Eureka County				
Total Labor Force	870	840	860	920
Unemployment	40	50	60	90
Unemployment Rate	4.2%	5.6%	7.3%	9.5%
Total Employment	830	790	800	830

Source: Nevada Department of Employment, Training and Rehabilitation, Employment Security Division, Nevada Labor Force Summary Data.

Income

Service industries in Nevada provided approximately 41 percent of the statewide payroll in 1993, while mining provided about 3 percent (Nevada Department of Employment, Employment Security Research, no date). In Elko County, approximately $58.5 million (16 percent) of the total county payroll of $368.9 million came from mining, whereas in Eureka County approximately $179.2 million (92 percent) of the total county payroll of $194.8 million came from mining. In 1994, Newmont's estimated payroll for the North Operations Area was $29 million (Conger 1995b).

Similar to indirect employment induced as a result of the mining industry, for each new payroll dollar in the mining industry, an estimated $1.57 in earnings for other Nevadans is realized in the form of wages and salaries, rents, interest, and business incomes (Dobra 1989). Using the Nevada 1993 total mining payroll of $544,784,114, indirect annual payroll as a result of mining provided an additional $855,311,059 in earnings to the state economy.

Per capita personal income in Nevada in 1992 was $21,648, compared with $19,385 for Elko County and $21,706 for Eureka County (Nevada Department of Administration 1995). In 1993, the annual average wage for people working directly in the mining industry was $43,168 for Nevada, $44,021 in Elko County, and $45,798 in Eureka County (**Table 3-30**). Annual average wage in the mining industry was the highest of all industrial sectors of the state (Nevada Department of Employment, Employment Security Research, no date).

Environmental Justice

Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" directs BLM to assess whether the Proposed Action or alternatives would have disproportionately high and adverse human health or environmental effects on minority and low income populations. Under NEPA, environmental justice is considered a critical element of the human environment. BLM has determined that issues associated with environmental justice would not be affected by the Proposed Action or alternatives.

TABLE 3-30
Average Annual Income[1] By Major Industry -
State of Nevada and Elko and Eureka Counties

Industry	1991	1992	1993	% Change (1991-93)
State of Nevada				
Mining	$38,751	$41,293	$43,168	+11.4%
Construction	$28,709	$30,094	$31,497	+9.7%
Manufacturing	$26,900	$30,588	$28,702	+6.8%
Transportation, communications, & public utilities	$27,544	$29,153	$29,908	+8.6%
Wholesale & retail trade	$17,606	$18,742	$19,033	+8.1%
Finance, insurance, & real estate	$25,082	$27,446	$28,562	+13.9%
Service industries[2]	$24,046	$23,093	$23,838	+13.1%
Government	$28,396	$30,002	$30,927	+6.8%
All industries[3]	$23,080	$24,744	$25,461	+10.3%
Elko County				
Mining	$39,311	$42,529	$44,021	+12.0%
Construction	$28,109	$28,499	$32,338	+15.0%
Manufacturing	$22,025	$23,506	$23,531	+6.8%
Transportation, communications, & public utilities	$24,846	$25,938	$27,238	+9.6%
Wholesale & retail trade	$16,775	$16,729	$17,125	+2.1%
Finance, insurance, & real estate	$18,800	$20,464	$21,407	+13.9%
Service industries[2]	$14,976	$16,031	$17,080	+14.0%
Government	$24,257	$25,279	$26,377	+8.7%
All industries[3]	$20,464	$21,258	$22,249	+6.8%
Eureka County				
Mining	$39,924	$43,349	$45,798	+14.7%
Construction	$34,007	$33,855	$37,764	+11.0%
Manufacturing; transportation, communications, & public utilities; finance, insurance, & real estate	Not Available	$23,278	$32,205	Not Available
Wholesale & retail trade	$11,341	$13,346	$13,789	+21.6%
Service industries[2]	$12,845	$19,696	$17,743	+38.1%
Government	$20,901	$20,404	$23,035	+10.2%
All industries[3]	$37,416	$40,457	$43,116	+15.2%

[1] Includes firms that are covered under the provisions of Chapter 612 of the Nevada Revised Statutes on Unemployment Compensation.
[2] Includes agricultural services and firms not elsewhere classified.
[3] Totals may be slightly different when adding columns due to rounding.

Source: Nevada Dept. of Employment, Employment Security Research, no date.

CHAPTER 4

CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

INTRODUCTION

The anticipated direct and indirect impacts of the proposed Bootstrap Project are discussed in this chapter. Chapter 4 also addresses anticipated irreversible and irretrievable commitments of resources, residual adverse effects, and cumulative effects of the Proposed Action. Alternatives delineated in this chapter are designed to avoid impacts from the Proposed Action. The Proposed Action and alternative selection process are described in Chapter 2. As described in Chapter 3, total proposed disturbance area for the Bootstrap Project is 1,037 acres, and previous disturbance totals 234 acres (total combined disturbance of 1,271 acres).

Operation, implementation of alternatives, closure, and final reclamation of the Bootstrap Project would result in irreversible and irretrievable commitments of resources, residual adverse effects, and cumulative effects. Irreversible commitments are those that cannot be reversed, except over an extremely long period of time. Irretrievable commitments are those that are lost for a period of time. Residual adverse effects are those remaining after implementation of mitigation measures. Cumulative effects result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable actions. Implementing the Proposed Action and alternatives would cause resources to be either consumed, committed, or lost during and after the life of the project. Nonrenewable resources, such as precious metals in the ore, would be irreversibly committed during ore-processing operations.

BLM has reviewed all significant aspects of the Proposed Action and the following alternatives to the Proposed Action: No Action Alternative; Alternative A-1 -- complete backfilling of the Bootstrap/Capstone pit with waste rock from the Tara pit; Alternative A-2 -- partial backfilling of the Bootstrap/Capstone pit with waste rock from the Tara pit; Alternative B -- ore processing at North Area Leach Facility; Alternative C-1 -- off-site power supply associated with the Proposed Action; and Alternative C-2 -- off-site power supply associated with Alternative B.

The Agency Preferred Alternative is Alternative B and C-2. Mitigation measures would be selected from those identified in this section of the EIS. Impacts associated with the Agency Preferred Alternative would include those discussed under the Proposed Action, as reduced or eliminated by mitigation identified in the EIS.

For each resource, potential mitigation and monitoring measures are identified, where necessary, in response to anticipated impacts of the Proposed Action. Mitigation measures discussed for each resource in this chapter have been developed by BLM and are not part of the Bootstrap Project proposal. Mitigation or monitoring measures can be required by BLM as a condition or stipulation of approval and authorization (Record of Decision) of the Plan of Operations.

GEOLOGY AND MINERALS

SUMMARY

The Proposed Action and Alternatives A-1, A-2, B, C-1, and C-2 would have direct impacts on geologic and mineral resources. The impacts would be limited to excavation and relocation of waste rock, processing of ore, and removal of gold. Alternatives A-1 and A-2 (partial and complete backfilling of the Bootstrap/Capstone pit), would not result in the loss of gold reserves because there are no known gold reserves outside the Bootstrap/Capstone pit. Impacts on geology and minerals resulting from implementation of Alternative B and Alternatives C-1 and C-2 would be similar to those of the Proposed Action.

Indirect impacts would involve potential discharge of acidic water from disposal facilities and sulfide-bearing ore stockpiles. Ongoing and proposed waste rock mixing and encapsulation and monitoring programs are expected to adequately mitigate these potential impacts. Potential instability of disposal facilities and pit slopes would be mitigated through proper design and construction.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Geologic and mineral resources within the area affected by the proposed Bootstrap Project would be directly impacted by relocation of approximately 116 million tons of waste rock and 40.2 million tons of processed ore. In addition, approximately 1.13 million ounces of gold would be extracted from the precious-metal resource.

The Proposed Action could create indirect impacts by exposing sulfide material in pit walls to oxygen, and by placement of potentially acid-producing rock in two waste rock disposal areas. Rain and snowmelt infiltrating through waste rock and ore piles could potentially cause an acidic water discharge. To evaluate the acid-producing potential of waste rock and ore, both static and kinetic tests were conducted on rocks from the Bootstrap Project area. Newmont evaluated 484 static tests for the absolute amount of sulfide and carbonate present in a sample and produced estimates of acid neutralization potential (ANP), acid generation potential (AGP) and net acid neutralization potential (NANP = ANP-AGP).

Tables 4-1 and Table 4-2 describe waste rock types to be excavated from the Bootstrap Project and show the tons of waste rock to be mined, source of data, the AGP, ANP, NANP, and potential for acid generation. From **Table 4-1** and **Table 4-2**, a weighted average ANP:AGP can be calculated comparing the various rock types. The oxidized carbonate makes up approximately 70 percent of the waste rock and has a weighted average ANP:AGP ratio of approximately 3,400 (acid-neutralizing rock exceeds acid-generating rock by a ratio of 3,400 to 1). As can be calculated from the table, the remaining 30 percent of the waste rock also has a weighted average ANP:AGP ratio of greater than 1.0. The NDEP (September 14, 1990) criterion for nonacid-producing rock is an ANP:AGP ratio of 1.0 or greater.

Newmont proposes encapsulating acid-producing waste rock with nonacid-producing waste rock (Newmont 1995a). Materials found to be acid producing using the NDEP (September 14, 1990) criterion (ANP:AGP ratio of less than 1) would be selectively placed in waste rock disposal facilities to reduce the potential for acid generation. According to Newmont (Klepfer 1995), none of the material type composites have been determined to be potentially acid producing under the NDEP criterion. Under Newmont's Proposed Action, if any rock is identified to be potentially acid producing, it would be deposited in the interior of the waste rock disposal facility and surrounded with acid-neutralizing material. Potentially acid-producing material would not be placed along outer disposal facility slopes or onto native ground. Reclamation plans for the waste rock disposal facility are described in Chapter 2, Reclamation.

TABLE 4-1
Bootstrap/Capstone Deposit Waste Rock Composition

Material Type	Waste Tons	Data Source[1]	ANP[2]	AGP[3]	NANP[4]	Potential Acid Production[5]
Tertiary-age Carlin Formation	2,795,000	District	20.08	0.05	20.03	No
Oxidized Siliceous	18,301,000	Deposit	13.25	1.37	11.88	No
Oxidized Carbonate	7,419,000	Deposit	193.44	5.47	187.97	No
Sulfidic-Siliceous Refractory	85,000	Deposit	56.15	41.92	14.23	No

[1] Two data sources were used to characterize the waste rock (April 19, 1995):
- Deposit - utilizes data from the deposit.
- District - utilizes data from district-wide mining production data.

[2] ANP = Acid Neutralization Potential (tons $CaCO_3$/1000 tons material).
[3] AGP = Acid Generation Potential (tons $CaCO_3$/1000 tons material).
[4] NANP = Net Acid Neutralization Potential (ANP - AGP).
[5] Newmont's criterion for potentially acid-producing material is a negative NANP; this is the same as NDEP's criterion of ANP:AGP<1.

Source: Klepfer 1995.

TABLE 4-2
Tara Deposit Waste Rock Composition

Material Type	Waste Tons	Data Source[1]	ANP[2]	AGP[3]	NANP[4]	Potential Acid Production[5]
Oxidized Carbonate	77,217,000	Deposit	341.15	0.09	341.06	No
Unoxidized Carbonate	10,183,000	Deposit	295.39	6.46	288.93	No

[1] One data source was used to characterize the waste rock (April 10, 1995):
- Deposit - utilizes data from the deposit.

[2] ANP = Acid Neutralization Potential (tons $CaCO_3$/1,000 tons material).
[3] AGP = Acid Generation Potential (tons $CaCO_3$/1,000 tons material).
[4] NANP = Net Acid Neutralization Potential (ANP - AGP).
[5] Newmont's criterion for potentially acid-producing material is a negative NANP; this is the same as NDEP's criterion of ANP:AGP<1.

Source: Klepfer 1995.

Potential acid production from the Bootstrap/Capstone and Tara pit walls was evaluated by PTI (1995). For the portion of pit wall rock that would be exposed to groundwater during pit lake development, PTI (1995) estimated net acid producing material would make up approximately 5 percent of the Tara pit, 20 percent in the north half of Bootstrap/Capstone, and 16 percent in the south half of Bootstrap/Capstone. Refer to the Water Quantity and Quality section in this chapter for additional information on predicted pit lake water quality.

To assess the overall potential for acid and metals release from bedrock materials at the Bootstrap Project, kinetic oxidation tests (4 humidity cells and 17 oxidation columns) were performed on rock samples under simulated weathering conditions (PTI 1995). Humidity cells were subjected to varying moisture conditions and operated for a 58-week period, while oxidation columns were operated for a 56-week period under controlled humidity conditions. These tests showed that rock from the Bootstrap Project is not potentially acid producing and is not a significant source of metals. However, the tests were only. performed on samples with a net carbonate value (NCV) greater than zero.

In the absence of kinetic tests on material with an NCV of less than zero, whole-rock analyses of wall rock were used to estimate releases from acid-generating rock (PTI 1995). The fraction of each metal released was then estimated from results of humidity cell tests in the Robinson District (PTI 1995). Using USEPA methods, metals from 17 samples were analyzed. Results showed that levels of arsenic, mercury, selenium, and cadmium occur in slightly elevated concentrations in the Tara and Bootstrap/Capstone test materials relative to typical concentrations in other parts of the United States. These levels of metals were multiplied by the fractional releases observed in the Robinson District kinetic tests to estimate metal releases from negative-NCV rocks at the Bootstrap Project. From this analysis, PTI (1995) determined that water collecting in the Tara and Bootstrap/Capstone pits would be of generally good quality and similar to natural surrounding groundwater. For a discussion of pit water quality, see the Water Quantity and Quality Section in this chapter.

Acid water discharge from the project area is not expected because of the abundance of silty limestone host rocks, the arid climate, and acid-neutralizing alluvium and waste rock (see also the Water Quantity and Quality section in this chapter). Other factors that could help mitigate acidic discharges include: 1) construction of low permeability bases beneath the ore stockpiles; 2) encapsulation of sulfide-bearing waste material by nonacid-generating rock; 3) reclamation of waste piles; 4) contouring and placement of waste piles to limit water infiltration; 5) establishing vegetation (reclamation) to limit infiltration; and 6) use of capillary barriers. The ore stockpiles are not expected to exist after mine closure, and thus would have a relatively short time to produce acid drainage.

The design criteria used to ensure stability of the Bootstrap Project facilities are described in Chapter 3, Geology and Minerals. Waste rock disposal facilities, leach pad, and mine pit slopes were designed in accordance with NDEP specifications for wet climate cycles, storm conditions, and earthquakes.

Alternatives A-1, A-2, B, C-1, and C-2

These alternatives would not significantly reduce impacts on geology and mineral resources compared with the Proposed Action. The effect of these alternatives on pit water quality is discussed in Chapter 4, Water Quality and Quantity.

No Action Alternative

The No Action Alternative would avoid potential direct and indirect impacts of the Proposed Action. It would also eliminate the recovery of approximately 1.13 million ounces of gold from the geologic resource.

POTENTIAL MITIGATION AND MONITORING MEASURES

BLM does not propose mitigation or monitoring measures beyond those presently proposed by Newmont for the Bootstrap Project.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Approximately 1.13 million ounces of gold would be removed from the geologic resource if the Proposed Action is implemented.

RESIDUAL ADVERSE EFFECTS

No residual adverse impacts to the geologic resource would be expected from the Proposed Action and mitigation measures.

PALEONTOLOGICAL RESOURCES

SUMMARY

Physical disturbances associated with the Bootstrap Project would potentially result in direct impacts on paleontological resources. Newmont would contact BLM to determine the steps necessary for recovery of vertebrate fossils discovered during mine-related activities. Impacts on paleontological resources resulting from Alternatives A-1, A-2, B, C-1, and C-2 would be the same as those for the Proposed Action. Impacts would be limited to areas of land disturbance.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Paleontological resources in the Bootstrap Project study area could consist of vertebrate, invertebrate, and paleobotanical fossils. Vertebrate fossils are more likely found in Tertiary-age and Quaternary-age sediments, whereas invertebrate fossils are more common in Paleozoic-age sediments. All known fossils in the study area have a relatively broad regional distribution, and are not restricted to the study area or north-central Nevada. No known fossil quarries or vertebrate fossils are located in the area to be physically disturbed by the mine.

Impacts on any fossils that may exist in the proposed disturbed area would usually be direct, caused by physical disturbance. Tertiary-age vertebrate fossils are relatively common in the area, and there would be a likelihood of finding these fossils. Activities that disturb Tertiary-age sediments should be conducted with an awareness that vertebrate fossils may be present.

Alternatives A-1, A-2, B, C-1, and C-2

Impacts on paleontological resources resulting from any of these alternatives would be the same as those described under the Proposed Action. Impacts would be limited to areas of land disturbance.

No Action Alternative

The No Action Alternative would eliminate potential impacts on paleontological resources in areas of proposed development.

POTENTIAL MITIGATION AND MONITORING MEASURES

During mine development or operation, steps should be taken to identify and preserve vertebrate fossils. If vertebrate fossils are discovered, Newmont should contact the BLM to determine the steps necessary for recovery of fossils.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable commitment of paleontological resources would occur as a result of the Proposed Action if fossils are encountered. Invertebrate fossils are fairly common in the study area, but have not been assigned a significance rating by the BLM.

RESIDUAL ADVERSE EFFECTS

No residual adverse effects on paleontological resources are anticipated as a result of the Proposed Action and mitigation measures.

AIR RESOURCES

SUMMARY

Mining-related activities at the Bootstrap Project would be a source for particulate and gaseous pollutants. Particulate emissions would be mitigated by dust suppression and best management practices. Gaseous pollutants would result from blasting and vehicle exhaust emissions. An air quality permit for surface disturbance has been approved by NDEP. Newmont will seek an air permit from NDEP for the ore processing operation and the on-site generators. Alternatives A-1 and A-2 (complete or partial backfilling of Bootstrap/Capstone pit) would result in similar impacts on air resources as the Proposed Action. Alternative B (ore processing at North Area Leach Facility) would result in reduced ore processing, wind erosion, and hydrogen cyanide emissions at the Bootstrap site; however, particulate emissions would increase as a result of greater haul road traffic. Alternatives C-1 and C-2 (off-site power supply) would eliminate the need for on-site diesel-powered generators and, therefore, reduce particulate and gaseous emissions.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Air quality in the project area would be affected by the Bootstrap Project. Other nearby mining and ore-processing operations also affect local air quality. The Bootstrap Project emissions would not affect any Class I areas. Primarily, the Bootstrap operations would be a source of fugitive dust (particulate) and fugitive gaseous emissions.

Particulate Emissions

Particulate emissions from mining and construction would be caused by drilling, blasting, excavating, loading, hauling, and dumping of waste rock and ore. Particulate emissions associated with ore processing would result from crushing, handling, storage of ore, and operation of diesel-powered generators. Measures to reduce particulate emissions include minimizing drop heights during loading, watering and chemical stabilization of haul roads, and use of water spray, water fog, or baghouse fabric particulate control during crushing and ore handling. In addition to particulates resulting from construction, mining, and ore processing, ambient particulates occur in the vicinity of the project area from wind erosion of unvegetated areas, traffic on unpaved roads, agricultural operations, and other sources.

Gaseous Emissions

Natural background levels for gaseous pollutants are low in the Bootstrap Project area with no significant sources. The proposed Bootstrap operations would be a source of gaseous air pollutants including sulfur dioxide, carbon monoxide, oxides of nitrogen, and volatile organic compounds. Sources of these pollutants in the mining operations include vehicle exhaust, emission from ammonium nitrate and fuel oil (ANFO) used as blasting agents, and emissions from diesel-powered electric generators. Estimated emissions from diesel generators required for 3.5 megawatts of power are presented in **Table 4-3**.

In the proposed heap leach process, sodium cyanide solution is maintained at a pH in excess of 9 through use of lime and caustic to facilitate extraction of gold. By maintaining a high pH level during operations, hydrogen cyanide (HCN) emissions from the leach pads would be minimized. Upon mine closure, low concentrations of HCN gas produced during detoxification of the heap leach facility would be slowly released to the atmosphere.

TABLE 4-3 Estimated Emissions From On-Site Power Generation for Proposed Action		
Pollutants	Emission Factor (lb/MMgal)	Emissions (tpy)
Sulfur Dioxide	60	55.50
Carbon Monoxide	130	120.25
Nitrogen Oxides	500	462.50
Particulates	50	46.25

Note: Fuel usage estimated at 1,850,000 gallons per year for 3.5 megawatts of power generation for the Proposed Action.
lb = pound; MMgal = million gallons; tpy = tons per year.

Source: USEPA 1985

Alternatives A-1 and A-2

Implementation of these alternatives would result in similar levels of particulate and gaseous emissions as compared with the Proposed Action. Alternative A-1 would extend the total mine life several years and therefore increase the period of air quality impacts. Disposal of waste rock from the Tara pit in the Bootstrap/Capstone pit would have similar rock roll and dust as disposal in waste rock disposal facilities.

Alternative B

Implementation of this alternative would result in an increase in fugitive dust and vehicle exhaust emissions compared with the Proposed Action as a result of the increased level of haul truck traffic (17 haul trucks per hour) along the 6-mile haul route to the North Area Leach Facility. Ore processing and related emissions would continue at the permitted North Area Leach Facility at existing rates. No additional leach pad construction at this leach facility would be required for Alternative B. There would also be a reduction in wind erosion from exposed areas at the Bootstrap Project and a reduction in potential emissions of HCN from the Bootstrap leach pad.

For Alternative B, on-site power generation would be reduced to under 0.5 megawatts. Estimated emissions from this reduced level of power generation are presented in **Table 4-4**. These emissions are significantly reduced from the on-site power generation that would be required for the Proposed Action (**Table 4-3**).

Alternatives C-1 and C-2

Electrical power would be supplied from an existing off-site powerline for these two alternatives, eliminating the need for on-site power generation using diesel-powered generators and associated emissions. As a result, particulate and gaseous emissions would be reduced and resulting impacts on ambient air quality for particulate and gaseous pollutants would be the lowest for Alternatives C-1 and C-2.

No Action Alternative

The No Action Alternative would eliminate potential impacts of the Proposed Action on air quality.

POTENTIAL MITIGATION AND MONITORING MEASURES

BLM has not developed any mitigation or monitoring measures beyond those presently proposed by Newmont for the Bootstrap Project. Measures to reduce particulate emissions include minimizing drop heights during loading, watering, and chemical stabilization of haul roads, and use of water spray, water fog, or baghouse fabric during crushing and ore handling. The crushing

TABLE 4-4
Estimated Emissions From On-Site Power Generation for Alternative B

Pollutants	Emission Factor (lb/MMgal)	Emissions (tpy)
Sulfur Dioxide	60	9.24
Carbon Monoxide	130	20.02
Nitrogen Oxides	500	77.00
Particulates	50	7.70

Note: Fuel usage estimated at 308,000 gallons per year for 0.5 megawatts of power generation for Alternative B.
lb = pound; MMgal = million gallons; tpy = tons per year.
Source: USEPA 1985.

and conveying operations would be subject to the emission and reporting requirements of the New Source Performance Standards for Metallic Mineral Processing Plants (40 CFR 60.380-386). Emissions from on-site power generation could be reduced through use of catalytic converters or propane fuel. Newmont will seek an air quality permit from NDEP for the ore processing operation and on-site generators. NDEP has approved an air quality permit for surface disturbance. Air quality monitoring in the area would be subject to requirements of the NDEP air quality permit.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No irreversible and irretrievable commitment of air resources would result from the Proposed Action or alternatives.

RESIDUAL ADVERSE EFFECTS

No residual adverse effects on air resources would be anticipated as a result of the Proposed Action or alternatives. After cessation of mining and completion of reclamation activities, air quality would be expected to approach pre-mining conditions.

WATER QUANTITY AND QUALITY

SUMMARY

The Bootstrap Project would not require dewatering or discharge of excess water because the nearby Betze/Post Mine dewatering system has lowered the groundwater table well below the Bootstrap/Capstone and Tara pit bottoms. As a result, impacts on water resources from the Bootstrap Project would be limited primarily to minor increases in sedimentation from disturbed areas and the development of three pit lakes. In addition, the Bootstrap/Capstone pit would extend across a portion of Boulder Creek at the northern end of the project site where a diversion for the creek has been permitted by the USCOE and constructed by Newmont. Groundwater flow in alluvium along Boulder Creek in this area would be intercepted by the mine pit.

Results of a study for the two proposed mine pits show that two separate lakes would develop in the Bootstrap/Capstone pit and a single lake would form in the Tara pit after cessation of mining. Quality of pit lake water is predicted to be similar to natural groundwater because of groundwater throughflow and low potential for net acid generation from the pit wall rock.

Alternatives A-1 and A-2 (complete or partial backfilling of the Bootstrap/Capstone pit) would eliminate two pit lakes and associated evaporation. Groundwater quality within the backfill may be adversely affected during initial saturation of the backfill. Backfill material, however, has a low potential for acid generation and leaching of metals.

Alternative B (ore processing at North Area Leach Facility) would reduce the potential for erosion and sedimentation from disturbed areas because of elimination of the proposed Bootstrap Heap Leach Facility and reduce the amount of water consumption for the Bootstrap Project. Cyanide would not be used at the Bootstrap Project for Alternative B, but cyanide use and water consumption would increase at the North Area Leach Facility.

Alternatives C-1 and C-2 (off-site power supply) would have impacts similar to the Proposed Action.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Surface Water Quantity

The proposed Bootstrap/Capstone and Tara mine pits associated with the Bootstrap Project would be located on Round Mountain, which has small ephemeral channels extending radially from the ridge top. The Bootstrap/Capstone pit would extend across a section of Boulder Creek in the north portion of the project area where a diversion has been constructed to direct the stream away from the proposed pit location (see **Figure 2-5**). This Boulder Creek diversion was previously permitted by the USCOE, and Newmont completed construction of the structure in 1995 (see Chapter 3, Water Quantity and Quality). The diversion relocated approximately 2,800 feet of Boulder Creek channel that would be intercepted by the Bootstrap/Capstone pit.

Two proposed waste rock disposal facilities would be located adjacent to the mine pits on the east flank of Round Mountain. The Tara Waste Rock Disposal Facility and Bootstrap Heap Leach Facility would be located adjacent to Bell Creek. However, these proposed facilities would not directly or indirectly affect flow in the Bell Creek channel and they would be located outside of the projected 100-year floodplain for Bell Creek (see Chapter 3, Water Quantity and Quality).

Diversion ditches would be constructed where necessary to intercept stormwater run-on and run-off, preventing water from entering the pits, waste rock disposal facilities, and leach facility. This water would be handled under the existing stormwater permit issued by the State of Nevada. The stormwater permit requires that best management practices be used to control stormwater discharges.

The two proposed open mine pits would receive water from direct precipitation. During operations, this water would combine with groundwater inflow and be consumed for mine-related purposes (see "Groundwater Quantity" section below). Some evaporation of pit surface water would occur.

The Boulder Creek diversion is designed to meet regulatory criteria. If flow in Boulder Creek were to exceed the design capacity of the diversion structure (i.e., 100-year, 24-hour storm event), surface water would enter the Bootstrap/Capstone pit as flow over the north pit wall. This water would collect in the bottom of the pit and eventually evaporate, infiltrate, and/or be consumed by mine operations. No impacts to existing surface water rights are expected as a result of the Bootstrap Project.

Surface Water Quality

Best management practices at the Bootstrap Project, along with other reclamation activities, would minimize erosion and sedimentation of disturbed areas. Newmont's Storm Water Pollution Prevention Plan (Newmont 1995b) associated with its stormwater permit includes measures that would be implemented to control sediment and erosion. Many of these best management practices are also included in

Newmont's Spill Prevention, Control and Countermeasure Plan (Newmont 1995c). Most of the disturbed areas are located in the Bell Creek drainage. Therefore, some minor increases in sediment load would occur in Bell Creek and possibly Rodeo Creek from surface disturbance in the project area (see Chapter 4, Soil and Watershed, for additional information on erosion and soil loss). As discussed in the Water Quantity and Quality section of Chapter 3, quality of surface water in Rodeo Creek probably has been affected by mine-related disturbances in the Little Boulder Basin.

Some impacts on surface water could occur from mine processing chemicals, including spills of lubricants, fuels, solvents, and cyanide into drainageways. Acid drainage from waste rock disposal facilities could affect surface water quality in the Bell Creek drainage; however, Newmont is implementing several mitigation measures to prevent acid mine drainage from occurring and impacting surface water (see Chapter 4, Geology and Minerals). In addition, surface water in the area of the waste rock and leach facilities flows only during brief periods of heavy precipitation and snowmelt run-off. During these ephemeral surface water flow events, the water would be diverted around mine-related structures and facilities. As a result, surface water quality impacts are not expected from the waste rock and leach facilities. Cyanide to be used in leach operations is discussed below under "Cyanide Fate."

The proposed haul road would result in ground disturbance extending from the Mill #4 complex to the Bootstrap Project area. Potential effects on surface water resources from upgrading the haul road and construction of access roads within the project area include increased sedimentation in affected drainages along Rodeo and Bell creeks. Significant drainage crossings would require culverts to direct surface flow beneath the road surface. Minor spills of fuels, lubricants, cyanide, or sodium hydroxide could occur along the roads and affect surface water resources.

Groundwater Quantity

During mining operations at the Bootstrap Project, dewatering at the Betze/Post Mine and the resultant groundwater cone of depression has lowered the water table below the maximum vertical extent of the Bootstrap/Capstone and Tara pits. Therefore, Newmont would not be required to dewater or discharge for the Bootstrap Project. Newmont would obtain make-up water for the Bootstrap Project from the Betze/Post Mine dewatering system via a pipeline. Therefore, no water supply wells would be located at the Bootstrap Project.

The only aspect of the Bootstrap Project expected to intercept groundwater during mining operations would be an extension of the Bootstrap/Capstone pit across a portion of Boulder Creek where the flow has been diverted north of the proposed pit extent. Groundwater flow in the Boulder Creek valley alluvium and Tertiary-age Carlin Formation would be intercepted, at least in part, by the maximum northward extent of the mine pit. The unconsolidated alluvium and Tertiary deposits in this area, consisting primarily of sand and gravel, are up to about 30 feet thick. Groundwater would flow from the unconsolidated deposits into the Bootstrap/Capstone pit at an estimated rate of 30 gpm or less. During mine operations at Bootstrap, this water would be consumed for mining-related purposes. After mine operations cease, this water would collect in the pit bottom and mix with bedrock groundwater that eventually would reestablish in the mine pits (see "Groundwater Recovery in Mine Pits" section below).

Interception of alluvial groundwater flow along a portion of Boulder Creek into the Bootstrap/Capstone pit would reduce groundwater flow in the alluvium and Tertiary deposits downstream from the mine site. Surface water flow in Boulder Creek may be reduced in this area as greater infiltration of surface water occurs to replace depleted groundwater.

Currently, flow in Boulder Creek infiltrates naturally to the subsurface; therefore, the Bootstrap/Capstone pit should not significantly affect flows in Boulder Creek. It is expected that groundwater flow in alluvium along Boulder Creek downgradient from the Bootstrap/Capstone Mine would reach natural conditions within 1 or 2 miles of the mine as recharge from Boulder Creek and precipitation. No impacts to existing groundwater rights are expected from the Bootstrap Project because the primary dewatering program in this area is located at the Betze/Post Mine.

Groundwater Quality

Water that may collect in the open pits from direct precipitation during mining operations could infiltrate to the underlying groundwater system. However, low precipitation rates, high evaporation rates, and pumping of water in the pit bottoms for consumption by the mine would eliminate or greatly reduce the potential for groundwater impacts. Other potential impacts on groundwater quality at the Bootstrap Project include acid drainage, cyanide, and/or elevated metal concentrations in water that infiltrate to the subsurface beneath the waste rock disposal facilities and leach facility. Potential for acid mine drainage and Newmont's mitigation measures are discussed in the Geology and Minerals section of this chapter. Predicted quality of water that would develop in and surrounding the Bootstrap/Capstone and Tara pits after cessation of mining and recovery of the Betze/Post Mine groundwater cone of depression is discussed below in "Groundwater Recovery in Mine Pits".

Five waste rock types have been identified in the Tara and Bootstrap/Capstone deposits: alluvium, oxidized siliceous, sulfide-siliceous, oxidized carbonate, and unoxidized carbonate. Based on static and kinetic tests of these waste rocks, the rock types projected to be encountered in the Tara and Bootstrap/Capstone pits would not have a net acid-generating potential during weathering (see **Tables 4-1** and **4-2**). As a result, leaching of metals into the underlying groundwater system from waste rock probably would not occur (see Geology and Minerals section in this chapter). In addition, low precipitation and high evaporation rates would minimize the amount of water moving through the waste rock disposal facilities.

While many metals in the oxide ore are oxidized and susceptible to leaching, the cyanide leach would solubilize and remove these mobile elements during the leaching process. Metals leached during cyanide processing would be removed from ore in the cyanide solution. In addition, spent ore would be washed to remove residual cyanide solutions, which would also remove residual solubilized metals. Hence, much of the available metals in the ore (oxides/sulfides) would be removed during the cyanide leaching process.

Table 4-5 summarizes analytical results for metals and trace elements that are acid extractable (whole rock) in the wall rock and those that are leachable from weathered wall rock samples (leachate). The whole rock results shown in **Table 4-5** are compared with typical metal and trace element values found in rocks and soil in the United States (Dragun 1988) and obtained from USEPA Region III that pose potential human health hazards ("risk-based soil concentrations"). The weathered-rock leachate values are compared to the toxicity characteristic values in **Table 4-5** from the Toxicity Characteristic Leaching Procedure (TCLP) and drinking water standards.

Whole rock analysis of wall rock indicates that the majority of metals are within the range of typical soils and rocks found in the United States (**Table 4-5**). Elements elevated above typical ranges are arsenic, cadmium, mercury, and selenium. Elevated levels of arsenic, mercury, antimony, and selenium are expected due to their common association with gold deposits. Cadmium, mercury, and selenium measured in wall rock are all below risk-based soil concentrations for both industrial and the stricter residential levels developed by USEPA, Region III.

TABLE 4-5
Tara and Bootstrap/Capstone Whole Rock and Leachate Results

Element	Concentration Range in milligrams per kilogram (mg/kg)				TCLP[4]/Drinking Water Std.[5] (milligrams per liter)
	Whole Rock[1]	Leachate[1]	Typical Native Soil[2]	Risk-Based Soil Concentrations[3]	
Aluminum	7,200 - 120	<0.175 - <0.04	300,000 - 10,000	1,000,000	0.05-0.2(s)
Antimony	2.5[6]	0.257 - 0.119	10 - 0.6	410	--10.006
Arsenic	190 - <5	0.077 - 0.0024	40 - 1.0	23[7]	5.0/0.05
Barium	3,400 - 9	<0.238 - <0.02	3,500 - 100	72,000	100.0/2.0
Cadmium	9.3 - <0.5	<0.024 - <0.003	7.0 - 0.01	39[7]	1.0/0.005
Calcium	390,000 - 3,000	641 - 3.3	400,000 - 100	--	--
Chromium	47 - 5	0.22 - <0.002	3,000 - 5	390[7]	5.0/0.1
Copper	26 - <10	0.048 - 0.004	100 - 2	38,000	--/1.3
Iron	16,000 - 240	3.25 - 0.0105	550,000 - 7,000	--	--/0.3-0.6(s)
Lead	38 - <5	<0.024 - <0.002	200 - 2	700[7]	5.0/0.015
Magnesium	34,000 - 300	299 - 0.7	6,000 - 600	--	--/125-150(s)
Manganese	190 - 13	0.78 - <0.01	7,500 - 750	5,100	--/0.05-0.10(s)
Mercury	6.8 - <0.1	0.0016 - 0.0001	0.08 - 0.01	23[7]	0.2/0.002
Molybdenum	6 - <1	0.37 - <0.01	5.0 - 0.2	5,100	--
Nickel	45 - 2	0.277 - <0.011	1,000 - 5.0	20,000	--/0.1
Potassium	7,500 - 52	42.9 - 0.4	30,000 - 4	--	--
Selenium	9 - <5	0.938 - <0.004	2.0 - 0.1	390[7]	1.0/0.05
Silica	720 - 160	--	350,000 - 230,000	--	--
Silver	0.7 - <0.5	0.22 - <0.002	5.0 - 0.1	390[7]	5.0/0.1(s)
Sodium	150 - 25	134 - 0.2	7,500 - 750	--	--
Thallium	13 - <10	0.095 - <0.002	12 - 0.1	--	--/0.002
Zinc	520 - <10	0.14-<0.01	300 - 10	23,000[7]	--/5.0(s)

1 PTI 1995. A total of approximately 20 samples were tested for this analysis.
2 Dragun 1988.
3 Smith 1994.
4 40 CFR 261.24. TCLP = Toxicity Characteristic Leaching Procedure.
5 All concentrations reported are primary drinking water standards unless followed by an (s) indicting secondary standards (see NAC 445A.453 and 445A.455). Standards for copper and lead are "action levels". Standards for aluminum and silver are secondary standards from USEPA (1995) -- Nevada has not adopted standards for aluminum and silver.
6 Whole rock value for antimony is from Robinson District, Nevada.
7 More stringent residential risk-based concentrations.

Leachate values in **Table 4-5** are below TCLP criteria and drinking water standards, except for two of the 21 leaching samples that are above the drinking water standard for arsenic. These data indicate that the potential for high metal concentrations in leachate water from spent ore on the leach pad during weathering is low.

Groundwater Recovery in Mine Pits

During mining of the Bootstrap/Capstone and Tara pits, the regional groundwater level would remain below the pit bottoms because of dewatering at the nearby Betze/Post Mine. Relatively low flows of groundwater (<30 gpm) would enter the northern portion of the Bootstrap/Capstone pit from shallow, perched water in alluvium and Teritary deposits along Boulder Creek. This water would be utilized during operations for dust suppression and would not remain in the mine pit.

The regional groundwater table eventually would recover to approximate pre-mining levels after dewatering at the Betze/Post Mine is terminated. Dewatering commenced at the Betze/Post Mine in 1990 and is expected to continue until the end of mining at the Betze/Post pit and underground Meikle Mine in year 2006. Some groundwater pumping will continue until about year 2010 for processing needs. The Betze/Post dewatering rate currently is about 40,000 gpm (peak pumping rates have been approximately 68,000 gpm). Dewatering plans associated with the Betze/Post operations would increase pumping rates to approximately 60,000 gpm. As a result of the dewatering, groundwater has declined in the vicinity of the Betze/Post pit and Bootstrap Project site by over 1,000 feet from the pre-mining level of approximately 5,250 feet AMSL.

To evaluate and predict recovery and chemistry of the Bootstrap/Capstone and Tara pit lakes, Newmont commissioned a study that utilized existing chemical and hydrogeologic data in conjunction with laboratory tests and computer models (PTI 1995). Groundwater in the vicinity of the Bootstrap/Capstone and Tara pits is expected to recover to a steady-state elevation of approximately 5,230 feet AMSL (PTI 1995). As a result, two separate pit lakes would develop in the Bootstrap/Capstone pit and one lake would form in the Tara pit (**Figure 2-8**). **Table 4-6** shows the projected elevations of the mine pit bottoms and the final pit lake elevations and surface areas. Water depth in the three separate pit lakes would range from approximately 100 to 320 feet.

PTI (1995) conducted flow modeling to simulate local groundwater flow in the Bootstrap/Capstone and Tara pits area to provide rates of groundwater inflow to the pits. This modeling supplements other modeling conducted by Barrick for the Betze/Post mine. Groundwater would not begin to fill the mine pits until about 50 to 105 years after dewatering ceases at the Betze/Post Mine (PTI 1995). Complete recovery of the water table is predicted to take about 300 years after cessation of dewatering (PTI 1995). Maximum combined surface area for the three pit lakes would be approximately 30 acres. Estimated evaporation from these water surfaces would be 84 acre-feet per year (52 gpm) based on a net evaporation rate of 2.8 feet (33 inches) per year. The net evaporation rate represents a total evaporation rate of 43 inches per year and an annual precipitation of 10 inches.

Potential water quality issues that have been identified for mine pit lakes include acid generation, evaporative concentration, mobilization of metals, chemical and oxygen distribution in the final lake, and impacts on surrounding groundwater. The Tara and Bootstrap/Capstone pit-lake water quality predictions by PTI (1995 and 1996) are based on models that incorporate wall-rock oxidation, groundwater composition, and water balance in the pit lakes. Chemical reactions would occur in the pit lake as a result of mixing of groundwater with wall-rock leachate and evaporative concentrates.

Approximately 500 static tests of rock projected to remain in the pit walls were used to evaluate potential for acid production in the pit. Release of metals into the pit was estimated using kinetic leaching tests and whole-rock analyses of 17 rock samples. The Davis-Ritchie model was used by PTI (1995) to quantify the oxidation of sulfidic rock that would be exposed in the pit walls, and the resulting release of metals and

TABLE 4-6
Physical Characteristics of Mine Pit Lakes at the Bootstrap Project

Pit Lake	Pit Bottom Elevation (feet AMSL)	Final Pit Lake Elevation (feet AMSL)	Maximum Water Depth (feet)	Maximum Pit Lake Surface Area (acres)
Tara Pit	4,910	5,224	314	20.5
North Bootstrap/Capstone	5,070	5,234	164	5.9
South Bootstrap/Capstone	5,130	5,232	102	3.3

Source: PTI 1995.

acid to the pit lakes. The resulting equilibrium chemistry of the pit lakes was calculated by PTI (1995) using the USEPA geochemical model MINTEQA2.

Groundwater inflow to the mine pits would originate from carbonaceous and siliceous lithologic zones. Water that would flow into the pits, therefore, is assumed to be an average of these two water sources, weighted by their volumetric inflow rates. The Tara and Bootstrap/Capstone pits differ from most open-pit mines in that they are located on the perimeter of a groundwater cone of depression caused by dewatering at the Betze/Post Mine, rather than being at the center of the groundwater drawdown cone. When the regional groundwater table rises to the base of the Tara and Bootstrap/Capstone pits beginning approximately 50 years after dewatering ceases at the Betze/Post Mine, there would be groundwater flow into and out of the pits (throughflow) toward the center of the Betze/Post Mine cone of depression.

Pit wall rocks would be exposed to atmospheric oxygen as a result of dewatering and excavation activities. A relatively small portion of the wall rock in the mine pits would contain pyrite, potentially producing acid upon oxidation of the pyrite (i.e., 5 percent of wall rock in Tara, 20 percent in northern Bootstrap/Capstone, and 16 percent in southern Bootstrap/Capstone). The majority of the Tara and Bootstrap/Capstone pit wall rock has excess carbonate buffering capacity (relative to sulfide acid-generating potential) and thus would have a net acid neutralization potential (PTI 1995). Acid that may be added to the lake as a result of wall-rock pyrite oxidation would be neutralized by carbonate ions in the alkaline groundwater flowing into the pit.

Groundwater inflow and outflow from the mine pits would result in short residence times for lake water (i.e., time required for entire volume of lake to be replaced by groundwater throughflow). These residence times are predicted to range from about 2 to 49 years in Tara, and 0.2 to 14 years in the Bootstrap/Capstone pit lakes (PTI 1995). These relatively short residence times for pit lake water would keep the water from becoming stagnant and limit buildup of metals and other chemicals. The steady-state evaporative concentration factor is predicted to limit chemical concentrations to between 1.0 and 1.3 times greater than the average composition of groundwater for the Bootstrap/Capstone pit lakes, and 1.0 to 3.5 for the Tara pit lake (PTI 1995).

Modeling indicates that water quality in the Tara and Bootstrap/Capstone pit lakes would show effects of wall-rock oxidation during initial infilling, but would become dominated by the composition of surrounding groundwater after the lakes are full (PTI 1995 and 1996). The water would evolve from a predominantly calcium-magnesium sulfate type to a sodium-potassium bicarbonate water as the lakes reach hydraulic steady state (after about 250 years of infilling). **Table 4-7** summarizes predicted chemical composition of the Tara and Bootstrap/Capstone pit lakes for various years after the start of pit lake development.

The Tara pit and southern portion of the Bootstrap/Capstone pit would receive inflow almost entirely from carbonate rock. In the northern portion of the Bootstrap/Capstone pit, groundwater inflow through carbonate rocks initially would be 82 percent, decreasing to 62 percent as the lake fills (PTI 1995). The pH of pit lakes is predicted to be above 7 at all times during infilling and range from 8.5 to 8.8 at

TABLE 4-7
Predicted Quality of Bootstrap Project Pit Lakes

Parameter	Predicted Concentration in mg/L (years after start of pit infilling)[1]									
	Tara Pit Lake			N. Bootstrap/Capstone Pit Lake			S. Bootstrap/Capstone Pit Lake			Drinking Water Std.[2]
	10 years	100 years	250 years	10 years	60 years	210 years	15 years	90 years	195 years	
Alkalinity	40	143	173	114	138	147	105	137	146	--
Aluminum	0.028	0.089	0.107	0.067	0.088	0.093	0.057	0.086	0.092	0.05 - 0.2(s)
Antimony	0.047	0.007	0.001	0.006	0.002	0.001	0.007	0.002	0.001	0.006
Arsenic	0.009	0.008	0.009	0.007	0.007	0.006	0.007	0.006	0.006	0.05
Barium	0.009	0.020	0.031	0.024	0.032	0.035	0.023	0.033	0.035	2.0
Cadmium	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.005
Calcium	71.9	4.2	2.9	6.2	4.1	3.7	7.4	4.2	3.7	--
Chloride	23.1	16.7	14.7	15.1	12.8	12.4	15.4	12.4	12.2	250-400(s)
Chromium	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.10
Copper	0.004	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	1.3
Fluoride	1.8	1.6	1.4	1.2	1.2	1.1	1.2	1.1	1.1	2.0(s)-4.0
Iron	<0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.3-0.6(s)
Lead	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.002	0.002	0.015
Magnesium	72.0	43.8	36.7	32.3	30.6	30.1	31.4	30.1	29.9	125-150(s)
Manganese	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.05-0.10(s)
Mercury	0.0008	0.0002	0.0001	0.0003	0.0001	0.0001	0.0004	0.0001	0.0001	0.002
Nickel	0.032	0.015	0.012	0.012	0.010	0.010	0.011	0.010	0.010	0.1
pH (s.u.)	8.1	8.7	8.8	8.6	8.7	8.7	8.6	8.7	8.7	6.5 - 8.5(s)
Potassium	29.8	21.3	18.3	16.7	15.4	15.5	16.5	15.4	15.4	--
Selenium	0.043	0.009	0.003	0.005	0.004	0.003	0.005	0.003	0.003	0.05
Silver	0.018	0.005	0.003	0.004	0.003	0.003	0.003	0.003	0.003	0.1(s)
Sodium	86.9	70.3	62.5	52.6	51.3	50.8	51.0	50.6	50.3	--
Strontium	0.110	0.015	<0.001	0.006	0.002	<0.001	0.005	0.002	<0.001	--
Sulfate	603	180	110	138	99	90	145	96	90	250-500(s)
TDS	941	518	452	401	381	376	395	377	374	500-1000(s)
Thallium	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002
Zinc	0.024	0.016	0.016	0.013	0.012	0.012	0.013	0.012	0.012	5.0(s)

[1] Concentrations are 50th percentile or median value of predictions (i.e., 50% of values are greater and 50% are less); mg/L = milligrams per liter.

[2] All concentrations reported are primary drinking water standards unless followed by an (s) indicating secondary standards (see NAC 445A.453 and 445A.455). Standards for copper and lead are "action levels". Standards for aluminum and silver are secondary standards from USEPA (1995) -- Nevada has not adopted standards for aluminum and silver.

Source: PTI 1996.

steady-state conditions. The total dissolved solids (TDS) concentration initially would be about 900 mg/L in the Tara pit lake, decreasing to below 500 mg/L 100 years after mining (TDS secondary standard = 500-1000 mg/L). The TDS concentration in both Bootstrap/Capstone pit lakes would remain below 500 mg/L.

Concentrations of metals are predicted to be relatively low (**Table 4-7**), reflecting the generally good quality of surrounding groundwater. The highest concentrations would tend to occur within the first 50 to 100 years after the pits begin filling, when the effects of oxidized wall rock are most pronounced. Concentrations generally would decrease over time as pit-lake chemistry becomes dominated by the surrounding groundwater. In addition, iron oxides introduced into the pit lakes by groundwater and wall rock would adsorb metals and settle to the pit bottoms (PTI 1995).

Predicted concentrations of antimony, mercury, and selenium in the Tara and Bootstrap/Capstone pit lakes would exceed background concentrations in regional groundwater. Antimony would exceed the primary drinking water standard of 0.006 mg/L; however, the antimony exceedance would not occur after about 10 to 15 years of pit water infilling for the Bootstrap/Capstone pit lakes, and about 100 years for the Tara pit lake. Groundwater transport modeling by PTI (1996) shows that groundwater downgradient of the mine pits would be affected by antimony for a distance of less than 2,500 feet, with no drinking water standard exceedances occurring in groundwater after 300 years of pit lake infilling. Little information is available regarding potential impacts on wildlife from antimony; however, antimony apparently has low toxicity and does not bioaccumulate with respect to wildlife (Macler 1995).

The secondary drinking water standards for pH (6.5 to 8.5) and aluminum (0.05-0.2 mg/L) would be slightly exceeded in the pit lakes. The pH level in the pit lakes would be elevated because of degassing of carbon dioxide (CO_2) from groundwater that would flow into the pits under atmospheric conditions. Modeling by PTI (1996) indicates that the pH would decrease to below 8.5 when the lake water moves from the pits and back into the natural groundwater system, thereby increasing the pressure of CO_2 again. Chemical modeling also shows that aluminum concentrations would drop to below 0.05 mg/L when the pH decreases as pit lake water mixes with downgradient groundwater (PTI 1996). Predicted aluminum concentrations in the pit lakes would not exceed the upper limit of 0.2 mg/L. Nevada has not adopted an enforceable standard for aluminum.

The secondary standard for sulfate (250-500 mg/L) is predicted to be exceeded in the Tara pit lake during the first 80 years of infilling (PTI 1995 and 1996). The USEPA (1995) has proposed a primary drinking water standard for sulfate at 500 mg/L. The maximum sulfate concentration of about 600 mg/L would occur by about year 10 (**Table 4-7**). Groundwater downgradient of the Tara pit may be affected by sulfate for a period of about 25 years and for a distance of up to approximately 1,200 feet with respect to the secondary standard of 500 mg/L (PTI 1996).

Attenuation and dilution of metals and other chemical constituents of pit lake water as it leaves the pits and mixes with natural groundwater would likely result in no adverse effects on human health or the environment. Prior to the regional groundwater system reaching steady state conditions (i.e., approximately 300 years after mining ceases at Bootstrap), groundwater flowing out of the Bootstrap/Capstone and Tara pits would go toward and possibly into the Betze/Post pit lake.

Cyanide Fate

Cyanide process solutions would be used in the gold recovery process. These solutions are maintained in lined ponds associated with the heap leach facilities, and in the ore heap. No impacts on water resources are expected from cyanide use due to designed containment systems. Newmont's reclamation plan includes provisions to neutralize and detoxify cyanide and dispose of leach solutions through evaporation, in accordance with NDEP regulations.

Cyanide is a highly reactive and relatively unstable compound. Its toxicity is directly related to the amount of cyanide ion (CN^-) and hydrogen cyanide (HCN) present in solution. Neutralization and detoxification occur through chemical processes that volatilize hydrogen cyanide, bind cyanide ions in stable, nontoxic compounds, or otherwise degrade cyanide into nontoxic constituents (carbon and nitrogen). Chemical agents may be used to accelerate these processes, but the proposed method consists of adding water to reduce pH and allowing exposure to air and sunlight to accelerate the degradation processes.

Reducing pH of the cyanide-bearing solution is the primary method of neutralization and detoxification. Cyanide remains in solution only under alkaline conditions (pH >9). As the pH is reduced through introduction of fresh water, the cyanide is converted to hydrogen cyanide gas and released to the atmosphere. Although concentrated hydrogen cyanide gas is highly toxic, the gas concentrations that would accompany neutralization and detoxification would be diffused into the atmosphere and rendered harmless. Hydrogen cyanide gas breaks down readily in the presence of oxygen and sunlight.

Cyanide solution in the leach facility would be neutralized and detoxified by recirculation and evaporation. Fresh water would be introduced onto the leach pad to rinse residual cyanide from the spent ore. Rinse water would be recycled through the leach pad until it meets the regulatory criteria described in Chapter 2, Reclamation. Rinse water would be collected and disposed of through evaporation. If fresh water rinsing does not meet State of Nevada standards, additional neutralization techniques such as hydrogen peroxide treatment would be utilized.

Alternatives A-1 and A-2

Complete and partial backfilling of the Bootstrap/Capstone pit (Alternatives A-1 and A-2, respectively) would preclude formation of the two Bootstrap/Capstone pit lakes. Recovery of the groundwater table in this area, therefore, would saturate a portion of backfill material. Quality of groundwater that develops within and surrounding the backfill material may be adversely affected, at least during initial groundwater recovery. As groundwater rises through a portion of backfill material in the Bootstrap/Capstone pit, exposure of oxygenated water to the relatively large surface area of the waste rock would dissolve some metals and other compounds. Backfill material from the Tara Mine, however, would have low potential for acid generation and could help to neutralize acidic groundwater that may initially flow into the pit (see Chapter 4, Geology and Minerals). As described under "Groundwater Quality" above, potential for elevated heavy metal concentrations from rock at the Bootstrap Project is low. Additional compounds that could be mobilized in groundwater from the backfill material are associated with blasting agents, such as nitrate.

Elimination of two pit lakes would prevent evaporation loss of groundwater (approximately 16 gpm) from the Bootstrap/Capstone pit. This is about 30 percent of the total predicted evaporation rate (52 gpm) for all three pit lakes. Complete backfilling of this pit would provide an opportunity to reestablish the diverted portion of Boulder Creek to its original location. The completely backfilled pit would also prevent flood flows in Boulder Creek from possibly entering an open mine pit.

Alternative B

Implementation of Alternative B would reduce the amount of water consumed by operations at the Bootstrap Project that would be piped from the Betze/Post Mine dewatering system. Cyanide would not be used in the Bootstrap Project area, eliminating the potential for cyanide leakage or spill problems. Additional water and cyanide consumption would occur at the North Area Leach Facility as a result of Alternative B. Potential erosion and sedimentation would be reduced for Alternative B because of fewer disturbed areas at the Bootstrap Project (i.e., elimination of leach facility).

Alternatives C-1 and C-2

Utilization of an off-site power supply by connecting power lines to an existing line to the west of the project site in the Boulder Valley would not result in any changes to predicted impacts described above. Impacts associated with Alternative C-1 would be similar to the Proposed Action; whereas, Alternative A-2 impacts would be similar to Alternative B.

No Action Alternative

The No Action Alternative would have no effect on water resources in the Bootstrap Project area. The existing Boulder Creek Diversion probably would be removed and this portion of the creek would be reestablished in its original location. Mine pit lakes would not develop at the Bootstrap Project site.

POTENTIAL MITIGATION AND MONITORING MEASURES

No additional water monitoring or mitigation measures are recommended by BLM, beyond those required by NDEP and the USCOE. The existing hydrologic monitoring program described in Chapter 3, Water Quantity and Quality would continue. Most of this monitoring is being conducted by Barrick as part of the Boulder Valley Monitoring Program. As part of this program, Barrick prepares quarterly reports of their monitoring programs which are reviewed by various agencies such as the Nevada State Engineer and the BLM, as well as, Newmont Gold Company. The agencies may require additional monitoring from Barrick as they see necessary for monitoring of dewatering activities for the Betze/Post mining operations.

Additional monitoring wells would also be established by Newmont around the proposed Bootstrap/Capstone and Tara pits. These wells would be used to monitor groundwater recovery/quality as the pit lakes develop after cessation of mining. Quality of water that develops in the post-mine pit lakes and groundwater quality surrounding the pits would be evaluated until steady-state conditions are achieved. Process materials used at the Bootstrap Project would be regulated and monitored according to the zero discharge Water Pollution Control Permit from NDEP. Water quality problems identified in surface water or groundwater samples in the Bootstrap Project area would be evaluated for potential source, followed by mitigation of the problem and remediation of contamination, if necessary. Appropriate best management practices should be implemented and monitored to control erosion and sedimentation.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Approximately 500 gpm of water would be consumed at the mine site during operations. Water sources would include: 1) excess discharge water from the Betze/Post Mine dewatering system; 2) water that would collect in the Tara and Bootstrap/Capstone pits from precipitation; and 3) groundwater inflow from shallow alluvium along Boulder Creek and possible perched groundwater in bedrock into the Bootstrap/Capstone pit. Evaporation from the Bootstrap/Capstone and Tara pit lakes would continue indefinitely after mining ceases and the groundwater table rises to near-normal levels. The maximum evaporation rate from the three pit lakes (30 acres) would be approximately 50 gpm (based on an annual net evaporation rate of 2.8 feet).

RESIDUAL ADVERSE EFFECTS

As discussed above, the Bootstrap/Capstone and Tara pits would be a continuous source of groundwater loss due to evaporation from the pit lakes. However, this loss (approximately 50 gpm) is not expected to have a significant impact on regional hydrology. It is predicted that water in the pit lakes after mining would not be acidic, and would be similar to natural groundwater in the area.

SOIL AND WATERSHED

SUMMARY

The proposed Bootstrap Project, which includes open-pit mines, waste rock disposal facilities, and other supporting facilities, would result in 1,037 acres of additional disturbance (1,271 acres total). Potential impacts on soil resources and watersheds include loss of soil during salvage and replacement, sediment loss due to erosion, and reduced productivity. These impacts are expected to be minimal as a result of proposed reclamation activities.

The complete backfill alternative (A-1) for the Bootstrap/Capstone pit would result in approximately 100 additional acres being restored to beneficial use compared with the Proposed Action. The partial backfill alternative (A-2) would result in approximately 10 additional acres being restored to productive land use compared with the Proposed Action. Alternative B (ore processing at North Area Leach Facility) would reduce the amount of disturbed land by 165 acres. Alternatives C-1 and C-2 (off-site power supply) would result in an additional land disturbance of 1 acre associated with a power substation, access road, and power poles.

DIRECT AND INDIRECT IMPACTS

Impacts on soil resources occur in two separate stages during mining operations: 1) soil loss during mining, when salvaged topsoil is stockpiled and stabilized in storage areas; and 2) soil loss between final topsoil redistribution and completion of reclamation. Although impacts on soil are more numerous during mining, topsoil erosion during and after topsoil redistribution has a greater effect on final reclamation.

Proposed Action

Direct impacts on soil resources from the Proposed Action would include modification to soil chemical and physical characteristics, loss of soil to wind and water erosion, and decreased soil biological activity. Chemical changes would result from mixing of surface soil with subsoil during salvage activities, reducing the organic matter content of surface soil. Impacts on physical characteristics of soil during salvage, stockpiling, and redistribution would include soil mixing, compaction, and pulverization from equipment and traffic. Soil compaction and pulverization would result in decreased permeability and available water-holding capacity, and loss of soil structure and finer-grained soil material due to erosion.

Soil loss from wind erosion is potentially high in Nevada's arid, windy climate. The potential for loss of salvaged soil would be greatest during reclamation after topsoil redistribution on disturbed areas. The potential for loss of nonsalvaged subsoil would be greatest between initial disturbance and cover soil redistribution. The volume of soil loss would depend on wind velocity, size and condition of exposed area, and soil texture. The wind erodibility index is 56 tons/acre/year for noncalcareous loam and silt loam that has less than 20 percent clay content (WEG 5) and 86 tons/acre/year for other soil (WEG 4 and 4L) present within the proposed disturbance (USDA 1993) (**Appendix A**).

Water erosion potential could be high during heavy precipitation due to exposed soil, fine soil texture, soil surface conditions, and slope. The tolerable limit is 1 to 2 tons/acre/year for soils 20 inches or less to bedrock or unfavorable substrata (USDA 1993). **Table 4-8** shows predicted soil loss from the waste rock facilities and the heap leach facility during the first year and fifth year following reclamation using the Revised Universal Soil Loss Equation (RUSLE), Version 1.03 (Soil and Water Conservation Society 1993).

TABLE 4-8
Predicted Soil Loss by Disturbance Area

Disturbance Area	Soil Loss (tons/acre/year)[1]	
	First Year[2]	Fifth Year[2]
Bootstrap/Capstone Waste Rock Disposal Facility (218 acres)	39	0.5
Tara Waste Rock Disposal Facility (284 acres)	33	1.0
Bootstrap Heap Leach Facility (165 acres)	24	0.9

[1] Values calculated using Revised Universal Soil Loss Equation (RUSLE).
[2] First year is after soil redistribution; fifth year is after establishment of vegetation.

Source: Grass Land 1995.

Soil loss due to water erosion from the three primary disturbance areas could exceed tolerable limits during the period between soil redistribution and successful reclamation **(Table 4-8)**. However, management practices such as mulching, addition of organic matter, or leaving the slope in a roughened condition would reduce predicted losses. Also, soil loss at the leach pad facility could be lower than predicted because the texture of the material is likely to be greater than that assumed by the model.

Redistributed soil would have a lower organic matter content as a result of salvage and stockpiling. Soil biological activity would be significantly reduced or eliminated during stockpiling as a result of anaerobic conditions created in deeper portions of stockpiles. After soil redistribution, biological activity would slowly increase and eventually reach pre-salvage levels.

Redistribution of soil during reclamation would result in soil loss and compaction from loading, hauling, and placement, and soil loss would continue until vegetation is established. Soil compaction would be reduced by scarifying soil after placement.

Seeding of topsoil stockpiles would significantly reduce the potential for erosion. The established vegetation would provide additional organic matter to the soil.

Indirect impacts on other resources caused by soil disturbance from the Proposed Action include:

- Changes in water quality due to sedimentation from erosion of exposed slopes.

- Decreased vegetative productivity due to soil loss or inadequate cover soil depth.

- Impacts on hydric soils supporting wetland and riparian vegetation.

- Decreased land-use utility.

Reclaimed Topography

Grading and contouring as proposed in the reclamation plan (Newmont 1995d) would partially mitigate erosion and rilling by reducing overall slope faces from 2.5H:1.0V (40 percent) to 3.0H:1.0V (33 percent). Terracing, proposed by Newmont, of the waste rock disposal facilities and the leach pad facility would reduce soil erosion potential from water. The proposed post reclamation topography is discussed in Chapter 2, Proposed Action.

In localized areas where post-mining slope configuration cannot be altered, erosion would be reduced through utilization of contour ditches, check dams, erosion control materials, small catch basins, and other appropriate means.

Growth Medium Handling

Topsoil currently supports vegetation in the mine area and is the most desirable plant growth material available for revegetation. Although stripping, stockpiling, and redistribution affect topsoil characteristics, the benefits of using topsoil outweigh adverse effects of topsoil handling. Benefits of topsoil include: suitable texture and generally low coarse-fragment content; relatively high nutrient content; lack of phytoxic elements; low acid-producing potential; and plant propagules (mainly seed), soil microorganisms, and organic matter.

The stockpiles for salvaged soil would be located in areas with minimum disturbance and constructed in sequential lifts with slopes graded to 2.5H:1.0V. As construction of soil stockpiles is completed, temporary vegetative cover would be established to reduce erosion.

During reclamation topsoil or other growth media would be redistributed. **Table 4-9** shows salvageable depths and volumes of soil available for salvage from each proposed disturbance area. Soil surveys indicate that up to 18 inches of topsoil are available for reclamation of waste rock disposal facilities. Soil shortages are anticipated in the heap leach area. Roads and ancillary facilities would be regraded and nearby associated road berms would be respread as a growth medium. Newmont would vary topsoil and growth media redistribution depths based on test plot and concurrent reclamation studies to be performed in cooperation with BLM, NDEP, and NDOW.

Replaced soil may be amended with organic material and fertilizer to create a satisfactory plant growth medium. Surface preparation and cultivation practices would be selected based on their success in promoting plant establishment and resistance to soil erosion on test plots and concurrent reclamation.

Because the depth of respread topsoil is unknown, impacts to potential vegetation are uncertain. Mining waste below the topsoil may form part of the root zone for vegetation. If mine waste has high coarse-fragment content, salts, trace element concentrations, acidity, or other undesirable characteristics, impacts on revegetation could be significant.

Alternative A-1

Impacts from Alternative A-1 would be similar to the Proposed Action, except that backfilling the Bootstrap/Capstone Mine pit (Alternative A-1) would result in an additional 100 acres to be reclaimed. This would reduce the amount of soil available for reclaiming other disturbed areas.

Alternative A-2

This alternative (partial backfilling) would result in similar impacts as the Proposed Action, except that approximately 10 additional acres would be reclaimed.

Alternative B

Compared to the Proposed Action, Alternative B would reduce the amount of disturbed land by 165 acres. Since the amount of land to be disturbed is less under Alternative B, overall soil loss due to wind and water erosion would be reduced.

Alternative C-1 and C-2

Implementation of an off-site power supply would increase the disturbance area by 1 acre associated with a power substation, access road, and power poles. Topsoil would not be removed from the substation and power pole sites. All disturbance areas would be reclaimed after cessation of mining and the power is no longer required.

No Action Alternative

The No Action Alternative would eliminate potential impacts on soil beyond those presently occurring at the Bootstrap Project site.

TABLE 4-9
Disturbance Acreage[1], Depth of Available Soil, and Total Available Soil Volume

Soil Mapping Unit[2]	Acres	Soil Salvage Depth (in)	Soil Salvage Volume (yd^3)	Total Soil Salvage Volume (yd^3)
BOOTSTRAP/CAPSTONE PIT				
ML-DIS	9.8	12	5,485	
DIS-RI-RO	82.2	0	0	
DIS	8.9	0	0	
RI-RO	26.4	0	0	
TOTAL	**120.9**			**5,485**
TARA PIT				
RG	82.9	7	0	
RG-DIS	2.2	0	0	
MSD	9.8	19	24,267	
SWS	12.1	0	0	
SWR	18.2	26	59,648	
STD	8.0	31	33,342	
TOTAL	**142.9**			**121,229**
BOOTSTRAP/CAPSTONE WASTE ROCK DISPOSAL FACILITY				
ML-DIS	9.8	18	15,811	
DIS-RI-RO	13.1	0	0	
DIS	67.8	0	0	
STD	2.1	31	8,752	
BN	19.6	10	26,351	
PD	45.8	8	49,260	
PB	31.3	7	29,457	
X	9.9	6	0	
PDX	14.4	11	21,296	
DPX	18.0	6	14,520	
SW	30.2	18	73,084	
Y	3.3	8	3,549	
BN	18.3	24	59,048	
TER	1.7	33	7,542	
LT	0.5	33	2,218	
LBN	6.2	20	16,671	
TOTAL	**292.0**			**327,560**

TABLE 4-9 (continued)
Disturbance Acreage[1], Depth of Available Soil, and Total Available Soil Volume

Soil Mapping Unit[2]	Acres	Soil Salvage Depth (in)	Soil Salvage Volume (yd^3)	Total Soil Salvage Volume (yd^3)
TARA WASTE ROCK FACILITY				
RG `	1.8	0	0	
RG-DIS	3.3	0	0	
RS	85.9	21	242,524	
STD	94.9	31	395,522	
FN	33.5	10	45,039	
RD	10.0	0	0	
RD	3.0	0	0	
SW	7.5	18	18,150	
RD	4.0	24	4,195	
TER	22.8	33	101,156	
RS	14.4	0	0	
TOTAL	**284.0**			**806,586**
HEAP LEACH FACILITY				
LBN	6.0	24	16,133	
SW	18.7	18	45,254	
BN	81.1	21	261,683	
RBN	18.7	10	21,108	
TER	22.3	33	92,726	
PDX	6.3	18	9,317	
PD	4.0	8	4,517	
Y	6.3	8	6,776	
DPX	4.0	8	3,227	
DP	4.0	8	1,694	
TOTAL	**165.0**			**462,435**
ANCILLARY FACILITIES				
LT	3.0	33	13,310	
DIS	30.7	0	0	
FN	27.5	10	36,972	
BN	44.5	24	143,587	
SW	16.5	18	40,898	
STD	2.3	31	9,586	
TER	24.0	33	106,480	

TABLE 4-9 (continued) Disturbance Acreage[1], Depth of Available Soil, and Total Available Soil Volume				
Soil Mapping Unit[2]	**Acres**	**Soil Salvage Depth (in)**	**Soil Salvage Volume (yd^3)**	**Total Soil Salvage Volume (yd^3)**
Y	2.4	8	2,581	
PDX'	6.0	11	3,980	
PD	3.7	8	3,980	
TOTAL	**126.9**			**352,957**
GEOLOGIC EVALUATIONS[3]				
Unknown	**50.0**	6	40,333	**40,333**
TOTAL SOIL SALVAGE VOLUME (YD^3)				**2,116,585**

1 Includes existing disturbance of 54 acres associated with geologic evaluations within proposed disturbances for pits, waste rock disposal facilities, and leach facility (see Table 2-2).
2 See Figure 3-9 for soil mapping units.
3 Geologic Evaluations are isolated areas throughout the project area. For soil salvage purposes, an average depth of 6 inches of suitable soil was used to obtain an estimated soil salvage volume.

Source: Grass Land 1995

POTENTIAL MITIGATION AND MONITORING MEASURES

Mitigation and monitoring measures for soils would include those outlined in the BLM Solid Minerals Reclamation Handbook H-3042-1 (BLM 1992c). The following are additional mitigation and monitoring measures for soil resources:

- Designing toes of waste rock dumps to withstand surface water flows (assuming ultimate failure of stormwater diversion channels).

- Avoiding windy conditions when stripping soil from mapping units MSD, TS, STD, SW, TER, LT, and BN to reduce soil loss.

- Monitoring topsoil stockpiles, especially after storms, to ensure continuing stability and to evaluate potential for future losses.

- Direct-hauling topsoil from salvage operations whenever possible to areas designated for immediate reclamation.

- Testing material (waste rock and deep alluvium) and developing a materials handling plan before end of operations so that desirable material can be stored or operations modified to ensure that desirable material ends up in root zone. If special material handling is not feasible, a plan should be developed for treating or amending undesirable materials.

- Monitoring topsoil redistribution to ensure minimal mixing of soil with underlying materials.

- Prior to seeding (if seedbed is compacted) scarifying the surface by ripping, discing, tilling, or a combination of these practices to provide a seedbed. Scarifying should be done along the contour.

- Leaving the seedbed in a roughened state to reduce soil erosion.

- Following seeding, mulching the surface at a rate of 1 ton/acre to reduce soil erosion.

- Monitoring erosion control and sedimentation structures.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Soil loss due to erosional or human-caused forces is irretrievable and irreversible. An estimated 264 acres of land associated with the open pits would not be reclaimed. Subsoil material would not be salvaged and would therefore be irretrievably lost.

RESIDUAL ADVERSE EFFECTS

Loss of soil or discontinuation of natural soil development, decrease in infiltration and percolation rates, decrease in available water-holding capacity, breakdown of soil structure, and loss of organic matter content would be reversed by natural soil development over an unknown period of time. Reclamation steps such as grading, soil redistribution, and revegetating would expedite the process.

Loss of fertility and soil microorganisms, vegetative productivity, and land-use potential could be reversed within 5 to 15 years after successful reclamation. If reclamation were not successful, these impacts could have long-term effects.

VEGETATION

SUMMARY

The Proposed Action would disturb 1,037 acres of vegetation, primarily lower elevation sagebrush-bunchgrass communities in deteriorated condition at the Bootstrap Project site. According to the reclamation plan, revegetation of the entire disturbance area would not occur. Following mining, 264 acres of mine pits would remain unreclaimed. Implementation of Alternate A-1 (complete backfilling of Bootstrap/Capstone pit) would restore and revegetate approximately 100 additional acres of land surface compared with the Proposed Action. Partial backfilling of the Bootstrap/Capstone pit (Alternative A-2) would restore and revegetate approximately 10 additional acres of land surface compared with the Proposed Action. Alternative B (ore processing at North Area Leach Facility) would reduce the disturbance area by approximately 165 acres. Alternatives C-1 and C-2 would have minor impacts on 1 acre of additional disturbance associated with the power substation, access road, and power poles.

DIRECT AND INDIRECT IMPACTS

Proposed Action

The Proposed Action would directly affect 1,037 acres of upland vegetation in addition to the 234 acres of previous disturbance, and less than 1.0 acre of wetlands within the mine operation and facilities areas. Acreages of ecological sites that would be directly impacted by the Proposed Action are listed in **Table 4-10**.

Potential indirect impacts would include an increase in weedy plant species, invasion of noxious weeds, sedimentation to undisturbed areas downslope, and airborne dust emissions. Minor indirect impacts on some wetland areas could occur from interrupted drainage resulting from the mine pits, Tara Waste Rock Disposal Facility, and Bootstrap Heap Leach Facility. The wetlands most likely to be affected include 16 acres of the Bell Creek floodplain along the southern boundary of the project and 8.3 acres of seeps along the western project boundary (see **Figure 3-10** and **Table 3-17**). The seeps along the western boundary, however, may currently be affected by dewatering at the Betze/Post Mine.

Reclamation would result in establishing self-perpetuating rangeland plant communities on most of the disturbed land. These communities would differ from the native plant communities in species composition, but eventually with the colonization of species from adjacent areas, disturbed areas could approximate pre-mining vegetation communities.

TABLE 4-10
Acres of Proposed Disturbance by Dominant Ecological Site and Wetlands[1]

	Ecological Site Description (ESD)							
PROPOSED DISTURBANCE	ESD 25-14	ESD 25-18	ESD 25-22	ESD 25-19	ESD 25-21	ESD 24-5	Wetlands	Total
Bootstrap/Capstone Pit	0	0	0	44	12	6	0.1	62
Tara Pit	0	0	0	100	29	14	0	143
Bootstrap/Capstone Waste Rock Facility	20	40	40	83	24	11	0.3	218
Tara Waste Rock Facility	0	0	0	200	56	28	<1	284
Heap Leach Facility	2	4	4	107	32	16	0	165
Access Roads and Ancillary Facilities	6	12	12	97	26	14	0	169
Geologic Evaluations	0	0	0	35	10	5	0	50
Total Disturbance (Acres)	**28**	**56**	**56**	**666**	**191**	**94**	**<1**	**1,041[2]**
Total Disturbance (Acres) for Alternative B[3]	**26**	**52**	**52**	**559**	**159**	**78**	**<1**	**926**

[1] See Figure 3-10 for location of ecological sites and wetland areas.
[2] Acreage total includes 54 acres of disturbed lands associated with geologic evaluations included in the proposed disturbance (see Table 2-2).
[3] Under Alternative B, the Bootstrap Heap Leach Facility would not be constructed.
Source: SCS 1991, 1983.

Plant communities established by reclamation would have a higher density of wheatgrasses (*Agropyron* spp.) and lower density of sagebrush than existing native plant communities. Herbaceous species currently not growing on sites to be disturbed (e.g., chickpea milkvetch, gooseberryleaf globemallow, and small burnet) would be the dominant forbs of reclaimed communities. During early phases of the reclamation (i.e., the first 10 or 20 years following seeding), native perennial forbs would be sparsely and irregularly distributed on reclaimed sites. Eventually, native perennial forb species capable of growing on disturbed soils would colonize reclaimed areas, but species diversity and frequency of occurrence would be lower than in existing native communities.

The canopy structure of reclaimed plant communities would likely differ from native plant communities for many years following seeding. Reclaimed communities would have lower densities of shrub canopies with greater foliar cover of grasses than existing plant communities. The overall visual aspect of reclamation would be that of a grassland rather than of a sagebrush shrubland.

Reclamation problems may be encountered where soils are deeply compacted and where soils erode before vegetation can be established. Problems with reclamation can also occur where slopes fail, or where soils contain or are shallowly underlain by rock, acid, or salts.

Applying irrigation water would likely enhance initial germination of growth of plants seeded in reclamation; however, it is impractical to apply irrigation for extended periods given high costs of intensive maintenance requirements. A primary goal of reclamation is to establish self-sustaining, stable plant communities adapted to local climatological conditions. Application of irrigation water would not be consistent with this objective because plant communities that would establish in response to supplemental watering would not be adapted to seasonal drought cycles that are a dominant feature of the regional climate.

Alternative A-1

Impacts on vegetation from implementation of Alternative A-1 would be similar to those of the Proposed Action except that more land surface would be restored and more vegetation established during reclamation of the Bootstrap/Capstone pit. An estimated 100 additional acres of land surface would be restored and revegetated under this alternative.

Alternative A-2

This alternative would restore and revegetate approximately 10 additional acres of land surface compared with the Proposed Action. Reclamation would include revegetation of the backfilled surface.

Alternative B

Implementation of Alternative B would reduce the amount of land disturbance associated with the Bootstrap Project by 165 acres and allow established vegetation at the proposed leach facility to remain undisturbed.

Alternatives C-1 and C-2

Off-site power supply associated with Alternatives C-1 and C-2 would have minor impacts on vegetation from placement of power poles and construction of a power substation and access road. A total of 1 acre would be disturbed for these power facilities. If a power line blows down and contacts vegetation, a wildfire could start and destroy native woody shrubs and encourage the proliferation of cheatgrass and other undesirable plants.

No Action Alternative

The No Action Alternative would have no impact on vegetation. No disturbance beyond those presently permitted would occur.

POTENTIAL MITIGATION AND MONITORING MEASURES

Reclamation mitigation and monitoring measures of the Proposed Action are described in Chapter 2, Proposed Action. Potential mitigation measures beyond those described in the Proposed Action include the following:

- Varying the seed mixes to take advantage of slope and aspect, soil depth, and landscaped features.
- Plant seedlings, rather than seed, of selected plant species in designated areas during reclamation.
- Nonuniform seeding or shrub planting, depending on specific management goals and the site environment.
- Preventing livestock grazing of revegetated areas for a minimum of two growing seasons following seeding.
- Restoring impacted wetlands so that at least 75 percent are in proper functioning condition after water table recovery.
- Protecting riparian and wetland areas through proper fencing and/or change in season of use.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

With the Proposed Action there would be an irreversible commitment of resources in the loss of 264 acres to open pits. An irretrievable loss of vegetative productivity from the non-pit disturbed areas would exist until reclamation is successful.

RESIDUAL ADVERSE EFFECTS

Residual adverse effects of the Proposed Action would be determined by success of reclamation. If revegetation is unsuccessful or undesirable weeds become established, grazing capacity and wildlife habitat values would be reduced.

TERRESTRIAL WILDLIFE

SUMMARY

The primary impact on terrestrial wildlife would be direct loss of habitat (primarily sagebrush/grassland) and the loss or displacement of wildlife from affected habitat. Direct loss of habitat would eliminate forage, hiding cover, breeding sites, and nesting cover.

Complete backfilling of the Bootstrap/Capstone pit (Alternative A-1) would restore approximately 100 acres of land surface to wildlife habitat; partial backfilling (Alternative A-2) would restore approximately 10 acres for wildlife use. Elimination or reduction of pit lakes in the Bootstrap/Capstone pit as a result of Alternatives A-1 and A-2 would affect aquatic life that could potentially inhabit these lakes and wildlife that could use them as a source of drinking water. Elimination of a heap leach facility and cyanide process ponds (Alternative B) would reduce possible wildlife mortalities at the Bootstrap Project. Increased haul road traffic to the North Area Leach Facility is not expected to have a significant effect on wildlife. Use of an off-site power supply (Alternatives C-1 and C-2) could increase mortality to birds due to collision and/or electrocution with the power lines.

DIRECT AND INDIRECT IMPACTS

Proposed Action

The proposed Bootstrap Project would result in direct loss of about 1,037 acres of terrestrial wildlife habitat, in addition to the 234 acres of previous disturbance, until such habitat is reclaimed. Of this total area, the two mine pits would affect 264 acres. Direct loss of habitat would eliminate forage, hiding cover, breeding sites, nesting cover, and thermal cover. All terrestrial wildlife species dependent on these disturbed sites would die or be displaced. Displaced animals may be incorporated into adjacent populations. Depending on variables such as species, behavior, density, and habitat, adjacent populations may experience increased mortality, decreased reproductive rates, or other compensatory or additive responses. Species impacted most severely would be those that rely primarily on big sagebrush/bunchgrass habitat, including: reptiles and amphibians; small mammals such as deer mice, voles, black-tailed jackrabbits, and Richardson's ground squirrels; birds such as vesper sparrows, rock wrens, sage thrashers, and horned larks; and associated predators such as coyotes and golden eagles. A small number of mule deer that live year-round in the vicinity would be temporarily displaced.

Mule deer use of transitional range between winter and summer habitat has been affected by extensive mining in the Carlin Trend. Small patches of deciduous shrub stands on the slopes of Round Mountain that provide food and security for mule deer and other wildlife would also be lost as a result of the Proposed Action.

With mining at the Bootstrap Project, some deer that traditionally utilize the area as transitional habitat during migration may remain longer on summer range to the north. Animals remaining longer on summer range may become stressed by heavy snow accumulation and scarcity of browse. Conversely, in spring, some animals may also remain longer on crowded winter ranges that have been depleted of forage if their traditional movements are diverted or inhibited by activities at the Bootstrap Project site. Stress from displacement and insufficient or poor quality food could lead to mortality from starvation, disease, increased, predation, and reduced reproductive success.

Some displaced mule deer also could be killed by vehicles. Roads in the gentler terrain of the valley bottoms, to which mule deer would be displaced, have higher traffic volumes and speed limits.

Pronghorns that move through or periodically occupy habitat in the Bootstrap study area would be displaced from the immediate area of mining disturbance due to noise and human activity. Displaced animals probably would move to other summer range northwest of the Bootstrap study area and west of Dee Gold.

Because the Bootstrap study area is not optimal pronghorn habitat (i.e., steep topography), losses from direct disturbance and displacement because of noise and human activity would likely have minor impacts on local and regional pronghorn populations. Displaced pronghorns would likely occupy suitable habitat in the Boulder Valley; however, limited data on population dynamics, seasonal movement, and other aspects of pronghorn life history in north-central Nevada preclude predicting impacts with a high level of certainty. Because of recent expansions of pronghorn populations in north-central Nevada (including the Bootstrap study area), current data that accurately reflect pronghorn status are limited.

Impacts to terrestrial wildlife from hazardous materials being transported along Dunphy Road for Bootstrap Project may occur from vehicle collisions or potential hazardous material spills.

No known sage grouse display sites (leks) would be impacted by the Proposed Action, but some sage grouse nesting habitat may be removed. This loss would be minor because there is other nesting habitat that could be utilized.

Some chukar upland habitat (steep, rocky slopes) would be lost, but this loss would be minor compared with habitat availability in the study area.

Hungarian partridge are sparsely disturbed throughout the study area. Loss of upland habitat as a result of the Proposed Action would be minor compared with habitat availability in the study area.

Mourning doves would not likely be affected by the loss of upland habitat associated with the Proposed Action.

The golden eagle nest south of Round Mountain would not be directly impacted by the Proposed Action. After cessation of mining, golden eagles, kestrels, and other raptors may construct nests on pit wall ledges. Raptor use of mining pits and other facilities has been documented at the Ren Mine, where red-tailed hawks have nested for several years on the highwall. Also, roost sites and hunting areas created through reclamation at Dee Gold have been used by a variety of raptors including golden eagles.

Raptors would also be affected by the loss of prey base as a result of disturbance of 1,364 acres of upland habitat. Because most raptors usually range over a large area, this loss is not quantifiable but is probably minor and would not result in a change in raptor diversity. Some raptors would take advantage of prey availability, nest sites, and perches in reclaimed habitats.

Noise levels associated with the proposed project would increase above existing levels. Some animals would be displaced an unknown distance, but many would become habituated to regular noise and resume use of otherwise unaffected habitat. Noise is not expected to affect reproductive success or viability of regional wildlife populations.

By reducing palatability of vegetation, dust, exhaust fumes, and other air pollutants may temporarily or permanently displace wildlife. Impacts would primarily occur downwind from construction and mining activities and would be minor.

Wildlife (mostly bats and birds) consuming water from the heap leach facility could die. Existing monitoring programs at the Newmont South Operations Area and other nearby mines indicate that mallards, teal, other unidentified ducks, blackbirds, sparrows, and one mule deer have been found killed through exposure to process water from tailings and heap leach facilities. Practices such as netting and fencing of ponds and maintaining nonlethal cyanide concentrations are designed to reduce the potential for wildlife mortality.

All pipelines would be constructed to allow free passage of wildlife over or under them. All disturbed sites (except open pits) would be reclaimed after cessation of mining.

Following mining and reclamation, the two mine pits would partially fill with water. Depending on the steepness of pit walls and potential mitigation measures (e.g., construction of a berm around the pit), animals such as mule deer and other mammals could enter a pit and drown. The open water could also be attractive to waterfowl for resting during migration. Bats could use the open water for drinking and foraging for airborne insects. Because the quality of water that would fill the mine pits is predicted to be good, no adverse impacts are expected from wildlife contacting or drinking the water. The quality of habitat that would be created in the pits is unknown.

Alternative A-1

Compared to the Proposed Action, complete backfilling of the Bootstrap/Capstone pit and successful reclamation would restore approximately 100 acres of land to productive use, including wildlife habitat. Loss of two pit lakes as a result of this alternative would eliminate aquatic life that would potentially colonize them and remove a potential source of drinking water for several wildlife species such as bats and birds. Covering pit walls with backfill would result in minor losses of wildlife habitat, although highwalls would still exist after complete backfilling.

Alternative A-2

Compared to the Proposed Action, partial backfilling of the Bootstrap/Capstone pit would restore approximately 10 additional acres of land to productive use, including wildlife habitat. However, some aquatic habitat in the Bootstrap/Capstone pit would be lost. The highwall would provide wildlife habitat for nesting birds.

Alternative B

Elimination of a heap leach operation and cyanide process ponds at the Bootstrap Project would reduce the potential for mortality of wildlife exposed to process solutions. Increased truck traffic for hauling oxide-grade leach ore to North Area Leach Facility (estimated at 17 trucks/hour) would not significantly affect the influence of the haul road as a barrier to mule deer movement. The effects of increased haul truck traffic on mule deer migration would be similar to those identified for the Proposed Action.

Alternatives C-1 and C-2

Potential mortality to birds from use of an off-site power supply could be caused by collision with the conductors and/or overhead power lines or electrocution (primarily raptors) Direct loss or alteration of 1 acre of habitat would result from placement of poles and weed control activities. Potential for habitat loss and increased mortality risk to wildlife would be increased due to wildfire that could result from accidentally downed power lines.

Waterfowl and other birds (e.g., great blue heron, red-winged blackbird, starling, sage grouse, gulls, and song sparrow) are known to collide with transmission lines, particularly during foul weather or at night when visibility is poor (James and Haak 1979, Beaulaurier 1981, and Meyer 1978). The highest incidence of collision with power lines occur where lines cross rivers or other bodies of water where flights of water-associated birds tend to concentrate. The proposed power line would extend over Boulder Creek just west of the Bootstrap Project area.

Electrocution of raptors and other large birds (e.g., ravens), attracted to power poles for perching or nesting, can occur when birds simultaneously touch two or more wires or a wire and a pole. In arid environments, such as the Bootstrap study area where trees and other perching and nesting sites are limited, power poles are especially attractive to raptors. Because of the relatively high use of the of the Bootstrap area by raptors, the risk of electrocution would be high if power lines were not constructed to prevent raptor mortality. However, if the power line were constructed as proposed by Olendorf et al (1981), impacts to raptors would be negligible.

If power lines were constructed to prevent raptor electrocution, they could have a positive impact for raptors as perching and nesting sites.

No Action Alternative

The No Action Alternative would have no impacts on wildlife beyond than those already occurring at the Bootstrap Project site.

POTENTIAL MITIGATION AND MONITORING MEASURES

Mitigation measures beyond that provided in the Proposed Action could include acquisition of private lands to replace affected public lands and/or enhancement of certain areas identified through consultation with BLM and NDOW.

Mitigation for loss of transitional mule deer habitat could consist of establishing north-south movement corridors along the east and west slopes of the Tuscarora range that would allow and encourage migrating deer to bypass mining activities. The area of impact associated with the Bootstrap Project (1,271 acres) could be incorporated into a regionwide plan to maintain deer movements during and after mining activity. Identifying and maintaining movement corridors in a regionwide area would require consultation among Newmont, Barrick, BLM, and NDOW. If it is not feasible to provide long-term, secure travel corridors for migrating mule deer along the Tuscarora range, the potential for developing secure movement corridors at lower elevations in close proximity to the Tuscarora range would be investigated.

Many lower elevation areas have been severely degraded by fires that have converted native shrub communities to cheatgrass-dominated grasslands. Migrating mule deer currently avoid these areas because of scarcity of food and resting cover. Before deer would utilize lower elevation habitat in the Boulder Valley as winter range or transitional habitat, vegetation (primarily shrubs) that provide forage and security cover would need to be established.

If shrub-dominated communities were established in the Boulder Valley, it is not known whether mule deer would modify their traditional migratory patterns and utilize areas that are being avoided or receiving little use. However, based on observations that mule deer appear to be shifting their migratory routes and winter range use in response to displacement (i.e., from Dunphy Hills to Izzenhood and Sheep Creek ranges), it is conceivable they would occupy suitable habitat adjacent to that being removed or degraded by mining activities.

Establishment of shrub-dominated communities would also benefit other wildlife species. Increased density and diversity of vegetation would provide improved habitat for paserine birds, raptors, small mammals, and pronghorn antelope.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Wildlife resources are generally considered renewable. If wildlife habitat lost through construction and operation of the Bootstrap Project is reclaimed to pre-mining conditions after project completion, no wildlife resources would be irreversibly or irretrievably lost. Open pits would result in lands irretrievably lost to terrestrial wildlife use (264 acres). Although 264 acres of terrestrial habitat would be lost, aquatic habitat that would replace it could contribute to wildlife diversity in the area. Highwall crevices would create bat habitat and open water in the pit lake would provide water for drinking and over which bats could forage for insects. The lake created by the pit would likely provide a stable water source, particularly during drought years when springs and seeps are dry. Birds, because of their high mobility, would likely benefit from a stable water source.

The degree of habitat recovery after mining ceases would depend on success of reclamation. In some cases, reclamation would create habitat better in quality than that existing prior to mining (especially in areas where fire has created largely cheatgrass communities). However, it is probable that wildlife diversity would largely recover to pre-mining levels in the foreseeable future.

RESIDUAL ADVERSE EFFECTS

The Bootstrap Project mine pits (264 acres), because of their steep, unvegetated sidewalls, would constitute a potential hazard to wildlife. Even though the pits would be bermed, some mammals would enter and possibly drown.

When disturbed lands are revegetated following reclamation, they typically have more open ground initially as well as more introduced plant species and less plant diversity. In the short term (10 to 20 years), this vegetative cover tends not to support the same numbers and diversity of wildlife as the habitat that existed prior to disturbance. Ultimately, however, reinvasion of the reclaimed area by native plants can create habitat equal to that existing prior to mining.

AQUATIC HABITAT AND FISHERIES

SUMMARY

The Proposed Action would have negligible impacts on aquatic biota. Slight increases in sediment yield to Boulder, Rodeo, and Bell creeks from construction of roads and other facilities would occur. However, these changes would have minor impacts on aquatic habitat, which is already degraded by heavy livestock use of the streams and riparian zones.

Complete or partial backfilling of the Bootstrap/Capstone pit (Alternatives A-1 and A-2) would preclude development of two pit lakes and, therefore, eliminate the potential for the pit lakes to support aquatic life and fish. Alternative B (ore processing at North Area Leach Facility) and Alternatives C-1 and C-2 (off-site power supply) would have impacts similar to the Proposed Action.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Construction of mining facilities in Boulder Creek and in close proximity to Bell Creek would increase turbidity and suspended sediment levels in these streams, particularly following intense precipitation and surface runoff. However, because the only perennial sections of Boulder and Bell creeks are upstream of the proposed Bootstrap Project, potential impacts to aquatic biota would be limited to the spring runoff period. Sediment can directly affect fish and aquatic invertebrates by abrading gill tissues, silting in stream substrates, and forming deposits over aquatic habitats. Speckled dace populations would likely experience minor impacts due to increased sediment from mining activities. Because these native fish are currently exposed to high sediment loads during spring runoff and other high-flow periods, the localized, relatively small sediment increase resulting from the Proposed Action would likely have minor impacts.

Spills of toxic materials from vehicles and mining processes (e.g., fuel, lubricants, and cyanide) could enter Boulder and Bell creeks and kill speckled dace and aquatic invertebrates. The magnitude of impacts would depend on the nature and amount of material entering the aquatic ecosystem, season, and streamflow rate. Hazardous material handling and transportation procedures detailed in the Proposed Action would greatly reduce the potential for toxic spills and related incidents.

Alternatives A-1 and A-2

Complete or partial backfilling of the Bootstrap/Capstone pit would preclude development of two pit lakes, eliminating the potential for these lakes to support aquatic life and fish.

Alternatives B, C-1, and C-2

Implementation of these alternatives would have effects on aquatic habitat and fisheries similar to those described for the Proposed Action.

No Action Alternative

The No Action Alternative would eliminate adverse impacts on fish, aquatic habitat, or other aquatic organisms.

POTENTIAL MITIGATION AND MONITORING MEASURES

Increases in sediment should be reduced through rapid revegetation of disturbed areas and placement of silt screens adjacent to the streams. The stormwater permit and Pollution Prevention Plan should be periodically updated with best management practices to control sediment and erosion. Newmont's Spill Prevention, Containment, and Countermeasure Plan, with appropriate clean-up materials on-site, would reduce the potential for spills and limit environmental damage.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

There would be no irreversible or irretrievable commitment of resources that would affect aquatic life. Impacts from sediment or toxic spills may be evident for a few months or years. However, recolonization of affected stream reaches from downstream drift of aquatic invertebrates and fish would be relatively rapid.

RESIDUAL ADVERSE EFFECTS

There would be no residual adverse impacts on aquatic habitat and fisheries as a result of the Proposed Action.

THREATENED, ENDANGERED, AND CANDIDATE SPECIES

SUMMARY

No threatened, endangered, or candidate species or their habitat would likely be affected by the Proposed Action or alternatives because none are known to use habitat on or near the Bootstrap Project site. All of the alternatives would have impacts similar to those described for the Proposed Action.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Bald Eagle

Wintering bald eagles would be unaffected by the Proposed Action. A few wintering bald eagles are present along the Humboldt River, attracted to areas of open water by availability of prey (i.e., waterfowl and fish). Wintering bald eagles are mobile and will readily move to new wintering areas if prey becomes scarce or unavailable. Deer killed by vehicles in the vicinity of the Bootstrap Project could attract bald eagles, which might then become vulnerable to the same fate. Potential mortality to eagles could be reduced by removing road-killed deer and other animals from road rights-of-way and disposing of them where there would be little risk to eagles attracted to them.

Peregrine Falcon

Peregrine falcons would not be adversely affected by the Bootstrap Project.

Candidate Species

Direct impacts on some candidate species could result from habitat destruction or degradation, or displacement from habitat. Direct loss of sagebrush-grassland habitat would have only minor impacts on the pygmy rabbit because this habitat is abundant and widespread in the study area and in north-central Nevada. No known occupied habitat for this species would be affected by the proposed mine, but potential habitat (i.e., sagebrush-grassland) would be lost.

Bats could be affected by the project if water contaminated with cyanide or other toxic materials is accessible and attractive to them. Bats typically are attracted to ponds for drinking water or to forage on insects that typically are more numerous around water bodies. Bat populations could be affected positively by the pit lakes formed after mining if pit water quality is good.

Because habitat for candidate species is regionally widespread and accessible, impacts on candidate species would be minimal. The Bootstrap Project would not affect population viability of candidate species either locally or regionally.

Alternatives A-1, A-2, B, C-1 and C-2

Impacts on threatened, endangered, or candidate species as a result of these alternatives would be similar to impacts described for the Proposed Action.

No Action Alternative

The No Action Alternative would eliminate any adverse impacts on threatened, endangered, or candidate species.

POTENTIAL MITIGATION AND MONITORING MEASURES

No direct or indirect adverse impacts on threatened, endangered, or candidate species are anticipated as a result of the project. In addition, no critical habitat for these species is present in the project area. If any adverse impacts on threatened, endangered, or candidate species or critical habitat are revealed during mine operations, the USFWS, NDOW, and BLM would be notified.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

There would be no irreversible and irretrievable commitment of resources that would affect threatened, endangered, or candidate species.

RESIDUAL ADVERSE EFFECTS

There would be no residual adverse impacts on threatened, endangered, or candidate species.

GRAZING MANAGEMENT

SUMMARY

The Proposed Action would reduce livestock forage production on lands disturbed by mining. Following reclamation, livestock forage production would increase and eventually reach pre-mining levels, with the exception of permanent loss of 52 AUMs from 264 acres of unreclaimed mine pits.

Under current permitted grazing, all of the alternatives would have the same effect. For future grazing, complete backfilling of the Bootstrap/Capstone pit (Alternative A-1) would reestablish approximately 100 acres of reclaimed land for grazing use. Alternative A-2 (partial backfilling of Bootstrap/Capstone pit) and Alternative B (ore processing at North Area Leach Facility) would result in future grazing impacts similar to those described for the Proposed Action. Implementation of an off-site power supply (Alternatives C-1 and C-2) would have negligible impacts on grazing resources; however, if wildfires are started by downed power lines, areas of livestock forage could be adversely affected.

DIRECT AND INDIRECT IMPACTS

Proposed Action

The proposed Bootstrap Project potentially affects 258 AUMs on the T Lazy S Allotment and 8 AUMs on the 25 Allotment. However, grazing has been suspended since 1990 on the portion of the T Lazy S allotment located within the permit area due to mining activity in the area (BLM 1995a). The Proposed Action could affect the 25 Allotment if an unplanned interruption of livestock access to Boulder Creek occurs. Furthermore, an increase in traffic on Dunphy Road could result in increased livestock mortality. The Proposed Action is expected to cause no loss of AUMs on the 25 Allotment, but permanent loss of an estimated 52 AUMs resulting from excavation of two proposed mine pits would occur on the T Lazy S Allotment.

Five stock ponds with a combined area of less than 1 acre are within the project area boundary. Two stock ponds that catch and store runoff water would be directly impacted by construction of the Bootstrap/Capstone Waste Rock Disposal Facility. Another stock pond associated with existing mine disturbance would be impacted by the Bootstrap/Capstone pit. Proposed mine facilities may affect surface water flows to a fourth stock pond located in the Bell Creek drainage along the southern project area boundary. Surface water flow to the fifth stock pond has been eliminated by the Boulder Creek Diversion.

Additional range improvements that would be temporarily lost by the Proposed Action include fences and seeded rangeland (see Chapter 3, Grazing Management). Fencing to eliminate livestock from the project area would remain in place and be maintained to exclude cattle from the project area.

Alternative A-1

With complete backfilling of the Bootstrap/Capstone pit (Alternative A-1), an additional 100 acres of land surface would become available for grazing. The use of this land for grazing would depend on success of reclamation and the extent to which noxious weeds or unpalatable species proliferate there.

Alternative A-2

Partial backfilling of the Bootstrap/Capstone pit (Alternative A-2) would not result in additional land surface available for livestock grazing. This alternative would have the same impacts on grazing management as the Proposed Action.

Alternative B

Because grazing on the T Lazy S Allotment within the project area is currently suspended, Alternative B would have no effect on present AUMs. The number of AUMs that would need to be reestablished at the end of mining would be fewer than for the Proposed Action, because 165 acres of land would not be disturbed under this alternative.

Alternatives C-1 and C-2

Alternatives C-1 and C-2 (off-site power supply) would have negligible impacts on grazing resources. Although a small amount of livestock forage would be lost from power line and substation construction, this lost forage would be insignificant when compared to the local and regional forage resource. In the event wildfires are started as a result of accidental downing of power lines, relatively large amounts of livestock forage could be lost for one growing season and quality of forage could be adversely affected by increased amounts of poor quality plants replacing more palatable and nutritious grasses.

No Action Alternative

The No Action Alternative would not affect livestock grazing, since no disturbances beyond those already permitted would occur.

POTENTIAL MITIGATION AND MONITORING MEASURES

Access to Boulder Creek for cattle on the 25 Allotment would be maintained at the Boulder Creek diversion area. Any future fence relocation at this access point would not prevent access to Boulder Creek by livestock in the 25 Allotment. Furthermore, the stream channel diversion would not remove water flow from the access point. In the event that access to Boulder Creek near the diversion cannot be maintained, an alternative water source would be provided in the 25 Allotment within 1,000 feet of the current access point.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

If the Proposed Action is implemented, 264 acres of vegetation (52 AUMs) would be irreversibly lost as a result of unreclaimed pits. There would be an irretrievable loss of livestock grazing potential on areas to be reclaimed until vegetation is reestablished.

RESIDUAL ADVERSE EFFECTS

The potential for affected lands to support livestock grazing would be reduced due to the permanent unreclaimed mine pits.

RECREATION AND WILDERNESS

SUMMARY

The Bootstrap Project would result in fewer acres available for recreational use during operations and after cessation of mining. Increased population associated with construction of new facilities could impact existing campgrounds and result in increased use of recreational opportunities in the area. Local wildernesses would not be impacted by the Bootstrap Project, except possibly by increased visitation. Implementation of Alternatives A-2 and B would result in impacts similar to those of the Proposed Action. Complete backfilling of the Bootstrap/Capstone pit (Alternative A-1) would make available approximately 100 additional acres of land for recreational use after reclamation. Off-site power supply (Alternatives C-1 and C-2) would not cause any additional impacts to recreation and wilderness.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Recreation

The Proposed Action would increase the disturbance area of the Bootstrap Project by an additional 1,037 acres, 787 public acres and 250 private acres. This area would not be available for recreation until mining and reclamation were completed. However, the Bootstrap Project area is not intensively used for recreation and does not offer unique recreational opportunities. Because much of the area adjacent to the mining activity is being utilized for exploration, public access has been restricted for safety and security reasons. The BLM Elko Resource Area contains large areas of similar land available to the public for dispersed recreation.

Construction of the mine facilities would take about 1 year. The labor force would peak at about 110 employees with half coming from the local area. The majority of nonlocal employees would live in Carlin at the work camp or in Elko. Some temporary employees may live in campgrounds in the area, although BLM campgrounds have a 14-day use limit. Temporary use of campground facilities by construction workers would diminish the opportunity for use by recreationists. In addition, temporary employees living in Carlin or Elko could impact recreation in the area through increased hunting, fishing, camping, off-road vehicle (ORV) use, and other recreational activities. No additional employees are scheduled to be hired for the Bootstrap Project after construction is completed.

Wilderness

The closest wildernesses and wilderness study areas are over 30 miles away and would not be directly impacted by the Bootstrap Project. High-intensity lighting associated with mining activity could affect the sense of solitude experienced by visitors to the wildernesses when the glow is visible. However, the glow from the Bootstrap Project would not be discernible from other existing light sources in the North Operations Area.

Alternative A-1

Complete backfilling of the Bootstrap/Capstone pit would make available approximately 100 additional acres to recreational use.

Alternatives A-2, B, C-1, and C-2

Effects on wilderness and recreation resources from these alternatives would be similar to those described for the Proposed Action.

No Action Alternative

The No Action Alternative would result in no additional private or public land being disturbed by mining activities. Thus, 787 acres of public land would not be removed from the recreation base and there would be no additional impact on recreation in the area. The No Action Alternative would not affect local wildernesses or wilderness study areas.

POTENTIAL MITIGATION AND MONITORING MEASURES

No mitigation or monitoring for recreation or wilderness have been developed by the BLM.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Recreation and wilderness would not be irreversibly or irretrievably affected by the Bootstrap Project.

RESIDUAL ADVERSE EFFECTS

The only residual adverse effect of the Proposed Action on recreation would be loss of 264 acres associated with the mine pits. There would be no residual adverse effects on wilderness.

ACCESS AND LAND USE

SUMMARY

Land use in the Bootstrap Project area continues to change from ranching and grazing to mining. With the exception of a small portion of the 25 Allotment, the area is currently not used for livestock grazing. Recreational activities have been restricted at the project area since 1984 when active mining and exploration began. No impacts on water uses are expected as a result of the Bootstrap Project. Alternative A-1, backfilling of the Bootstrap/Capstone pit, would eventually restore approximately 100 acres of land to potential recreational uses. Alternative A-2 (partial backfilling of Bootstrap/Capstone pit) and Alternative B (ore processing at North Area Leach Facility) would result in impacts similar to those described for the Proposed Action. Alternatives C-1 and C-2 (off-site power supply) would require rights-of-way for the power line and substation on public land.

DIRECT AND INDIRECT IMPACTS

Proposed Action

The majority of the Bootstrap Project is on public land (787 acres) with 250 acres on private land. Public land use at the mine project would not change significantly from present uses in the area, which are evolving from ranching and grazing, to mining. Access along the Dunphy Road and Bell Creek/Antelope Creek roads would be maintained for mine exploration and other land uses. Recreational activity at this project has been limited since 1984 when active mining and exploration began. Grazing is currently being conducted on only a small portion of the Bootstrap Project area. Land ownership in the area would remain the same as with the Proposed Action.

No impacts on water uses or water rights in the Bootstrap Project area are expected because there would be no dewatering or water discharge associated with the project. In addition, the Boulder Creek diversion and mine pit interception of a portion of Boulder Creek are not expected to significantly affect groundwater levels or surface water flows in this project area. The mine pit lakes that would eventually develop at the Bootstrap Project may be available for water use with appropriate water rights.

Alternative A-1

Compared to the Proposed Action, complete backfilling of the Bootstrap/Capstone pit would make available approximately 100 additional acres for recreational or other land uses.

Alternatives A-2 and B

Impacts on land use and access in the Bootstrap Project area from these two alternatives would be similar to those described for the Proposed Action.

Alternatives C-1 and C-2

Off-site power supply would require acquisition of rights-of-way for the power substation and power lines when they are constructed on public land.

No Action Alternative

The No Action Alternative would result in no impacts from the Bootstrap Project area on land use and access.

POTENTIAL MITIGATION AND MONITORING MEASURES

No mitigation or monitoring for land use or access have been developed by BLM.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Pre-mining land use would be irreversibly and irretrievably lost in the mine pit areas (264 acres).

RESIDUAL ADVERSE EFFECTS

The steep walls of the mine pits would prevent the pit areas from returning to pre-mining land use. The remaining disturbed land would be reclaimed and restored to pre-mining land use.

NOISE

SUMMARY

The Bootstrap Project would result in an increase in noise generated by mining and ore-processing activities in the North Operations Area. However, the noise generated would not impact residential areas. Alternative A-1 (complete backfilling of Bootstrap/Capstone pit) would extend noise effects beyond the proposed project mine life as additional land would be subject to reclamation activities. Partial backfilling of the Bootstrap/Capstone pit (Alternative A-2) would have noise effects similar to those described for the Proposed Action. Haulage of ore to the North Area Leach Facility (Alternative B) would cause increased noise from greater truck traffic on the haul road. With both Alternatives C-1 and C-2 (off-site power supply), a decrease in noise would result because of the elimination of on-site diesel-powered generators.

DIRECT AND INDIRECT IMPACTS

Proposed Action

The major sources of noise from the Bootstrap Project would be the same as those from nearby mining and processing operations: rock drilling, blasting, loading of waste rock and ore, truck hauling, and ore crushing. The same types of equipment currently used in the North Operations Area would be used at the Bootstrap Project.

Development of the Bootstrap/Capstone and Tara pits, waste rock disposal areas, and leach facility would result in increased noise production. Large haul truck and dozer activity in the new waste rock disposal areas would add to the noise levels. Blasting noise in the pits would diminish over time, as the pits grow deeper and noise is attenuated by pit walls. Effects of noise on wildlife in the area is expected to be negligible (see Wildlife Resources section in this chapter).

Alternative A-1

Complete backfilling of the Bootstrap/Capstone pit would extend noise impacts several years beyond the proposed Bootstrap Project mine life because of the sequential mine development and additional land area that would be subject to reclamation.

Alternative A-2

This alternative would not alter the proposed operating schedule and therefore would result in noise levels similar to those described for the Proposed Action.

Alternative B

Haulage of ore to the North Area Leach Facility would create additional noise and noise sources; however, noise levels would be similar to those of the Proposed Action.

Alternatives C-1 and C-2

Implementation of an off-site power supply would result in a decrease in noise during operations due to elimination of on-site diesel powered generators. A temporary increase in noise levels could result from power line and substation construction.

No Action Alternative

Under the No Action Alternative, impacts from noise would not increase beyond current levels.

POTENTIAL MITIGATION AND MONITORING MEASURES

No mitigation or monitoring measures for noise have been developed by the BLM.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No resource would be irreversibly or irretrievably impacted by noise generated from the Bootstrap Project.

RESIDUAL ADVERSE EFFECTS

There would be no residual adverse effects on the environment from the noise generated during mining and ore-processing operations. When mining activity ceases, noise would be reduced to low levels associated with reclamation (recontouring and seeding) and then cease altogether.

VISUAL RESOURCES

SUMMARY

Visual impacts of the Proposed Action and alternatives were analyzed using procedures set forth in the Visual Contrast Rating Handbook (BLM 1986b). Changes in landscape from the Proposed Action and alternatives are compared with the characteristic landscape to determine the degree of contrast in form, line, color, and texture. If the degree of contrast does not meet the Visual Resource Management (VRM) System objectives, the project should be redesigned or mitigation measures proposed. As noted in Chapter 3, all of the project site is located on VRM Class IV land, which allows the greatest degree modification of the landscape by management activities. Implementation of Alternative A-1 and/or Alternative B would reduce the visual effects potentially created by the Proposed Action. Alternative A-2 would have effects on visual resources similar to those of the Proposed Action. Construction of a power substation and power lines for off-site power generation (Alternatives C-1 and C-2) would result in a slight increase in visual impacts.

DIRECT AND INDIRECT IMPACTS

Proposed Action

The primary impact of the Proposed Action would be large-scale modification of landforms. Angular, blocky forms and horizontal lines would create moderate contrasts with the natural rounded, rolling hills and ridges of the characteristic landscape.

Land clearing and construction of waste rock storage and leach facilities would expose soil and rock in a variety of colors ranging from light grayish tan to reddish tan to very dark gray. Contrast between these colors and those of the existing landscape would range from moderate in bright sunlight and when front-lighted, to weak in overcast conditions and when back-lighted.

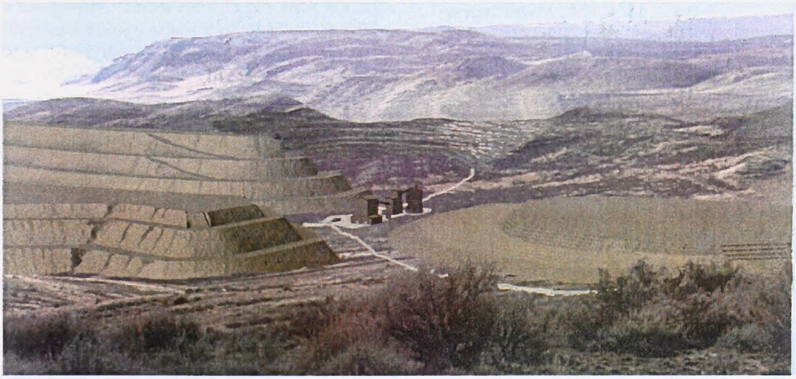
Clearing of vegetation in mine pit areas would create weak to moderate color contrasts with the existing landscape. New lines would be introduced delineating the edges of cleared areas and some change in texture would be seen, but overall contrast would be weak. Visual impacts of new structures would be small when compared with the visually dominant waste rock disposal areas and mine pits.

When viewed from KOP 1, the Proposed Action would contrast strongly with the existing landscape (**Figure 4-1**). The Tara pit highwall would be visible in the foreground. Behind the highwall, approximately 150 vertical feet of the Tara Waste Rock Disposal Facility would be visible. An end view of the Bootstrap/Capstone highwall would be seen to the north. New types of landforms, lines, colors, and textures would be introduced by the Proposed Action. Bold, angular forms, vivid color hues, and rough textures would offer strong contrasts with the existing landscape.

From KOP 2, the Bootstrap/Capstone pit and waste rock disposal facility would introduce moderate to strong contrasts in form, line, color, and texture with the existing landscape (**Figure 4-1**). The Bootstrap pit highwall would be visible in the foreground, creating moderate to strong contrasts in form, color, and texture. Bold, trapezoidal forms and horizontal lines would be introduced by the waste rock facility, creating moderate contrasts with the existing landscape. Exposure of unweathered soil and rock would create moderate contrasts in color with the characteristic landscape.

KOP1

KOP2



KOP3

Post-Mining Conditions From KOP1, KOP2, and KOP3
Bootstrap Project
FIGURE 4-1

All facilities associated with the Proposed Action would be visible in the foreground and middleground from KOP 3. The southern end of the Bootstrap/Capstone Pit highwall would be visible, creating moderate to strong contrasts in form with the existing landscape. Waste rock disposal facilities, leach pad, and ore crusher and maintenance buildings would introduce blocky, trapezoidal forms creating moderate to strong contrasts with the existing landscape (**Figure 4-1**). Visual impacts of the Proposed Action could be perceived as an extension of existing mining operations to the southeast. The Proposed Action would introduce visual elements that contrast strongly with undisturbed distant mountain and basin views, especially to the south and southwest.

Figure 4-2 depicts the post-reclamation landscape as viewed from KOPs 1, 2, and 3. Reclamation would reduce visual contrast of the Proposed Action.

Alternative A-1

Complete backfilling of the Bootstrap/Capstone pit would result in a negligible reduction in visual impacts as viewed from KOP 2. Reductions in visual impacts as viewed from KOPs 1 and 3 would be greater. From KOP 1, the Tara Waste Rock Disposal Facility would become less visually dominant than the Tara pit highwall. Visual impacts would, however, remain moderately strong. From KOP 3, the Tara Waste Rock Disposal Facility would become less visually dominant. The Bootstrap/Capstone pit highwall would remain and would continue to be visually dominant.

Alternative A-2

Partial backfilling of the Bootstrap/Capstone pit would have minimal changes in overall visual impacts from the Proposed Action. Negligible changes in the size and height of the Tara Waste Rock Disposal Facility would result. The east-facing highwall of the Bootstrap/Capstone pit would still be visually dominant.

Alternative B

Elimination of the heap leach pad would reduce visual impacts as seen from KOP 3. Because the leach heap would be located in a low-visibility area between the Bootstrap/Capstone Waste Rock Disposal Facility and the large hill east of the project site, changes to the visual character of the project would be minimal. This would result in a minor reduction in the overall scale of the earthen structures as seen from KOP 2. The heap leach pad would be the closest structure to the viewer when viewed from KOP 3, and would be viewed from a superior vantage point. The reduction in scale of earthen structures would be greater from this KOP.

Alternatives C-1 and C-2

Construction of a substation near the existing SPPC power line in the Boulder Valley just west of the Bootstrap Project area would result in a slight increase in visual impacts when viewed from KOPs 1 and 3. The substation and power line would be visible in the middleground from KOP 1 and some power poles would be silhouetted against the sky. From KOP 2, the power line extension to the security office would be visible in front of the Bootstrap/Capstone Waste Rock Disposal Facility. Increases in visual contrasts would be insignificant. From KOP 3, Alternative C-1 would create a minimal increase in visual contrasts when compared to other, more visually dominant facilities. Alternative C-2 would create no additional visual contrast when viewed from KOP 3.

No Action Alternative

Under this alternative, no visual impacts would occur at the Bootstrap Project site beyond those already present.

POTENTIAL MITIGATION AND MONITORING MEASURES

Mitigation measures have been developed to minimize visual impacts. The objective is to reduce visual contrasts based on three concepts: 1) siting of facilities in less visible areas; 2) minimizing disturbance; and 3) repeating the basic elements of form, line, color, and texture.

In addition to measures included in the Proposed Action, the following measures have been developed by BLM to minimize visual impacts of the Proposed Action and alternatives:

- Slope gradients on embankments (between 3.0H:1.0V and 2.3H:1.0V) could be varied to create diversity of form and reflect the naturally rolling, rounded forms of the existing topography.
- Clearly defined construction limits should be established, including the use of irregular shapes that reflect existing forms and patterns.
- Revegetation should be planned so that colors and textures blend with undisturbed lands.
- Visual contrast of structures with natural forms could be minimized by using colors which blend with the land rather than the sky and by using finishes with low levels of reflectivity.
- Blasting of selected benches within the pit highwalls would breakup horizontal lines and reduce visual impacts of the benches.
- Painting structures a slightly darker color than the surrounding landscape could compensate for the effects of shade and shadow.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irretrievable commitment of visual resources would occur during the active mining period and until reclamation is successful. Impacts on visual resources would be reduced through implementation of reclamation and mitigation measures.

RESIDUAL ADVERSE EFFECTS

Following successful reclamation, the most noticeable residual adverse effect of the Proposed Action would be the Bootstrap/Capstone and Tara pits. Portions of the upper slopes of the Tara pit could be visible from KOP 1 (**Figure 4-2**). A large portion of the Bootstrap/Capstone pit highwall could be visible from KOPs 2 and 3 (**Figure 4-2**). Contrasts in form, line, and color would remain. Weak contrasts would result from the prismoidal forms and straight lines of the reclaimed waste rock disposal embankments and leach pad. Finer and more uniform soils in these areas would also create weak contrasts in texture with the existing landscape.

CULTURAL RESOURCES

SUMMARY

Fifty-six cultural heritage sites have been recorded in the Bootstrap Project area and haul road. Sixteen of these sites, all prehistoric lithic scatters, are recommended eligible for inclusion in the National Register of Historic Places (NRHP). Because of current mining and exploration in the area around the Bootstrap Project, most adjacent lands have been inventoried for cultural resources. The area has a relatively high prehistoric site density, particularly along the water drainages. The Tosawihi chert quarries (about 12 miles from the Proposed Action) have drawn Native American groups to this area for thousands of years, a factor which adds to the generally high site density.

Implementation of Alternatives A-1 and A-2 (complete or partial backfill of Bootstrap/Capstone pit) would result in the same impacts on cultural resources as the Proposed Action. Alternative B (ore processing at North Area Leach Facility) would reduce the impact on cultural resources by reducing the amount of land that would be disturbed. Construction of a power substation and power lines for an off-site power supply (Alternatives C-1 and C-2) would not affect NRHP - eligible sites in the area of potential effect; however, the power substation, access road, and power poles in the Boulder Valley just west of the Bootstrap Project Area will possibly effect five prehistoric sites, two of which (CrNV-12-2261 and -2262) are recommended eligible to the NRHP under Criterion 'd'.

KOP1

KOP2

KOP3

Post-Reclamation Conditions From KOP1, KOP2, and KOP3
Bootstrap Project
FIGURE 4-2

DIRECT AND INDIRECT IMPACTS

Proposed Action

Fifty-six sites and 55 isolates have been recorded in the Bootstrap Project area, which includes the area of potential effect (APE). Sixteen of these sites are recommended eligible for the NRHP under Criterion 'd'; 11 of these sites appear to be within areas proposed for disturbance by the Proposed Action. One eligible site (CrNV-12-7946) would be impacted by the Bootstrap/Capstone pit. The Tara waste rock disposal area would disturb one NRHP eligible site (CrNV-12-11641). The leach facility/maintenance complex would impact four sites recommended as eligible: CrNV-12-7103, -7921, -7924, and -7940. The haul road, both inside the project area and outside the block area to the southeast, has the potential to impact eligible sites CrNV-12-7345, -7364 and -7368. Construction of the security office and improvements to the access road would adversely effect sites CrNV-12-12289 and -10448 respectively. **Table 3-22** in Chapter 3, Cultural Resources, lists the cultural sites and NRHP eligibility.

Alternatives A-1 and A-2

Implementation of these alternatives would have impacts on cultural resources similar to those described for the Proposed Action.

Alternative B

Six prehistoric archaeological sites, three of which are NRHP eligible, would not be disturbed if Alternative B is implemented because the Bootstrap Heap Leach Facility would not be constructed under Alternative B.

Alternatives C-1 and C-2

No NRHP-eligible archaeological sites within the area of potential effect would be disturbed if Alternative C-1 or C-2 are implemented. However, the proposed substation, access road, and power poles in the Boulder Valley just west of the Bootstrap Project Area would possibly effect five prehistoric sites, two of which (CrNV-12-2261 and -2262) are recommended eligible to the NRHP. One of these sites is Protohistoric with possible Numic associations. On-going consultation with the Western Shoshone will include these alternatives prior to any surface disturbance.

No Action Alternative

The No Action Alternative would result in no impacts on NRHP-eligible sites.

POTENTIAL MITIGATION AND MONITORING MEASURES

Of the 16 sites within the area of potential effect recommended eligible for the NRHP, 11 would be impacted by the Proposed Action. Data recovery plans have been prepared by P-III Associates and will be implemented prior to surface disturbance as part of the Section 106 process.

Cultural sites that would be impacted by construction of the haul road and security office could be avoided by modifying these facility locations.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Any disturbance that results in destruction of cultural resources constitutes an irreversible and irretrievable commitment of resources. Many sites would be lost as a result of the Proposed Action, but information gained from inventory and analysis of these sites has been added to the archaeological record. Mitigation through data collection of the four NRHP-eligible sites would provide additional information.

RESIDUAL ADVERSE EFFECTS

The Proposed Action would affect numerous cultural resources but because of the general disturbance from previous mine construction and ongoing operations, there would be no additional residual adverse effects on cultural resources of the area. Construction of new access roads often has residual adverse effects, since roads provide unauthorized artifact collectors access to cultural resources that might otherwise remain inaccessible. However, extensive mine development in this area has resulted in professional inventory of large areas. There would be no residual adverse effects on cultural resources from the Proposed Action.

NATIVE AMERICAN RELIGIOUS CONCERNS

SUMMARY

Impacts on Western Shoshone tribes from the Bootstrap Project were assessed through review of historic and ethnographic literature and discussions with Western Shoshone leaders and individuals knowledgeable about traditional ways. The analysis evaluated impacts of the Proposed Action in relation to Western Shoshone traditional values, practices, and properties. While ethnographic inquiry did document general issues of concern (see Chapter 3, Native American Religious Concerns), it was determined that 1) current use of the area of potential effect for the practice of traditional beliefs appears to be nonexistent; and 2) no cultural properties currently identified within the Bootstrap area appear to fit the formal definition of traditional cultural properties (National Register Bulletin 38, Guidelines for Evaluating and Documenting Traditional Cultural Properties). Implementation of any of the alternatives would have impacts on Native American Religious Concerns similar to those of the Proposed Action.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Although there are no known traditional cultural properties within the area of potential effect, the Proposed Action would impact Western Shoshone traditional values through: 1) disturbance of the land, thus affecting the Little Men and animal spirits important to perpetuation of game animals; and 2) collection of artifacts that may be powerful or items of significance (e.g., knives or projectile points of Tosawihi chert). Although many artifacts would be removed by archaeologists, the Tosawihi chert artifacts do not meet the definition of "sacred objects" under the Native American Graves Protection and Repatriation Act (NAGPRA); consequently, there would be no impact under the terms of NAGPRA.

The Shoshone-Bannack Tribe (Sho-Ban) of Fort Hall have expressed concerns that deposits of white, rhyolitic tuff used for medicine and paint may be within the area of potential effect. Geological evaluation of the area did not reveal deposits of rhylotic tuff in the project area. Because there are no deposits of rhyolitic tuff, there would be no impact.

Alternatives A-1 and A-2

Complete or partial backfilling of the Bootstrap/Capstone pit would have the same effect on Native American religious concerns as described for the Proposed Action.

Alternative B

Although this alternative (elimination of the heap leach facility) would leave six archaeological sites undisturbed, it would have minimal effect on lessening the overall impact of the Bootstrap Project on Western Shoshone traditional values.

Alternatives C-1 and C-2

Utilization of an off-site power supply would have the same effects to Native American populations as the Proposed Action. However, it is not known if archaeological sites or Traditional Cultural Properties are located outside the area of potential effect where the proposed power substation, access road, and some power poles would be sited. This area would be subject to inventory, compliance with the National Historic Preservation Act (Section 106 Process), and additional consultation with the tribes prior to surface disturbance.

No Action Alternative

The No Action Alternative would result in no further impacts on Newe/Western Shoshone traditional values, practices, properties, human remains, and cultural items.

POTENTIAL MITIGATION AND MONITORING MEASURES

The Proposed Action may have adverse effects on Newe/Western Shoshone traditional practices that cannot be mitigated. Land disturbance would disrupt animal movement over the area. Some significant plant species may be impacted, but because of past grazing activity, most plants of importance to the Newe/Western Shoshone are rarely encountered. Land disturbance from mining would disrupt "puha" - a spiritual power important to the well-being of the Newe people - and this cannot be regained through reclamation. Removal of items of significance, although not sacred objects under the definition in NAGPRA (43 CFR 10.2(b)(5)), could be partially mitigated by having tribal representatives review and possibly curate these items.

If outcrops of the proper rhyolitic tuff are discovered within the area of potential effect, the tribes should assist in evaluating their significance and the sites should be recorded as Traditional Cultural Properties under Section 106.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Although there are no known traditional cultural properties within the area of potential effect and the area has already been disturbed by many gold mines, the Proposed Action would impact Western Shoshone traditional values by affecting the Little Men and animal spirits believed important to perpetuation of game animals. Collection of artifacts by archaeologists (e.g., knives or projectile points of Tosawihi chert) would be an irreversible commitment of these resources. Although not sacred objects under NAGPRA, the items are of concern to some tribal individuals. Collection of artifacts could be mitigated by allowing interested tribal parties to review and curate items if appropriate.

RESIDUAL ADVERSE EFFECTS

Residual adverse effects on Newe/Western Shoshone traditional values, practices, properties, or human remains and cultural items would result from land disturbance, much of which has been caused by previous mining development and operations. Newmont's proposed security measures for the project area would reduce the potential for adverse effects on cultural resources from disturbance by unauthorized persons.

SOCIAL AND ECONOMIC VALUES

SUMMARY

Newmont anticipates no additional permanent employees would be hired for the 7-year operational phase of the Bootstrap Project; however, contract construction workers would be hired for the 1-year construction phase. Equipment and personnel from Newmont's North Operations Area would be utilized for the Bootstrap Project. Between the second and third quarters of the construction phase, the projected peak number of construction workers would be 110, of which an estimated 50 percent would be hired from the local labor force (Conger 1995b).

Positive impacts under the Proposed Action and Alternatives would include continuation of direct employment in the mining industry and secondary employment in the retail and service sectors in the study area. Income would be generated from wages paid by Newmont at the Bootstrap Project and by secondary employers within the study area communities. Property taxes and net proceeds of mining taxes paid by Newmont for the Bootstrap Project would be collected by local and state jurisdictions. Negative impacts under the Proposed Action and Alternatives would be further stress on community service providers and housing in the area during the construction phase. However, since only a small number of construction workers are expected to be hired outside the local labor area and no additional employees for operations are anticipated, negative impacts would be minimal.

Under the No Action Alternative, operations from Newmont's currently permitted mines could cease by year 2001; however, approval of the Bootstrap Project would allow open-pit mining to continue in the North Operations Area until 2003. Early closure of mining and ore-processing operations would create negative impacts, such as increased unemployment, reduced wages spent in the local economy, decreased revenues to local and state jurisdictions, increased stress on public assistance programs, and decreased quality of life of some residents.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Impacts on socioeconomic resources occur when a significant number of workers and their families move into an area as a result of jobs either directly or indirectly created by mine development. Since relatively few employees outside of the local labor market would be needed for construction and no additional employees would be hired for operation activities, few people are expected to move into the area due to the Bootstrap Project. If necessary to alleviate the stress on temporary housing for contract construction workers, Newmont would offer housing in the Carlin workers camp. Therefore, negative impacts on socioeconomic resources such as community services, housing, and social well-being would be minimal. No significant economic or social impacts would result from moderate changes in livestock grazing conditions, wildlife habitat, or recreational use.

Positive impacts under the Proposed Action would be continuation of direct employment by Newmont and secondary employment in some area retail and service sectors. Salaries paid to workers employed at the mine and other economic sectors induced by the mining operation, as well as sales taxes paid by workers spending their salaries in local businesses, would continue. The annual payroll for the Bootstrap Project is estimated to be $10.6 million and the contract construction payroll would be approximately $4 million (Conger 1995b). Property taxes and net proceeds of mining taxes paid by Newmont for the Bootstrap Project would benefit local and state jurisdictions. An estimated $20 million would be spent by Newmont Gold Company for construction materials for the leach pad, crushers, carbon columns, and ancillary facilities (Conger 1995b). Continued employment opportunities as a result of the project would allow workers and their families to maintain their existing quality of life.

Alternatives A-1, A-2, and B

Implementation of any of these alternatives would result in impacts similar to those described for the Proposed Action.

Alternatives C-1 and C-2

Construction of a power substation and power lines specific to provide off-site electricity to the mine and ancillary facilities would result in no impacts to socioeconomic resources. Since Newmont would be responsible for paying for the substation and power line, no rate increases would be passed on to SPPC customers.

No Action Alternative

Negative socioeconomic impacts under the No Action Alternative would include increased unemployment, less money spent in the local economy, decreased revenues to local and state jurisdictions, increased stress on public assistance programs, and decreased quality of life of some residents. Less stress on housing and community services would be positive impacts under the No Action Alternative; however, housing impacts from the few contract construction workers expected to move into the area as a result of the Bootstrap Project would be minimal.

POTENTIAL MITIGATION AND MONITORING MEASURES

No mitigation measures have been developed by BLM; however, local, county, and state governments, BLM, and Newmont could collectively plan and implement measures to mitigate socioeconomic impacts resulting from the Bootstrap Project.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

There would be no irreversible and irretrievable commitment of socioeconomic resources associated with the Proposed Action or alternatives.

RESIDUAL ADVERSE IMPACTS

Residual adverse impacts would be as described under direct and indirect impacts.

CUMULATIVE EFFECTS

Introduction

This section summarizes the cumulative environmental impacts on resources in the Carlin Trend that could result from the Proposed Action. As stated in 40 CFR 1508.7, "...'cumulative impact' is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency [Federal or non-Federal] or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time... ."

Cumulative effects address direct and indirect impacts of those resource areas described earlier in this chapter. Cumulative effects analyses do not consider mitigations that may be required by BLM or other agencies for individual actions.

The geographic cumulative effects area referred to in this section varies depending on the resource being discussed. **Figure 4-3** depicts the general area for most resources for which cumulative effects have been evaluated. The Carlin Trend, an area of intense mine development, is the central feature of the cumulative effects area. The area is generally bounded on the northwest by the Hollister Mine and on the southeast by the Rain Mine.

Past and Present Activities

Mining and livestock grazing have been and continue to be dominant land use activities on both private and public lands in the cumulative effects area. Ranching activities include development of springs and groundwater resources for livestock watering, fencing, installation of windmills, development of irrigated pasture, and diversion of both groundwater and surface water for irrigation. Livestock grazing has been excluded from mining areas extending from Newmont's Mill #1 to the Bootstrap area (see **Figure 4-3**).

Mining activities in the cumulative effects area include exploration (drilling, trenching, sampling), development of underground mines, open-pit mining, waste rock disposal, ore milling and processing, tailings disposal, heap leaching, dewatering/discharging, and reclamation. Historic mining activity is discussed in Chapter 2.

New or upgraded power lines have been constructed in the cumulative effects area to supply energy for mining activities. Access roads constructed along power line corridors facilitate inspection and construction.

Reasonably Foreseeable Activities

Foreseeable activities within the cumulative effects area include mine development, mineral exploration, mined-land reclamation, livestock grazing, wildlife habitat restoration, transmission line and substation construction, and aquatic habitat restoration. These land uses are expected to continue into the future at varying levels of activity.

Mining Activities

Mining is expected to continue as a major activity in the Carlin Trend. **Figure 4-3** shows locations of existing and reasonably foreseeable mining and exploration sites in the North Operations Area. This figure includes locations of 13 existing and reasonably foreseeable mining operations, four exploration areas not included in an existing mining area, and five known but undeveloped gold deposits.

The boundaries shown in **Figure 4-3** for the mining operations delineate areas where disturbance has occurred or is expected to occur. These boundaries represent the outer limits of major surface disturbance but do not imply that all the area within the boundaries would be disturbed. Acreages for existing and reasonably foreseeable mining disturbances are listed in **Table 4-11**.

TABLE 4-11
Existing and Reasonably Foreseeable Mining Disturbance in the Carlin Trend

Map Reference Number	Facility Name	Existing[1] and Reasonably Foreseeable Mining Disturbance (Acres)				Comments and Source of Acreage Information.
		Pre-1981	1981-1994	1995-2006	Total	
1	Newmont - Hollister Mine	0	342	0	342	Inactive gold mine. (Conger 1995c)
2	Baroid - Rossi Mine	100	183	0	283	Active barite mine, currently under exploration for gold. (BLM 1993)
3	Dee Gold Mining Co. - Dee Gold Mine	0	1,032	423	1,455	Active gold mine. (BLM 1993c; Stadelman 1995)
4	Newmont - Bootstrap Project	234	0	1,037	1,271	Proposed gold mine in review; involves reopening Bootstrap pit and opening Tara pit. (Newmont 1995a)
5	Homestake Mining Co. - Ren Mine	0	62	0	62	Inactive mine and heap leach facility; closure and reclamation in progress. (BLM 1993a Stadelman 1995)
6A 6B	Barrick - Betze/Post and Newmont Mine TS Ranch Reservoir	0	5,509 494	446 0	5,955 494	Active gold mine with dewatering. (BLM 1991). Catchment reservoir for water discharge from Betze/Post Mine. (BLM 1990)
7	Barrick - Meikle Mine	0	92	0	92	Underground gold mine with dewatering. (BLM 1993b).
8	Newmont - Post/Mill #4 & Tailing Impoundment #1	0	197	0	197	Existing mill and tailing facility. (Conger 1995c)
9	Newmont - Blue Star/Genesis Mine, Section 36 Project (North Star, Bobcat, Payraise, Sold and Beast Pits), and Deep Star underground mine	200 0	1,043 171	0 586	1,243 757	Active open-pit gold mines. (BLM 1995b)
10	Newmont - North Area Leach Facility	0	494	100[2]	594	Existing and foreseeable expansion to leach pad facility. (Conger 1995c)
11	Newmont - Mill #4 Tailing Impoundment #2	0	280	200[2]	480	Existing tailing facility and foreseeable ancillary facilities. (Conger 1995c)
12	Universal Gas - Bullion Monarch Mine	50	0	0	50	Inactive mine, mill and tailing facility; closure and reclamation in progress. (BLM 1993a)
13	Newmont - Carlin Mine/Mill #1 and underground mine	900	1,399	0	2,299	Active gold mine. (Conger 1995c)
14 14A 14B 14C	Newmont- South Operations Area Project (SOAP) - SOAP Mine - Maggie Creek Ranch Reservoir - North Area Haul Road	 0 0 0	 4,745 176 189	 1,155[1,2] 0 0	 5,900 176 189	Active gold mine with dewatering. (BLM 1993a; Conger 1995c)
15	Newmont - Rain and SMZ Mine/Mill #3 and underground mine	0	503	50	553	Active gold mine. (Conger 1995c)

TABLE 4-11 (continued)
Existing and Reasonably Foreseeable Mining Disturbance in the Carlin Trend

Map Reference Number	Facility Name	Existing[1] and Reasonably Foreseeable Mining Disturbance (Acres)				Comments and Source of Acreage Information.
		Pre-1981	1981-1994	1995-2006	Total	
17	North Area Bioleach Facility	0	0	600[2]	600	Foreseeable gold leach operation. (Conger 1995c)
23	FMC Gold - Rossi (Storm) Deposit	0	0	100[2]	100	Foreseeable underground mine and facilities. (BLM 1993d; Stadelman 1995)
24	Newmont - Leeville Deposit	0	0	100[2]	100	Foreseeable underground mine and facilities. (Conger 1995c)
25	Newmont - Lantern Mine	0	0	600[2]	600	Open pit gold mine and foreseeable expansion. (Conger 1995c)
26	Newmont - Pete Deposit	0	0	600[2]	600	Foreseeable open pit gold mine and leach operation. (Conger 1995c)
30	Newmont - Emigrant Springs Deposit	0	0	400[2]	400	Foreseeable open pit gold mine operation. (Conger 1995c)
TOTAL		1,484	16,911	6,397	24,792	

[1] Projects permitted by BLM as of 12/31/94.
[2] Acreages for reasonably foreseeably disturbances (1995-2006) are estimates subject to change upon submittal of the actual proposal.

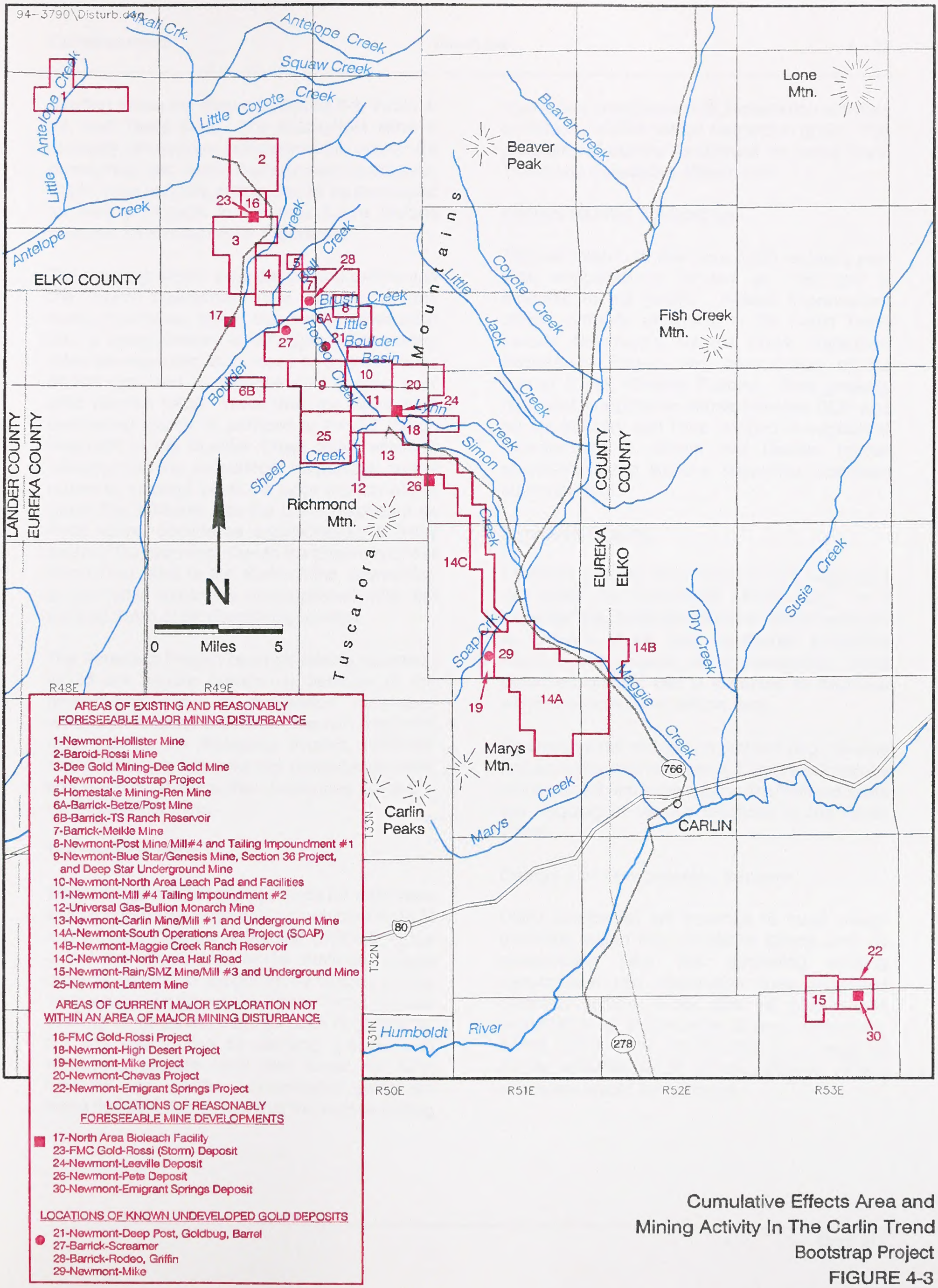
Note: Exploration projects are shown in **Figure 4-3** that total 322.5 acres (Chevas = 121.5 acres; Mike = 42.5 acres; Tara = 69.0 acres; High Desert = 46.3 acres; Emigrant = 8.2 acres; Rossi = 35.0 acres).

Disturbances related to mine development include mine pits, processing facilities, heap leach pads, waste rock disposal facilities, tailings impoundments, haul roads, and administrative offices. Exploration on undisturbed land is not necessarily included within the boundaries shown in **Figure 4-3**. Acreages of open-pit disturbance not scheduled for reclamation are listed in **Table 4-12**.

TABLE 4-12
Existing and Reasonably Foreseeable Mining Disturbance in the Carlin Trend from Open-Pits Only

Map Reference Number	Facility Name	Existing[1] and Reasonably Foreseeable Mining Disturbance for Open-Pits Only (Acres)				Comments and Source of Acreage Information
		Pre-1981	1981-1995	1995-2006	Total	
1	Newmont - Hollister Mine	0	54	0	54	Inactive gold mine. (Conger 1995c)
2	Baroid - Rossi Mine	0	80	0	80	Active barite mine, currently under exploration for gold. (Stadelman 1995)
3	Dee Gold Mining - Dee Gold Mine	0	162	86	208	Active gold mine. (BLM 1993e; Stadelman 1995)
4	Newmont - Bootstrap Project	59	0	205	264	Proposed gold mine in review; involves reopening Bootstrap pit and opening Tara pit. (Newmont 1995a).
5	Homestake - Ren Mine	0	5	0	[illegible]	Closed mine and heap leach facility; closure and reclamation in progress. (Stadelman 1995)
6A	Barrick - Betze/Post Mine	0	1,302	0	1,302	Active gold mine with dewatering. (BLM 1991)
7	Barrick - Meikle Mine	0	2	0	0	Underground gold mine with dewatering. (BLM 1993).
9	Newmont - Blue Star/Genesis Mine and Section 36 Project (North Star, Bobcat, Payraise, Sold and Beast Pits)	50 0	506 0	0 420	556 420	Active open-pit gold mines. (BLM 1995b; Conger 1995c).
12	Universal Gas - Bullion Monarch Mine	6	0	0	6	Inactive mine, mill and tailing facility; closure and reclamation in progress.
13	Newmont - Carlin Mine	100	28	0	128	Active gold mine. (Conger 1995c)
14A	Newmont- South Operations Area Project (SOAP)	0	815	150[2]	965	Active gold mine with dewatering. (BLM 1993a; Conger 1995)
15	Newmont - Rain and SMZ Mine	0	99	0	99	Active gold mine. (Conger 1995c)
23	FMC Gold - Rossi Project	0	0	0	0	Foreseeable underground mine. (Stadelman 1995)
24	Newmont - Leeville Mine	0	2	0	0	Foreseeable underground gold mining operation. (Conger 1995c)
25	Newmont - Lantern	0	0	200[2]	200	Permitted gold mine and foreseeable mine expansion. (Conger 1995c)
26	Newmont - Pete Mine	0	0	150[2]	150	Foreseeable open pit gold mine and leach operation. (Conger 1995c)
30	Newmont - Emigrant Springs Deposit	0	2	150[2]	100	Foreseeable open pit mining operation. (Conger 1995c)
TOTAL DISTURBANCE ACRES FROM OPEN PITS ONLY		215	3,051	1,311	4,577	

[1] Projects permitted by BLM as of 12/31/94.
[2] Acreages for reasonably foreseeable disturbances (1995-2006) are estimates subject to change upon submittal of the actual proposal.



Cumulative Effects Area and Mining Activity In The Carlin Trend
Bootstrap Project
FIGURE 4-3

Existing mines are shown in **Figure 4-3**, **Table 4-11**, and **Table 4-12**. The Betze/Post Mine is currently undergoing environmental review for dewatering and water management operations. Exploration projects anticipated to be developed as mining projects in the near future include numbers 16 through 20 in **Figure 4-3**.

The most significant mine dewatering program in the North Operations Area occurs at the Betze/Post Mine, where the current dewatering rate is approximately 40,000 gpm. Dewatering rates are expected to increase to approximately 60,000 gpm and to continue until at least year 2006 (Barrick 1995). Water from the Betze/Post dewatering system is pumped to the TS Ranch Reservoir in the Boulder Creek Basin where it infiltrates into the subsurface, evaporates, and is routed to irrigated lands. A large portion of the water that infiltrates into the basin reappears as three spring complexes approximately 5 miles south of the reservoir. Due to the proximity of the Betze/Post Mine to the Meikle Mine, dewatering at the latter would be accomplished with the existing Betze/Post dewatering system.

The Bootstrap Project open-pit mining operation would not require dewatering because of the groundwater cone of depression developed around the Betze/Post Mine. The two proposed mine pits at the Bootstrap Project, however, would ultimately intercept the groundwater table and develop pit lakes after dewatering ceases at the Betze/Post Mine.

Terrestrial Wildlife

Winter range rehabilitation projects for mule deer and pronghorn antelope being conducted by BLM and Nevada Division of Wildlife (NDOW) in the cumulative effects area would continue. These projects, which are supported by various mining companies throughout the Carlin Trend, include seeding of rangeland that has been degraded by fire and overgrazing by planting grasses and shrubs to provide food and cover for both livestock and wildlife. Cooperative plans are being developed to ensure that the various mining operations coordinate their reclamation activities to achieve wildlife habitat restoration goals. This program will expand to address the entire Carlin Trend and cumulative effects area.

Fishery Habitat Restoration

The Lahontan cutthroat trout (LCT) recovery plan was completed in January of 1995 and is available to the public. Habitat improvement efforts currently underway in the Carlin Trend include Newmont's Maggie Creek Watershed Restoration Project and construction of the Beaver Creek Riparian Pasture. Both projects represent cooperative efforts between BLM and private industry and have resulted in substantial improvement in stream and riparian habitat conditions along streams supporting Lahontan cutthroat trout.

Livestock Grazing

Livestock grazing will continue to be a major land use within the cumulative effects area. It is expected that grazing allotments will be managed at present levels and additional rangeland improvement projects will be conducted. Total permitted grazing use is expected to decrease within the cumulative effects area.

Riparian habitat restoration projects (e.g., fencing and stockwater development) to improve livestock management and enhance riparian/wetland areas are ongoing at various locations in the Carlin Trend.

Energy and Transmission Systems

Utility companies will continue to meet energy demands within the cumulative effects area by constructing new and upgrading existing transmission and distribution lines. Increased electrical service in the area will also require modification or construction of new substations. Some power lines constructed as a result of mining activities would remain following mining and some would be removed.

Cumulative Effects Analysis

Geology and Minerals

The cumulative effects area for geology and mineral resources depicted in **Figure 4-3** incorporates existing and reasonably foreseeable mining activity through year 2006. The area included in this analysis includes the Carlin Trend and extends from the Rain Mine in the southeast to the Hollister Mine in the northwest.

Because gold mining is a major activity in the Carlin Trend, it is reasonable to assume that large-scale mining will continue and result in creation of open pits, underground mines, waste rock disposal areas, heap leach pads, milling and tailings storage facilities, and administrative offices. Future exploration may also result in delineation of deeper oxide and refractory ore zones that would require dewatering systems for economical recovery of ore. It is difficult to quantify the total volume of ore, waste materials, and gold that could be economically excavated from the Carlin Trend in the future; however, it is estimated that 60 million ounces of gold reserves have been delineated.

Topography of the area will continue to be modified as a result of mine excavation and waste rock and tailings disposal. Continued mining may afford the opportunity to backfill mined-out pits with waste rock from future operations. Such opportunities would be judged individually and based upon accessibility as well as influence on future mining activities. Backfilling and subsequent reclamation would restore land to pre-mining uses.

Paleontological Resources

The cumulative effects area for paleontological resources includes areas potentially disturbed by mining activities through year 2006 (**Figure 4-3**). Vertebrate fossils occur primarily in Tertiary- and Quaternary-age sediments, whereas invertebrate fossils are more common in Paleozoic-age sedimentary rocks. Because of the greater abundance of vertebrate fossils, open-pit mining intercepting Tertiary-age sediments would have the greatest potential for impacting paleontological resources. Other mining-related excavations (e.g., leach pads and waste rock disposal areas) are shallow and would primarily affect unconsolidated soil surfaces.

Air Resources

The cumulative effects area evaluated for air resources includes the area between the Dee Gold Mine and Newmont Mill #1. Mining activities are the principal sources of air pollutants in the cumulative effects area, generating both particulate and gaseous pollutants.

Fugitive emission sources include drilling, blasting, loading, hauling, and dumping of barren rock and ore. These sources produce both particulates and gaseous pollutants. Fugitive particulates are generally large, suspended particulates that are removed from the air very near the emission source through gravitational settling. Fugitive gaseous pollutants from vehicle exhaust and blasting, along with fine particulates, are transported long distances downwind. However, these pollutants become dispersed during transport and eventually are removed by settling or by precipitation.

Because of control measures required as conditions of an NDEP air quality operating permit, point source emissions (generally fine particulates and some gaseous pollutants) are low compared with fugitive emissions. Point source emissions, like fugitive emissions, are transported long distances downwind and eventually removed.

Air monitoring in the cumulative effects area has demonstrated pollutant concentrations are well within ambient air quality standards. Within the cumulative effects area, no additional degradation of existing air quality is anticipated as a result of the Proposed Action.

Water Quantity and Quality

The cumulative effects area evaluated for water resources consists of the general area shown in **Figure 4-3** from the Rain Mine to the Hollister Mine in the Carlin Trend. Most existing and reasonably foreseeable mines in the Carlin Trend contribute or would contribute to water resources impacts, including: 1) increased sedimentation to drainageways from disturbed areas; 2) potential leakage or spills of cyanide or other processing fluids; and 3) potential leakage or spills of solvents, fuels, and lubricants. These impacts are expected to be limited to relatively small areas at each mine site and should therefore not cause significant cumulative effects.

The primary mine dewatering projects in the Carlin Trend are the Betze/Post Mine in the North Operations Area and Newmont's Gold Quarry Mine in the South Operations Area. No dewatering, however, would be required at the Bootstrap Project because dewatering at the Betze/Post Mine has sufficiently lowered the groundwater table in that area. Water quality ultimately developing in the various mine pits would vary depending on rock types in the pit walls. Quality of groundwater would be affected to some extent around the mine pits as pit lakes reach equilibrium levels. Acid mine drainage is expected to be minimal due to the presence of acid-neutralizing rocks, low precipitation rates, and isolation of potentially acid-producing material.

Soil and Watershed

The cumulative effects area for soils includes all disturbance areas associated with past, existing, and future mining activities in the Carlin Trend through year 2006. Prior to 1981, only 1,484 acres in this area were disturbed by mining. Between 1981 and 1994, mining and related soil disturbances in the Carlin Trend increased by 16,911 acres to a total of 18,395 acres (BLM 1993b).

The proposed Bootstrap Project and other reasonably foreseeable mining projects would bring the total area of disturbance to 24,792 acres by year 2006 (**Table 4-11**). With the exception of open pits, land disturbed by mining would be reclaimed, minimizing soil loss and reestablishing soil productivity. Increased erosion of disturbed areas and sedimentation of drainages will occur until reclamation adequately stabilizes the ground surface.

Vegetation

The cumulative effects area for vegetation includes all areas that have been or could be directly affected by proposed mining within the area shown in **Figure 4-3**. Total affected area for revegetation is expected to reach approximately 24,792 acres. Reclamation and land management activities would restore vegetation on most of the area affected by mining, grazing, and wildfire.

The cumulative effects area for riparian areas and wetlands is included within the vegetation cumulative effects area. Mine dewatering primarily at the Betze/Post Mine would temporarily affect some of these areas. Significant mine dewatering also would occur at the South Operations Area. Previous mining has directly impacted some riparian areas and wetlands through excavation, road construction, sedimentation, and general mine activity. However, there is a lack of baseline data to determine total cumulative effects. Livestock grazing has had a much greater impact than mining on wetlands and riparian areas (BLM 1993b).

Terrestrial Wildlife

Mule deer would be subject to cumulative impacts from mining activities, wildfire, livestock grazing, and seeding of native range with introduced species. The cumulative effects area for mule deer includes nearly 1.5 million acres of public and private land extending north to the Duck Valley Indian Reservation and south to Crescent Valley (BLM 1992b). A summary of mule deer habitat is provided in **Table 4-13** . Past and proposed activities would interact cumulatively to reduce available acreage and quality of transitional mule deer range (mining activities) and winter range (wildfire and conversion of native shrub and grasslands to seeded pasture and range). The Bootstrap Project is located in transitional range (also called linkage habitat) used by mule deer migrating between high-elevation summer range to the north and low-elevation winter range to the south.

TABLE 4-13
Summary of Mule Deer Habitat Included Within the Bootstrap Project Cumulative Effects Study Area

HABITAT TYPE	ACRES	PERCENT OF AREA
Crucial Summer Range	394,017	26
Crucial Winter Range	283,161	19
Crucial Linkage Habitat	286,970	19
Other Deer Habitat	472,800	32
Non-Deer Habitat	51,206	3
Total Cumulative Effects Area	1,488,154	100[1]

[1] Percentages do not add exactly to 100% due to rounding.

Source: BLM 1992b.

Currently, the low elevation winter range adjacent to the Tuscarora Range has been severely degraded by fires that have converted native shrub communities to cheatgrass-dominated grasslands. Migrating mule deer avoid these cheatgrass-dominated areas because of scarcity of food and resting cover. Vegetation that provides forage and security cover (primarily shrubs) probably needs to be established before deer will utilize lower-elevation habitat in the Boulder Valley as winter range or transitional habitat.

Expansion of mining activities at the Bootstrap Project and surrounding area (e.g., Newmont's North and South Operations Areas, the Betze/Post and Meikle mines, Dee Gold Mine) may further alter timing and location of traditional migration routes and may contribute to shifts in winter range utilization from the Dunphy Hills and southern portion of the Tuscarora Range to the Izzenhood and Sheep Creek ranges. The significance of major shifts in winter range utilization and migration routes is not known. However, it is likely that additional stress would be placed on animals wintering in the Izzenhood and Sheep Creek ranges due to increased demands for forage by animals that previously wintered in the Dunphy Hills and surrounding areas.

In Nevada and throughout most of the West, winter range is crucial to mule deer survival. Availability and quality of winter range are the primary factors that determine the regional carrying capacity of year-round habitat. Additional decreases in quantity and quality of transitional range would result in deer moving through it more rapidly, and onto winter range earlier in the season. This decreased use of transitional range would increase the demand on limited forage available on winter ranges.

Existing and reasonably foreseeable surface disturbance created by mining within the mule deer cumulative effects study area totals approximately 24,792 acres. The Bootstrap Project would contribute approximately 5 percent of this disturbance. In the mule deer cumulative effects study area, mining occurs on approximately 5,213 acres (2 percent) of crucial winter range, 2,085 acres (1 percent) of crucial summer range, 16,456 acres (6 percent) of crucial linkage habitat, and 1,038 acres of noncrucial habitat.

Aquatic Habitat and Fisheries

Cumulative impacts on aquatic habitat throughout the Carlin Trend would result from livestock grazing and drawdown of groundwater tables from mine dewatering. Decreased flows in some surface water (e.g., springs, seeps, and streams) would continue. The proposed project would have negligible impacts on livestock grazing and would not affect existing or proposed dewatering activities at Carlin Trend mines.

Threatened, Endangered, and Candidate Species

Cumulative impacts on threatened, endangered and candidate species as a result of the Proposed Action or alternatives would be negligible.

Grazing Management

The cumulative effects area for grazing includes all areas that have been or could be directly affected by mining within the upper Boulder Creek Basin, including the Bell and Rodeo creek drainages, through year 2006. Total affected grazing area is expected to be approximately 24,792 acres. Assuming an average grazing capacity of 0.2 AUMs/acre, 4,960 AUMs have been or would be lost until reclamation is achieved. Permanent loss of 915 AUMs (4,577 acres x 0.2 AUMs/acre) would occur due to open-pit areas that would not be reclaimed.

Previous mining along the Carlin Trend has impacted stock water sources through pit dewatering, road construction, sedimentation, and other mine activity. The most significant cumulative impacts on stock watering resources will result from combined dewatering operations at the Gold Quarry and Betze/Post mines. These impacts were analyzed in the South Operations Area Project EIS (BLM 1993a), the Betze/Post Mine EIS (BLM 1991), and the Meikle Mine EA (BLM 1993b). The degree of impact would depend on the magnitude of drawdown and site-specific hydrologic conditions.

Recreation and Wilderness

The gradual but continuous expansion of mining activities along the Carlin Trend will result in less area available for dispersed recreational activity. Any increase in population associated with expanding mining activity would result in more demand for recreation on public land. Increased night lighting associated with the various mining projects in the Carlin Trend would affect a person's wilderness experience.

Access and Land Use

As mining continues to develop along the Carlin Trend, more land will be removed from public access for use by the mining activities. Water uses will be affected where mine dewatering causes significant changes in groundwater levels, surface water flows, and/or water quality.

Noise

As mining continues to develop along the Carlin Trend, more noise will be generated from both mining and processing activities and traffic.

Visual Resources

Reclamation measures are required and will occur on active and future mining activities in the Carlin Trend. However, major elements of certain mining facilities will remain, including open pits and associated highwalls and earth-fill structures. Visual contrasts in form, line, and color will remain in the post-mining landscape.

VRM Class IV allows management activities that require major modification to the character of the landscape. Impacts on visual resources from reasonably foreseeable mining activities can be minimized, but not eliminated, through reclamation measures. To continue to meet VRM Class IV objectives, all feasible measures should be taken to minimize visual impacts. While it may not be feasible to restore pit highwalls to original contours, it is possible to regrade earthen structures to reflect existing forms, lines, and textures. Reclamation grading can achieve a stable post-mining configuration by rounding angular features and flattening sideslopes. Modifying the flat top surface of earthen structures and developing variable sideslopes can help reduce visual contrasts created by horizontal lines and trapezoidal forms.

Construction of power lines will create visual impacts, especially in the Boulder Valley. While these lines are being built in response to growing demand for power in the Carlin Trend mining area, they also serve local communities. Some of those lines would remain in service permanently.

Cultural Resources

As depicted in **Figure 4-3**, the cultural resources cumulative effects area consists of approximately 70,000 acres. Over this area, at least 30 Class III cultural resource inventories have been conducted. Adverse cumulative effects on archaeological sites include: 1) increased access that increases the chance of surface collection and vandalism; and 2) dewatering activities that dry up springs and drainages thus increasing erosion and exposure of archaeological materials. Positive cumulative effects on archaeological resources from mining activity would greatly increase the database generated by numerous regulatory and compliance-related studies. These studies have provided a better understanding of the prehistory of the upper Humboldt River area and the Great Basin in general.

In the Great Basin, water is a major resource and human groups through time have gravitated to water courses. Along a 2-mile stretch (approximately 320 acres) of Rodeo Creek, for example, there are 20 cultural sites (not including small sites/isolated finds). Many of these sites are large, covering approximately a half-mile along the creek; and of these, nine are recommended NRHP-eligible (Newsome et al. 1993).

On areas distant from drainages the density of archaeological resources is lower. For example, at the Ren area northeast of the Bootstrap Project, an inventory covering approximately 1,000 acres discovered 29 sites, five of which are considered NRHP-eligible (Newsome et al. 1992). This equates to about one site per 35 acres, compared with roughly one site for every 16 acres for areas within drainages. Also, 45 percent of sites within drainages are typically NRHP-eligible, while only 17 percent of sites away from drainages are eligible. Similar trends can be expected throughout the area of cumulative effects.

Native American Religious Concerns

Current and past mining activity in the Carlin Trend has had adverse cumulative impacts on the land and consequently on the traditional values and practices of Newe/Western Shoshone. Springs and water sources have been disturbed, affecting the presence of puha and animal and plant spirits that are important to religious practices. Although there are few springs in the area of cumulative effect and no hot springs, some springs have been affected by the long-term and cumulative effects of mining in the area.

Also of concern is the possible presence of sources of chalky rhyolitic tuff used for medicine and paint. Disturbance or destruction of sources of these materials would adversely affect Newe/Western Shoshone religious practices. Collection of artifacts by archaeologists, particularly knives and projectile points of Tosawihi chert is an adverse cumulative effect because these items are important to Newe/Shoshone people.

Although Traditional Cultural Properties (TCPs) are known to be in the cumulative effects area (e.g., the Rock Creek drainage and the Tosawihi quarries to the west). No TCPs have been identified by Newe/Western Shoshone groups in the Bootstrap Project area.

Social and Economic Resources

Cumulative socioeconomic impacts will result from mineral exploration activities and mine expansion along the Carlin Trend. Other cumulative socioeconomic effects would result from construction projects in the area such as building of school facilities, establishment of the Dodd/Beals Fire Protection Academy near Carlin, or any other developments that have the potential to increase population.

The Elko County Commissioners recently approved an agreement for the Fire Protection Academy to be fully relocated to Carlin within 2 to 6 years. The agreement requires that affordable housing be procured for academy staff and temporary lodging in motels be available for up to 300 firefighting students (Smith, D. 1995). One-week training courses would be conducted throughout the year, thus reducing the availability of motel rooms in the area. Community services, especially emergency services, also would need to be sufficient to serve the firefighting students and staff (Elko Daily Free Press 1995g). Money spent by students and staff for food, lodging, recreation, and other purchases would be positive for the local economy.

Currently, a large construction work force in Elko and Eureka counties is employed at the various mine expansion projects. Depending on timing of construction activities, it may be possible for members of the existing construction work force to satisfy construction labor demands without large influxes of new workers. However, if all construction activities were to occur concurrently, substantial numbers of new employees would be needed.

Increased numbers of construction workers and their families moving into the area would stress temporary housing and some community services. Some workers would camp or live in motor homes on federal lands or in recreation areas. Permanent residents of the study area would be displaced from some recreation areas and may perceive their quality of life to be degraded by uncontrolled growth. Increased traffic, crime, and demands for retail and community services would likely occur with substantial increases in the temporary work force. Permanent residents may bear a disproportionately large tax burden to pay for increased demands on community services.

CHAPTER 5

CONSULTATION, COORDINATION, AND PREPARATION

PUBLIC PARTICIPATION SUMMARY

Introduction

Public participation specific to the Bootstrap Project is summarized in this chapter. The summary indicates means of public involvement, identifies persons and organizations to be contacted for comments and feedback, and specifies time frames for accomplishing goals in accordance with 40 CFR 1506.6.

Public involvement in the EIS process includes the necessary steps to identify and deal with 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 participation and public notices are required at four specific points in the EIS process: the scoping period, review of the Draft EIS, review of the Final EIS, and receipt of the Record of Decision.

- **Scoping:** The public is provided a 30-day scoping period to identify potential issues associated with the Proposed Action that might warrant analysis during development of the Draft EIS.

- **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 in Elko, Nevada, to obtain comments. Public meetings will only be held in Reno if members of the public show interest.

- **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.

- **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 will be published in the Federal Register.

Implementation

The six items listed below outline the necessary components used to implement the public participation process.

1. Public Scoping Period and Meetings

Publication of a Notice of Intent (NOI) initiated the scoping period on Friday, December 2, 1994 (Fed. Reg. page 61897). The NOI summarized the Proposed Action and the determination by the BLM that an EIS was necessary for analysis of the proposal. All appropriate news media and the public were notified of the periods available for comment. Twenty-three news organizations and radio stations were contacted in Nevada, Idaho, California and Utah.

Written notification of the scoping period was given to the Eureka, Elko, and Lander County Commissioners; the Elko County Manager; the Elko City Manager; Elko City, Carlin (city), and Lander County planning boards; Elko Chamber of Commerce; and Nevada Association of Counties. Briefings were provided to Elko and Eureka County commissioners. In all, 438 scoping letters were sent to various agencies, groups and individuals.

Formal public scoping meetings were held in Elko, and Reno, Nevada on December 8 and 9, 1994, respectively. Two oral comments were received at the Elko meeting and no oral comments were received at the Reno meeting. Scoping comments were accepted until January 3, 1995. During that period, BLM received written comments from 11 individuals and groups.

2. Public Scoping Report

BLM compiled a Public Scoping Report for distribution to interested persons. Upon written request, the Public Scoping Report can be obtained from the Elko District BLM.

3. EIS Mailing List

An EIS mailing list of interested persons was assembled from previous mining-related EIS mailing lists and is included at the end of this chapter. This list was supplemented during the scoping process and is continuously updated as needed throughout the EIS process.

4. Distribution of the Draft EIS

The Draft EIS will be distributed as follows:

- A Notice of Availability will be published in the Federal Register specifying the dates for the comment period and the dates, times, and locations of public hearings.
- A news release will be provided by the Elko District BLM at the beginning of the 60-day comment period. The news release will be submitted to all relevant news outlets.
- The Draft EIS will be distributed to interested parties identified on the updated EIS mailing list.
- Letters received from interested parties concerning the Draft EIS will be promptly acknowledged so respondents will know their comments have been received by BLM.
- A public meeting will be held in Elko to obtain comments on the Draft EIS. The meetings will take place 18 days after publication of the Federal Register Notice. The meeting will be held on March 26 at BLM offices in Elko, NV at 7:00 pm.
- Briefings will be offered for local and state government representatives and Congressional Representatives.

5. The Final EIS Distribution

The Final EIS will be completed considering comments from the review of the Draft EIS and released as follows:

- A Notice of Availability will be published in the Federal Register.
- Copies of the final document will be sent to those on the updated mailing list.
- A news release will be issued to all relevant news outlets through the Elko District BLM office.

6. Record of Decision

The Record of Decision will be distributed to people and organizations on the updated mailing list, and a Notice of Availability will be published in the Federal Register. A news release will be issued to all relevant news outlets to announce distribution of the Record of Decision.

Criteria and Methods by Which Public Input is Evaluated

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 contains new data to be brought to the attention of the BLM which identifies deficiencies in the Draft EIS. Steps would then be initiated to correct such deficiencies and to incorporate the information into the Final EIS.

Should changes from the Draft EIS to the Final EIS be deemed significant, BLM will review the need to reissue a Draft EIS, prepare a supplemental EIS, or to prepare a Final EIS.

Consultation With Others

The following state and federal agencies were consulted during preparation of the EIS:

- Nevada Department of Conservation and Natural Resources
    - Division of Environmental Protection
    - Division of Water Resources
- Nevada Department of Human Services
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency, Region IX
- U.S. Fish and Wildlife Service.

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Elko County Library

James Dickenson Library
University of NV, Las Vegas

Nevada State Library
Mary Elliott, Library Assistant II

Getchell Library
University of Nevada, Reno

Elko Independent

Elko Daily Free Press
Attn: Dan Steninger

Mining World News
Attn: Dorothy Kosich

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CHAPTER 6 - REFERENCES AND GLOSSARIES

LIST OF REFERENCES

Adams, M. 1995. Personal communication. Director of the Nevada Welfare Department. Elko, Nevada.

Adrian Brown Consultants, Inc. 1992. Impact of Dewatering the Goldstrike Mine on Springs on the Eastern Slope of the Tuscarora Range. Report 1133E/920928/2.

Aiazzi, J. 1995. Personal communication. Town of Carlin Public Works Director. Carlin, Nevada.

Algermissen. S., D. Perkins, P. Thenhaus, S. Hanson and B. Bender. 1982. Probabilistic Estimates of Maximum Earthquake Acceleration and Velocity in Rock in the Contiguous United States. Open File Report 82-1033. U.S. Geological Survey.

_______1990. Probabilistic Earthquake Acceleration and Velocity Maps for the United States and Puerto Rico. U.S. Geological Survey. Map MF-2120.

Armentrout, L. and J. Gardetto. 1980. T Lazy S/25 Corporation Allotment Boundary Fence. Bureau of Land Management Report No. CR 1-284. Elko District Office. Elko, Nevada.

Armentrout, L. and R. Hanes. 1986. Archaeological Survey of the Susie Creek Area, Elko County, Nevada. Bureau of Land Management.

Askew, B. and S. Algermissen. 1983. An Earthquake Catalog for the Basin and Range Province 1803-1977. Open File Report 83-86. USDI Geological Survey.

Baker, E. 1991. Geology and Ore Deposits of the Bootstrap Subdistrict, Elko County, Nevada. In: Geology and Ore Deposits of the Great Basin, Symposium Proceedings. Geological Society of Nevada. Reno, Nevada.

Balleau Groundwater. 1993. Drawdown Effects of Betze Pit Dewatering. Prepared for Barrick Goldstrike Mines, Inc. Elko, Nevada.

Bandera, M. 1995. Personal communication. Superintendent, Elko County School District. Elko, Nevada.

Barrick Goldstrike Mines, Inc. 1993. Monitoring Report for First Quarter of 1993. Submitted to Nevada Bureau of Mining Regulation and Reclamation.

_______1995. Boulder Valley Monitoring Plan. 1994 Fourth Quarter Report. Submitted to Nevada State Engineer, Department of Conservation and Natural Resources. Carson City, Nevada.

Beaulaurier, D. 1981. Mitigation of Bird Collisions with Transmission Lines. Bonneville Power Administration. Portland, Oregon.

Beitia, F. 1995. Personal communication. Superintendent of Parks. Elko, Nevada.

Botti, N. and R. Kautz. 1992. An Archaeological Survey for the Proposed 120 kv Transmission Line from Coyote Creek to Bazza, Elko and Eureka Counties, Nevada. BLM Report CR1-1520(P). Prepared by Mariah Associates, Inc. Reno, Nevada.

Bradley, P. 1992. Personal communication. Nongame Biologist with Nevada Department of Wildlife. Elko, Nevada.

Bryan, A. 1979. Smith Creek Cave. In: The Archaeology of Smith Creek Canyon, Eastern Nevada. Edited by Donald R. Tuohy and Doris L. Rendall. Anthropological Papers 17. Nevada State Museum. Carson City, Nevada.

_______**1980.** The Stemmed Point Tradition: An Early Technological Tradition in Western North America. In: Anthropological Papers in Memory of Earl H. Swanson, Jr.

Bureau of Indian Affairs, U.S. Department of the Interior. 1993. Office of Economic Development. Washington, D.C. Indian Service Population and Labor Force Statistics.

_______**1995.** Indian Service Population and Labor Force Statistics.

Bureau of Land Management, U.S. Department of the Interior. 1966. Public Lands Guide, Elko District, Nevada. Elko District Office. Elko, Nevada.

_______**1985.** Elko Resource Area Draft Resource Management Plan and Environmental Impact Statement. Elko District Office. Elko, Nevada.

_______**1986a.** Visual Resource Inventory. BLM Handbook 8410-1.

_______**1986b.** Visual Resource Contrast Rating. BLM Handbook 8431-1.

_______**1987.** Elko Resource Management Plan Record of Decision. Elko District Office. Elko, Nevada.

_______**1990.** Final Environmental Assessment for the TS Ranch Reservoir and Pipeline. Elko District Office. Elko, Nevada. Prepared by JBR Consultants Group.

_______**1991.** Draft Environmental Impact Statement, Betze Project. Barrick Goldstrike Mines, Inc. Elko District Office. Elko, Nevada.

_______**1992a.** Environmental Assessment (EA-NV-010-92-021). Newmont Exploration Tara Project. Elko and Eureka Counties, Nevada. Elko District Office. Elko, Nevada. Prepared by JBR Consultants Group.

_______**1992b.** Dee Gold Cumulative Effects Analysis for Mule Deer and Pronghorn Antelope. Elko District Office. Elko, Nevada.

_______**1992c.** Solid Minerals Reclamation Handbook H-3042-1.

_______**1993a.** Environmental Impact Statement, Newmont Gold Company's South Operations Area Project. Elko District Office. Elko, Nevada.

_______**1993b.** Environmental Assessment (EA-NV-010-92-23), Meikle Mine Development. Elko District Office. Elko, Nevada.

_______**1993c.** Environmental Assessment (EA-NV-010-91-101), Dee Gold Mine Expansion Project. Elko District Office. Elko, Nevada.

_______**1993d.** Environmental Assessment (EA-NV-010-93-010), Rossi Mine South Waste Rock Dump Expansion. Elko District Office. Elko, Nevada.

_______**1993e.** Environmental Assessment (BLM/EK/PL-93/035), Dee Gold Mine Expansion Project II. Elko District Office. Elko, Nevada.

_______**1995a.** Memorandum addressed to Elko Land and Livestock Grazing Case File. Elko Resource Area. Elko, Nevada.

_______**1995b.** Environmental Assessment (BLM/EK/PL-95/003), Newmont Gold Company's Section 36 Project. Elko District Office. Elko, Nevada.

Burt, W. and R. Grossenheider. 1976. A Field Guide to the Mammals - North America, North of Mexico. Houghton Mifflin Co. Boston, Massachusetts.

Butts, T. 1992. Personal communication. Wildlife Biologist with Westech. Helena, Montana.

Cash, O. 1995. Personal communication. City Fire Chief. Elko, Nevada.

Chen-Northern, Inc. 1988. Newmont Gold Company, Site Exploration and Geotechnical Investigation of Tailings Disposal Area for No. 4 Mill. Volumes I and II.

Clark, T. 1987. Mammals in Wyoming. University of Kansas Museum of Natural History. Public Education Series No. 10. University Press of Kansas. Lawrence.

Clemmer, R. 1990a. From Ethnic to Ethnicity: Conditions Affecting Tosawihi ("White Knife") Shoshone Cultural and Identity in the Reservation Era. Ms. on file, Nevada State Museum. Department of Anthropology. Carson City, Nevada.

_______**1990b.** Seed-eaters and Chert-carriers: The Economic Basis for Continuity in Historic Western Shoshone Identities. Paper presented at the Great Basin Anthropological Conference. Reno, Nevada.

CMC Inc. 1989. Industry pamphlet on crushers. Anchorage, Alaska.

Coates, R. 1987. Geology of Elko County, Nevada. Nevada Bureau of Mines and Geology. University of Nevada. Reno.

Conger, G. 1995a. Bootstrap EIS - Hazardous Materials Information. Letters to N. Winslow from G. Conger (Newmont Gold Company) dated 3/20/95 and 4/21/95.

_______**1995b.** Bootstrap Project EIS - Social and Economic Resources Information. Letter to N. Winslow from G. Conger (Newmont Gold Company) dated 3/21/95.

_______**1995c.** Personal communication. November 1995.

Coope, J. 1991. Carlin Trend Exploration History: Discovery of the Carlin Deposit: Nevada Bureau of Mines and Geology. Special Publication No. 13.

Cooper, K. 1995. Memo to Westech, Helena, Montana, from K. Cooper. Nevada Natural Heritage Program. Nevada Department of Conservation and Natural Resources.

Cronquist, A., A. Holmgren, N. Holmgren, J. Reveal, P. Holmgren and R. Barnaby. 1989. Intermountain Flora, Vascular Plants of the Intermountain West, U.S.A. New York Botanical Garden. New York, New York.

Culwell, D. 1995. Personal communication. Environmental Specialist with WESTECH. Helena, Montana.

Dobra, J. 1988. Economic Impacts of Nevada's Mineral Industry. Nevada Bureau of Mines and Geology. Special Publication No. 9.

_______**1989.** Economic Impacts of Nevada's Mineral Industry - 1988 Update. Nevada Bureau of Mines and Geology. Special Publication No. L-9.

Dobra 1988, 1989; Dobra and Thomas, 1992. Nevada Department of Business and Industry, Division of Minerals 1995.

Dobra, J. and P. Thomas. 1992. The U.S. Gold Industry, 1992. Special Publication No. 14. Nevada Bureau of Mines and Geology. Mackay School of Mines. University of Nevada. Reno, Nevada.

Dodson, E. 1995. Personal communication. Landfill Superintendent. Elko, Nevada.

Dragun, J. 1988. The Soil Chemistry of Hazardous Materials. Hazardous Material Control Research Institute. Silver Springs, Maryland.

Eaton, J. 1994. Literature Assessment of Paleontological Resources along the Emigrant Pass - Battle Mountain Segment (Segment 1) of Nevada Bell Fiber Optic Corridor, Eureka, Lander, and Elko Counties, Nevada. Prepared for Nevada Bell by Sagebrush Archaeological Consultants.

Elko Daily Free Press. 1995a. NDEP Blocks Elko's Construction Boom. March 8, 1995. Elko, Nevada.

_______**1995b.** County Planners Approve Spring Creek Rental Units. February 23, 1995. Elko, Nevada.

_______**1995c.** City Planners Approve 2,300 Residential Units. February 8, 1995. Elko, Nevada.

_______**1995d.** Construction Last Year Third Highest in History. January 7, 1995. Elko, Nevada.

_______**1995e.** Building Permits in March Top $7 Million in Valuation. April 3, 1995. Elko, Nevada.

_______**1995f.** Housing Remains Tight in Elko Area, Experts Say. January 7, 1995. Elko, Nevada.

_______**1995g.** County Approves Terms for Fire Training Academy. May 6, 1995. Elko, Nevada.

Ellen, M. and A. Glass. 1983. Touring Nevada - A Historic and Scenic Guide. University of Nevada Press. Reno.

Ellis, R. 1983. Archaeological Report on the Evaluations of Sites CrNV-12-1986 to 1989 and CRNV-12-2000 to 2004, the Dee Gold Mine, Elko County. BLM Report No. CR 1-700. Elko District Office. Elko, Nevada.

Elston, R. and E. Budy (editors). 1990. The Archaeology of the James Creek Shelter. Anthropological Papers 115. University of Utah. Salt Lake City.

Elston, R. and K. Katzer. 1990. Conclusions. In: The Archaeology of the James Creek Shelter. Edited by Robert G. Elston and Elizabeth E. Budy. pp. 257-274. Anthropological Papers 115. University of Utah. Salt Lake City.

Elston, R., J. Davis, S. Clerico, R. Clerico and A. Becker. 1981. Archaeology of Section 20, North Valmy Power Plant, Humboldt County, Nevada. Social Sciences Technical Report 19. Desert Research Institute. University of Nevada. Reno.

Federal Emergency Management Agency (FEMA). 1982. Flood Hazard Boundary Map, Eureka County, Nevada, Unincorporated Area. Panel 1 of 43, Community Panel Number 320028-0001A. Effective date: December 1982.

Firby, J.R. 1992. Marys River Reverse Land Exchange Paleontological Evaluation and Literature Review. Submitted to Olympic Management, Inc.

_______**1993.** Jerritt Canyon Mine Expansion, Independence Mining Company: Evaluation of Paleonotological Resources. Prepared for Welch Engineering Science and Technology, Inc.

Firby, J. and H. Schorn. 1983. Paleontological Inventory of the Elko District, Elko, Nevada. University of Nevada. Reno. BLM contract YA553 CTI-108. Elko District Office. Elko, Nevada.

Flaherty, M. and G. King. 1991. A Geologic Overview of the Carlin Trend Subdistricts. In: Geology and Ore Deposits of the Great Basin. Field Trip Guidebook Compendium. Volume 2. Published by the Geological Society of Nevada. Reno.

Glazner, T. 1995. Personal communication. Budget Analyst, Local Government Finance, Nevada Department of Taxation. Carson City, Nevada.

Gonzales Sr., R. 1995. Personal communication. Chairman, Elko Band Council. Elko, Nevada.

Grass Land Soils and Reclamation, Inc. (Grass Land). 1995. Order 2 Soil Survey of the Bootstrap Project Area.

Harris, J. 1940. The White Knife Shoshoni of Nevada. In: Acculturation in Seven American Indian Tribes. Edited by R. Linton. Appleton-Century. New York, New York.

_______**1963.** The White Knife Shoshoni of Nevada. In: Acculturation in Seven American Indian Tribes. Edited by R. Linton. Peter Smith Publisher. Gloucester, Massachusetts.

Harris, N. 1995. Personal communication. Elko County Sheriff. Elko, Nevada.

Hatono, M. 1980. Caltrans Noise Manual. Federal Highway Administration CA/TL-80/07.

Hicks, P. 1989. A Class III Cultural Resource Inventory of 3698 Acres in Elko and Eureka Counties, Nevada. BLM Report No. CR 1- 1244. Prepared for Barrick Goldstrike Mines, Inc. by Desert Research Institute. Quaternary Sciences Center. Reno, Nevada.

Holeman, J. 1852. Communication in Report of the Commissioner of Indian Affairs for 1852. Thirty-second Congress, Second Session. Senate Executive Document 1 (Serial No. 658). Washington D. C.

Hultkrantz, A. 1986. Mythology and Religious Concepts. In: Great Basin. Edited by W. d'Azevedo. Handbook of North American Indians. Vol. II. Smithsonian Institution. Washington, D. C.

James, B. and B. Haak. 1979. Factors Affecting Avian Flight Behavior and Collision Mortality at Transmission Lines. Bonneville Power Administration. Portland, Oregon.

Janetski, J. 1981. Ethnohistory/Ethnography of the Elko and Ely Districts. In: Prehistory Ethnohistory and History of Eastern Nevada: A Cultural Resources Summary of the Elko and Ely Districts. Cultural Resources Series No. 3. Bureau of Land Management.

Jaynes, S. 1983. Cordex Mine Plan. BLM Report No. CR 1-484. Elko District Office. Elko, Nevada.

JBR Consultants Group. 1988. Baseline Reports, Little Boulder Basin. Prepared for Barrick Goldstrike Mines, Inc. and Newmont Mining Company.

_______**1990a.** Baseline Inventories for the Boulder and Bell Drainages (includes soil, vegetation, wildlife, aquatic resources, stream hydrology). Prepared for Newmont Gold Company.

_______**1990b.** Newmont Gold Company Rodeo Creek and Boulder Creek Jurisdictional Wetlands Surveys. Prepared for Newmont Gold Company.

_______**1992.** Newmont Inventory 1991-1992. Threatened and Endangered Species Studies Draft Report. Prepared for Newmont Gold Company.

Johnson, F. 1991. A Cultural Resource Inventory of the Waste Dump Expansion Project for Dee Gold Mining Company in Elko County, Nevada. BLM Report No. CR 1-1407. Elko District Office. Elko Nevada.

Johnston, W. 1995. Personal communication. Fire Chief and Ambulance/Rescue Team. Carlin, Nevada.

Jones, J. 1994. Cultural Resource Inventory and Data Recovery Plan of the Boulder Creek Diversion and Dunphy Road Realignment, Elko County, Nevada. BLM Report CR1-1947(P). Prepared by P-111 Associates. Salt Lake City, Utah.

Kartesz, J. 1988. A Flora of Nevada. Ph.D. Dissertation. University of Nevada. Reno, Nevada.

Kepler, R. 1995. Personal communication. ISO Commercial Risk Services, Inc. Denver, Colorado.

Klepfer, E. 1995. Bootstrap Project - Comments on (Preliminary) Draft EIS Chapters 1 and 2. Letter to D. McFarlane from E. Klepfer.

Knight Piesold and Company. 1989. Newmont Gold Company - No. 4 Mill Tailings Storage Facility Eureka County, Nevada, Tailings Management System and Ancillary Facilities, Final Design Report.

Kofoed, R. 1995. Bootstrap Subdistrict Geologic Summary. Internal Report. Newmont Gold Company.

LaPoint, D., J. Tingley and R. Jones. 1991. Mineral Resources of Elko County, Nevada. Nevada Bureau of Mines and Geology. Bulletin 106. University of Nevada. Reno.

Leggett, Brashears and Graham, Inc. (LBG). 1993. Hydrologic Effects of Dewatering at the Goldstrike Mine. Prepared in Association with Balleau Groundwater.

Liljebald, S. 1986. Oral Tradition: Content and Style of Verbal Arts. In: Great Basin. Edited by W. d'Azevedo. Handbook of North American Indians. Vol. II. Smithsonian Institution. Washington, D. C.

MacGillivray, R. 1995. Personal communication. Environmental Engineer with Newmont Gold Company. Denver, Colorado.

Macler, B. 1995. Personal communication. Regional Toxicologist with the U.S. Environmental Protection Agency, Region IX, San Francisco, CA.

Malouf, C. and E. Smith. 1947. Some Gosiute Mythological Characters and Concepts. Utah Humanities Review 1(3):369-377.

McCarty, M. 1995. Personal communication. Resident Firefighter, Northeastern Nevada Fire Protection District. Spring Creek, Nevada.

McQuiston, Jr., F. and R. Shoemaker. 1981. Gold and Silver Cyanidation Plant Practice, Volume II. Society of Mining Engineers of America. Institute of Mining, Metallurgical, and Petroleum Engineers, Inc.

McVehil-Monnett Associates, Inc. 1993. Quarterly Meteorological Monitoring Reports for Newmont Gold Company's North Operations Area.

_______**1994.** Quarterly Meteorological Monitoring Reports for Newmont Gold Company's North Operations Area.

Mendoza, C. 1995. Memorandum to BLM Elko District Manager from C.H. Mendoza. Nevada State Supervisor, Ecological Services. U.S. Fish and Wildlife Service.

Meyer, J. 1978. Effects of Transmission Lines on Bird Flight Behavior and Collision Mortality. Bonneville Power Administration. Portland, Oregon.

Miller, J. 1983. Basin Religion and Theology: A Comparative Study of Power (Puha). Journal of California and Great Basin Anthropology 5 (1,2):66-86.

Mires, P. 1992. Cultural Resource Report: Bell Creek to Miekle Transmission Line (Sierra Pacific Power Co). Report No.BLM81687(P). Submitted by P-III Associates to BLM Elko District Office. Elko, Nevada.

National Oceanic and Atmospheric Administration (NOAA). 1993. Climatological Data. Volume 108, No. 13. Annual Summary for Nevada 1993.

Nevada Department of Administration. 1995. Nevada Statistical Abstract - 1994 Edition.

Nevada Department of Commerce, Manufactured Housing Division. 1995. Unpublished data. Carson City, Nevada.

Nevada Department of Conservation and Natural Resources (NDCNR). 1987. Statewide Comprehensive Outdoor Recreation Plan (SCORP). Division of Parks. Carson City, Nevada.

Nevada Department of Education. 1995. Nevada Public Schools, 1994-95 School Year. Carson City, Nevada.

Nevada Department of Education, Planning, Research, and Evaluation Branch, No date. Nevada Education in 1990/91 - A Status Report.

Nevada Department of Employment, Employment Security Research, No date. Nevada Employment and Payrolls - 1991.

_______**1995.** Nevada Employment and Payrolls - 1994.

Nevada Department of Employment, Training and Rehabilitation, Employment Security Division. 1995a. Nevada Labor Force Summary Data.

_______**1995b.** Nevada Employment and Payrolls

Nevada Department of Minerals. 1991. Mineral Industries in the Nevada Economy.

_______**1995.** Mineral Industries in the Nevada Economy.

Nevada Department of Taxation, Local Government Finance. 1995. Combined Statement of Revenues, Expenditures and Changes in Fund Balances - All Government Fund Types and Expendable Trust Funds for the Year Ended June 30, 1994. Elko County. Eureka County. City of Elko. City of Carlin. Carson City, Nevada.

Nevada Department of Transportation (NDOT). 1993. Annual Traffic Report. Nevada Department of Transportation. Carson City, Nevada.

Nevada Division of Environmental Protection (NDEP). 1990. Waste Rock and Overburden Evaluation Guidelines.

Nevada Division of Water Resources. 1995. Computer Water Rights Database. May 1995.

Nevada Division of Wildlife (NDOW). 1992. Mid-winter (and other raptors) Survey Report. Nongame File, Region II. Elko, Nevada.

Nevada State Demographer. 1995. Nevada Population Projections and Forecasts -1995-2015 and Review of Methods. Bureau of Business and Economic Research. College of Business Administration. University of Nevada. Reno.

Newmont Gold Company. 1995a. Proposed Plan of Operations for the Bootstrap Project Open Pit Mines, Heap Leach Facility and Waste Rock Facility. Revised September 1995.

_______**1995b.** Emergency Response Plan.

_______**1995c.** Spill Prevention, Control and Countermeasure (SPCC) Plan.

_______**1995d.** Bootstrap Project Reclamation Plan.

_______**1996.** Bootstrap Operations Area Stormwater Pollution Prevention Plan.

Newsome, D. 1995. Cultural Resource Inventory of Private Lands in the Bootstrap/Capstone Area, Elko and Eureka Counties, Nevada (Draft report). BLM CR1-1988(P). Prepared for Newmont Gold Company by P-III Associates. Salt Lake City, Utah.

Newsome, D., B. Tipps, and G. Popek. 1992. Cultural Resource Inventory of the Ren Parcel, Elko County, Nevada. Cultural Resources Report 5003-02-9226. Submitted to BLM Elko District Office on behalf of Barrick Goldstrike Mines, Inc. Submitted by P-III Associates, Inc. Salt Lake City, Utah.

_______**1993.** Cultural Resource Inventory of Private and Public Lands Along and Near Bell, Boulder, and Rodeo Creeks in Northern Boulder Valley, Eureka County, Nevada. Cultural Resources Report 5027-01-9314. Submitted to BLM Elko District Office on behalf of Barrick Goldstrike Mines, Inc. Submitted by P-III Associates, Inc. Salt Lake City, Utah.

Olendorff, R., A. Miller and R. Lehman. 1981. Suggested Practices for Raptor Protection on Power Lines - The State of the Art. Edison Electric Institute and Raptor Research Foundation. St. Paul, Minnesota.

Popek, G. and B. Tipps. 1992. Cultural Resource Inventory of Newmont Gold Company Land in Northern Boulder Valley and Little Boulder Basin, Eureka County, Nevada. Cultural Resources Report 453-01-9201. Submitted to Newmont Gold Company by P-III Associates. Salt Lake City, Utah.

_______**1993.** Cultural Resource Inventory of Newmont Gold Company Lands in Northern Boulder Valley and Little Boulder Basin, Eureka County, Nevada. Draft. Prepared for Newmont Gold Company by P-III Associates. Salt Lake City, Utah.

Powell, J. and G. Ingalls. 1874. Report on the Condition of the Ute Indians of Utah; the Pi-Utes of Utah, Northern Arizona, Southern Nevada, and Southeastern California; the Go-SI Utes of Utah and Nevada; the Northwestern Shoshones of Idaho and Utah; and the Western Shoshones of Nevada. U.S. Government Printing Office. Washington, D. C.

PTI Environmental Services. 1995. Predicted Water Quality in the Tara, Bootstrap/Capstone Pit Lakes, Elko and Eureka Counties, Nevada. Prepared for Newmont Gold Company.

_______**1996.** Addendum: Tara and Bootstrap/Capstone Pit Lakes Water Quality Report. Prepared for Newmont Gold Company. Denver, Colorado.

Rafferty, K. 1988. A Cultural Resource Inventory of a 520-Acre Mining Exploration Area and an Access Road for Dee Gold Mining Company, in the Tuscarora Mountains, Elko County, Nevada. BLM Report No. CR 1-1203. Prepared by the Division of Anthropological Studies. University of Nevada. Las Vegas.

Reagan, J. and A. Grant. 1977. Highway Construction Noise Prediction and Mitigation. Federal Highway Administration Special Report. U.S. Department of Transportation. Washington, D.C.

Regnier, J. 1960. Cenozoic Geology of the Vicinity of Carlin, Nevada. Geologic Society of America Bulletin. Volume 71.

Rieger, A. 1995. Personal communication. Administrator, Elko General Hospital. Elko, Nevada.

Riverside Technology, Inc. 1994. Seep, Spring, and Stream Inventory, Barrick Goldstrike Mine, Dewatering Study Area. Volumes I and II. Prepared for Barrick Goldstrike Mines Inc. Elko, Nevada.

Rubens, R., K. Montgomery and R. Lehner. 1967. Geology and Mineral Resources of Eureka County, Nevada. Nevada Bureau of Mines Bulletin 64.

Rusco, M. and J. Davis. 1982. The Humboldt Project Rye Patch Reservoir: Phase IV Archaeological Data Synthesis Final Report. Archaeological Services Report. Nevada State Museum. Carson City, Nevada.

Rusco, M. and S. Raven. 1991. Background Study for Consultation with Native Americans on Proposed Mining Development within the Traditional Tosawihi ('White Knife') Quarry North of Battle Mountain, Nevada in the Traditional Land of the Tosawihi People, Western Shoshone Nation. Draft Report prepared for Bureau of Land Management.

Schroedl, A. and B. Tipps. 1991. Cultural Resources Inventory Monitoring and National Register Evaluations in Little Boulder Basin Area, Nevada. BLM Report No. CR 1-342. Elko District Office. Elko, Nevada.

Sierra Pacific Power Company. 1994. A Business Portrait of Northeast Nevada; Carlin, Elko, Wells and West Wendover. Economic Development Department. Reno, Nevada.

Simms, S. and M. Isgreen. 1984. Archaeological Excavations in the Sevier and Escalante Deserts, Western Utah. Reports of Investigations 83-12. Archeological Center. University of Utah. Salt Lake City.

Slemmons, D. 1983. Evaluation of Potential for Surface Faulting and the Design Earthquake Parameters for the Gold Quarry Project of Newmont Services Limited, Eureka County, Nevada. Prepared for Sergent, Hauskins & Beckwith.

Smith, B. 1995. Personal communication. Administrator, Elko Clinic. Elko, Nevada.

Smith, D. 1995. Personal communication. Administrator, Northeast Nevada Development Authority. Elko, Nevada.

Smith, R. 1994. Risk-Based Concentration Table - Fourth Quarter 1994. U.S. Environmental Protection Agency. Region III.

Soil and Water Conservation Society. 1993. Revised Universal Soil Loss Equation (RUSLE). Version 1.03. Akney, Iowa.

Songer, R. 1995. Personal communication. Chief of Police. Elko, Nevada.

Spencer, L. 1985. Newmont Explorations Bell Creek Project. BLM Report No. CR 1-947. Elko District Office. Elko, Nevada.

Stadelman, J. 1995. Personal communication. Technical Operations Advisor/Compliance. BLM Elko District. Elko, Nevada.

Steward, J. 1937. Linguistic Distributions and Political Groups of the Great Basin Shoshoneans. American Antiquity 39:625-634.

_______**1938.** Basin-Plateau Aboriginal Sociopolitical Groups. Bulletin 120. Bureau of American Ethnology, Smithsonian Institution. Washington, D. C.

_______**1939.** Some Observations of Shoshonean Distributions. American Antiquity 41:261:265.

_______**1941.** Cultural Element Distributions: XIII Nevada Shoshoni. Anthropological Records 4:2. University of California Press. Berkeley.

Stewart, J. and E. McKee. 1977. Geology and Mineral Deposits of Lander County, Nevada. Bulletin 88 Part 1, Geology. Nevada Bureau of Mines and Geology.

Stokes, L. 1995. Personal communication. Chief of Police. Carlin, Nevada.

Thomas, D., L. Pendelton and S. Cappannari. 1986. Western Shoshone. In: Great Basin. Edited by W. d'Azevedo. Handbook of North American Indians II. Smithsonian Institution. Washington, D.C.

Tipps, B. 1988. Archaic and Numic Encampment in the Little Boulder Basin, Eureka County, Nevada. Cultural Resources Report 421-1-8805. P-III Associates, Inc. Salt Lake City, Utah. Submitted to BLM Elko District Office. Elko, Nevada.

_______**1989.** Class II and III Cultural Resource Inventory in the Bootstrap Operations Area, Elko and Eureka Counties, Nevada. Cultural Resources Report 441-01-8916. BLM 1-1268(P). Submitted to BLM Elko District Office. Elko, Nevada.

Tipps, B. and G. Popek. 1991. Revaluation of Dee Gold Mining Company's Disposal Facility Expansion. BLM Report No. CR 1-1485. Elko District Office. Elko, Nevada.

_______**1992.** Class III Cultural Resource Inventory of Portions of Sections 13 and 24, T36N R49E, Eureka, County Nevada. Cultural Resources Report 5004-01-9214. BLM Report No. CR 1-1643. Elko District Office. Elko, Nevada.

Underwood, J. 1995. Personal communication. Administrator, Elko County Human Services. Elko, Nevada.

University of Nevada, College of Human and Community Services. 1991. Dynamic Growth: Compelling Outcomes - Elko County, 1985-1990. Data Book for Community Leaders. University of Nevada. Reno.

U.S. Bureau of Mines and Geology. 1976. Noise and Vibrations in Residential Structures from Quarry Production Blasting. Report of Investigations 8168.

U.S. Department of Agriculture. 1980. Soil Conservation Service (SCS) and BLM, in Cooperation with University of Nevada Agricultural Experiment Station. Soil Survey of Tuscarora Mountain Area, Nevada, parts of Elko, Eureka, and Lander Counties.

_______**1983.** Soil Conservation Service. Major Land Resource Technical Guide - Nevada.

_______**1991.** Soil Conservation Service. Major Land Resource Technical Guide - Nevada.

_______**1992.** Soil Conservation Service. Table 620-11. Soil Reconstruction Material for Drastically Disturbed Areas. National Soil Survey Interpretations Handbook - Draft.

_______**1993.** Soil Conservation Service. National Soil Survey Interpretations Handbook. U.S. Government Printing Office. Washington, D.C.

_______**1994.** Soil Conservation Service. Keys to Soil Taxonomy. Sixth Edition.

U.S. Department of Commerce, Bureau of the Census. 1991. Selected Population and Housing Characteristics 1990.

U.S. Environmental Protection Agency (USEPA). 1978. Protective Noise Levels. Office of Noise Abatement and Control. EPA 550/9-79-100. Washington, D.C.

_______**1985.** Compilation of Air Pollutant Emission Factors, Vol. 1 AP-42, Sec. 3.4. Stationary Large Bore Diesel Engines.

_______**1995.** Drinking Water Regulations and Health Advisories. Office of Water, USEPA, Washington, D.C., May 1995.

U.S. Geological Survey (USGS). 1994. Water Resources Data, Nevada, Water Year 1993. USGS Water-Data Report NV-93-1. Carson City, Nevada.

_______**1995.** Water Resources Data, Nevada, Water Year 1994. USGS Water-Data Report NV-94-1. Carson City, Nevada.

Valentine, D. 1991. A Cultural Resource Inventory of a 5,800' Diversion Ditch for Dee Gold Mining Company in Elko County, Nevada. BLM Report No. CR 1-1407. Elko District Office. Elko, Nevada.

Vega, J. 1995. Personal communication. Water Superintendent, Elko, Nevada.

Webb, W. 1995. Personal communication. Director, Elko County Ambulance. Elko, Nevada.

Welsh Engineering, Inc. 1989. Environmental Assessment for Newmont Gold Company's Blue Star Operations Area, Eureka County, Nevada. Submitted by Newmont Gold Company. Carlin, Nevada.

Western Regional Climate Center. 1995. Precipitation, Snowfall, and Temperature Data for Carlin Newmont Mine. Computer Data Base. Desert Research Institute. Reno, Nevada.

Wiley, L. 1995. Personal communication. Utilities Account Clerk. Spring Creek Utilities. Spring Creek, Nevada.

Williams, L. 1995. Personal communication. Superintendent, Wastewater Treatment Unit. Elko, Nevada.

Zevaloff, S. 1988. Mammals of the Intermountain West. University of Utah Press. Salt Lake City.

LIST OF ACRONYMS

AGP	acid-generating potential
AFDC	Aid to families with dependent children
AIRFA	American Indian Religions Freedom Act
AMSL	above mean sea level
ANFO	ammonium nitrate and fuel oil
ANP	acid-neutralizing potential
APE	area of potential effect
AWHC	available water holding capacity
AUM	animal unit month
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
B.P.	before present
CEQ	Council on Environmental Quality
CFB	circulating fluidized bed
CFR	Code of Federal Regulations
CIL	carbon-in-leach
CIP	carbon-in-pulp
CWA	Clean Water Act
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMT	emergency medical technician
ESD	ecological site description
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FLPMA	Federal Land Management Practices Act
FY	fiscal year
HCN	hydrogen cyanide
HDPE	high-density polyethylene
IF	isolated finds
ISO	Insurance Services Office
KOP	key observation point

LCT	Lahontan cutthroat trout
MCE	maximum credible earthquake
MSHA	Mine Safety and Health Administration
NAAQS	national ambient air quality standards
NAC	Nevada Administrative Code
NAGPRA	Native American Graves Protection and Repatriation Act
NANP	net acid neutralization potential
NDCNR	Nevada Department of Conservation and Natural Resources
NDEP	Nevada Division of Environmental Protection
NDH	Nevada Division of Health
NDOT	Nevada Department of Transportation
NDOW	Nevada Division of Wildlife
NDSP	Nevada Division of State Parks
NDWR	Nevada Division of Water Resources
NENDA	Northeast Nevada Development Authority
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	national pollution discharge elimination system
NRHP	National Register of Historic Places
NRS	Nevada Revised Statutes
ORV	off-road vehicle
OSHA	Occupational Safety and Health Administration
PLS	pure live seed
POO	plan of operations
PMP	probable maximum precipitation
PSC	Public Service Commission
PSD	prevention of significant deterioration
RA	resource area
RCRA	Resource Conservation and Recovery Act
RMP	Resource Management Plan
ROD	Record of Decision

RRD	root restricting depth
RUSLE	Revised Universal Soil Loss Equation
SARA	Superfund Amendments and Reauthorization Act
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SCS	Soil Conservation Service
SHPO	State Historic Preservation Officer
SPPC	Sierra Pacific Power Company
SRA	State Recreation Area
SRMA	special recreational management area
TCLP	toxicity characteristic leaching procedure
TCP	traditional cultural properties
TDF	tailings disposal facility
TDS	total dissolved solids
TPQ	threshold planning quantity
TSP	total suspended particulate
TSS	total suspended solids
USCOE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VRM	visual resource management
WAD	weak acid dissociable
WEG	wind erodibility group
WIC	women with infants and children
WSA	wilderness study area

UNITS OF MEASURES

C	celsius
cfs	cubic feet per second
dB	decibel
dBA	A-weighted decibel sound scale
F	fahrenheit
ft	feet
g	gravity
gal	gallon
gpm	gallons per minute
in	inch
kV	kilovolt
lb	pound
$\mu g/m^3$	micrograms per cubic meter
μmhos/cm	micromhos per centimeter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mgpd	million gallons per day
MM	million
mph	miles per hour
ppm	parts per million
%	percent
tpy	tons per year
yd^3	cubic yards

GLOSSARY

Acre-feet. 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; measure for volumes of water, reservoir rock, etc.

Activated Carbon. Highly adsorbent carbon formed by heating granulated charcoal to exhaust contained gases.

Adit. A nearly horizontal passage, driven from the surface, by which a mine may be entered, ventilated, and/or dewatered.

Alluvial. Pertaining to material or processes associated with transportation or deposition of soil and rock by flowing water (e.g., streams and rivers).

Alluvium. Soil and rock deposited by flowing water (e.g., streams and rivers); consists of unconsolidated deposits of sediment, such as silt, sand, and gravel.

Ambient. Surrounding, existing.

Assay. Qualitative or quantitative analysis of a substance (e.g., ore body).

Baghouse. Dust collection and control facility.

Basic Elements (visual). The four major elements (form, line, color, and texture) which determine how the character of a landscape is perceived.

Bio-oxidation. Process by which chemicals are transformed into their oxidized state by living organisms.

Carbonaceous Ore. Ore containing large amounts of carbon.

Contrast (visual). The effect of a striking difference in form, line, color, or texture of the landscape features within the area being viewed.

Critical (Crucial) Habitat. Habitat that is present in minimum amounts and is a determining factor for population maintenance and growth.

dBA. 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 (e.g., below 1,000 Hz).

Decant. To remove or pour off a liquid without disturbing associated sediment or solids.

Decibel (dB). One-tenth of a Bel is a measure on a logarithmic scale which indicates the ratio between two sound powers. A ratio of 2 in power corresponds to a difference of 3 decibels between two sounds. The decibel is the basic unit of sound measure.

Dissolution. The process of dissolving or, more rarely, melting.

Disturbed Area. Area where natural vegetation and soils have been removed.

Doré Bars. Product of retort furnace containing gold, silver, and impurities.

Ecological Site. Subdivisions of rangeland differentiated by the potential natural vegetation they are capable of supporting.

Electrolyte. A substance, usually in solution, which will transmit an electrical current.

Electrowinning - Electrometallurgy. The art or science of electrolytically depositing metals, or separating them from their ores or alloys.

Endangered Species. Species in danger of extinction throughout all or a significant portion of its range.

Ephemeral Stream. A stream or portion of a stream which flows briefly in direct response to precipitation in the immediate vicinity, and whose channel is at all times above the water table.

Evapotranspiration (ET). The portion of precipitation returned to the air through evaporation and transpiration.

Feeder Zones. Deep pathways followed by mineralizing fluids to form an orebody, often containing rich ore.

Floodplain. The low and relatively flat areas adjacent to rivers and streams. A 100-year floodplain is that area subject to a 1 percent or greater chance of flooding in any given year.

Flume. A structure built in an open channel that constricts water flow through a designed opening to measure rate of water flow.

Flux. A substance which promotes the fusing of minerals or metals.

Forage. Vegetation used for food by wildlife, particularly big game wildlife and domestic livestock.

Game Species. Animals commonly hunted for food or sport.

Hertz (Hz). The unit of frequency (i.e., sound) formerly designated as cps - cycles per second.

Host Rock. A rock body or wall rock enclosing mineralization.

Hydraulic Gradient. For groundwater, the rate of change of total head per unit of distance of flow at a given point and in a given direction.

Hydrostratigraphic Unit. Grouping of stratified, mainly sedimentary rocks that have similar groundwater flow conditions.

Igneous. Rock or mineral that solidified from molten or partly molten material.

Intermittent Stream. Stream that flows only part of the time or during part of the year.

Isopleth. A line, on a map or chart, drawn through points of equal size or abundance.

Key Observation Point (KOP). An observer position on a travel route used to determine visible area.

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.

Makeup Water. Water needed to supplement water removed by milling or processing of ore and losses to evaporation.

Maximum Credible Earthquake. The largest conceivable earthquake that could occur in an area.

Mesic. Moist habitats associated with springs, seeps, and riparian areas.

Mitigation. Actions to avoid, minimize, reduce, eliminate, replace, or rectify the impact of a management practice.

Peak Flow. The greatest flow attained during melting of winter snowpack or during a large precipitation event.

Perched Water Table. Unconfined groundwater separated from the underlying main body of groundwater by unsaturated rock.

Perennial Stream. A stream that flows throughout the year and from source to mouth.

Permeability. The capacity of porous rock, sediment, or soil to transmit a fluid.

pH. The negative $\log_{10}$ of the hydrogen ion activity in solution; measure of acidity or basicity of a solution.

PM-10. Particulate matter less than 10 microns in aerodynamic diameter.

Probable Maximum Precipitation (PMP). The greatest depth of precipitation for a given duration that is physically possible over a given storm area at a particular location at a certain time of year.

Raptor. A bird of prey (e.g., eagles, hawks, falcons, and owls).

Refractory Ore. Ore difficult to treat for recovery of valuable substances.

Retort. A furnace in which ore may be heated for removal of its metal content.

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 seep sites.

Run-of-Mine Ore. Ore taken from a mine or pit directly to a mill or leach pad for processing.

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.

Seepage Collection System. A system of drains, ponds, and pumps to collect and return tailing impoundment and embankment seepage.

Significant. As used in NEPA, 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)

Sulfides. That part of a lode or vein not yet oxidized by air or surface water and containing sulfide minerals.

Steppe. Vast plains devoid of forest.

Tackifier. An agent that binds seed, fertilizer, and mulch to a site, often used when seeding slopes.

Threatened Species. Any species of plant or animal which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Total Suspended Particulates (TSP). Particulates less than 100 microns in diameter (Stokes equivalent diameter).

Total Dissolved Solids (TDS). Total amount of dissolved material, organic or inorganic, contained in a sample of water.

Total Suspended Solids (TSS). Undissolved particles suspended in liquid.

Weak Acid Dissociable (WAD). Compound that in the presence of a weak acid would disassociate into its ionic forms in solution.

Weir. An overflow structure built across an open channel, usually to measure rate of water flow.

Wetlands. Areas inundated by surface water or groundwater with a frequency sufficient to support vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

STATUTE GLOSSARY

INTRODUCTION

The Statute Glossary is comprised of summary descriptions of the principal federal and state environmental and cultural resources laws, rules, and regulations. The federal enactments are included in the first part of this section followed by State of Nevada enactments.

FEDERAL ENACTMENTS

AMERICAN INDIAN RELIGIOUS FREEDOM ACT OF 1978 (P.L. 95-341)

This Act makes it a policy of the government to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise their traditional religions. This includes access to sites, use and possession of sacred objects, and freedom to worship through ceremonials and traditional rites. Compliance with the Act requires that federal agencies consult with Native American religious leaders, consider their views in the decision-making process, and avoid unnecessary interference with Indian religious practices in project implementation.

ANTIQUITIES ACT OF 1906 (34 STAT. 225)

This Act was the first general act providing protection for archaeological resources. It provides for protection of all historic or prehistoric ruins or monuments or any object of antiquity on federal lands, and establishes criminal sanctions against the injury, destruction, or unauthorized excavation of such resources.

ARCHAEOLOGICAL RESOURCES PROTECTION ACT OF 1979 (P.L. 96-95)

This Act supplements the provisions of the Antiquities Act of 1906 in securing the protection of archaeological resources and sites on public lands. It stipulates that no person may excavate, remove, damage, or otherwise alter or deface any archaeological resource on public lands unless such activity has been permitted in accordance with the Act. Criminal and civil penalties for violation of the law are included. Applicable regulation is 43 CFR 7.

NATIONAL HISTORIC PRESERVATION ACT OF 1966 (P.L. 89-665), AS AMENDED

This Act establishes as policy the preservation of prehistoric and historic resources and provides mechanisms for assessing the cultural and scientific value of such resources and their eligibility for listing in the National Register of Historic Places. It further requires that federal agencies with jurisdiction over federal, federally assisted, or federally licensed undertakings take into account the effects of such activities on properties eligible for listing in the National Register of Historic Places. Applicable regulations are 36 CFR 60, 36 CFR 61, and 36 CFR 800.

NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT OF 1990 (P.L. 101-601)

This Act establishes as policy that Native American human remains and associated funerary objects which are discovered or excavated on federal land are the property of Native Americans. It establishes mechanisms by which the treatment and disposition of such materials is to be accomplished and sets criminal and civil penalties for violation of the Act.

ARCHAEOLOGICAL AND HISTORIC PRESERVATION ACT OF 1974 (P.L. 93-291)

Congress amended the Reservoir Salvage Act to extend the provisions of the Act to all federal construction activities and all federally licensed or assisted activities that will cause loss of scientific, prehistoric, or archaeological data. It requires the Secretary of the Interior (Secretary) to coordinate this effort, and to report annually to Congress on the program. It permits agencies either to undertake necessary protection activities on their own or to transfer to the Secretary up to 1 percent of the total authorized expenditure on a federal or federally assisted or licensed project to enable the Secretary to undertake the necessary protection activities.

CLEAN AIR ACT (42 U.S.C. 7401) AND AMENDMENTS OF 1970

National Primary and Secondary Ambient Air Quality Standards-40 CFR 50.
State Implementation Plan Requirements-40 CFR 51.

The purposes of this Act are to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population; to initiate and accelerate a national research and development program to achieve the prevention and control of air pollution; to provide technical and financial assistance to State and local governments for aid in their development and execution of air pollution control programs; and to encourage and assist the development and operation of regional air pollution control programs."

The Act requires the USEPA to publish national primary standards to protect public health, and more stringent national secondary standards to protect public welfare (40 CFR 50). States and local governments are to be responsible for the prevention and control of air pollution.

States that are divided into air quality control regions are required to submit State Implementation Plans (SIPs) for USEPA approval (40 CFR 51). SIPs provide strategies for implementation, maintenance, and enforcement of national primary and secondary ambient air quality standards for each air quality control region.

Other provisions of the Act include: (1) standards of performance for new stationary sources; (2) motor vehicle emission and fuel standards; (3) national emission standards for hazardous air pollutants; (4) a study of particulate emissions from motor vehicles; and (5) a study of the cumulative effect of all substances and activities that may affect the stratosphere, especially ozone in the stratosphere.

CLEAN WATER ACT (33 U.S.C. 1251 *et seq.*)

Public Law 92-500, as amended

The Clean Water Act strives to "restore and maintain the chemical, physical, and biological integrity of the nation's water." To achieve this objective the Act sets forth the following goals: "(1) that the discharge of pollutants into the navigable waters of the United States be eliminated by 1985; (2) that as an interim goal there be attained by 1983 water quality which provides for the protection and propagation of fish, shellfish and wildlife, and provides for recreation in and on the water; (3) that the discharge of toxic pollutants in toxic amounts be prohibited; (4) that Federal financial assistance be provided to construct publicly owned waste treatment works; (5) that area wide waste treatment management planning processes be developed and implemented to assure adequate control of source pollutants in each State; (6) that a major research and demonstration effort be made to develop technology necessary to eliminate the discharge of pollutants into navigable waters, waters of the contiguous zone, and the oceans; and (7) it is the national policy that programs for the control of nonpoint sources of pollution be developed and implemented in an expeditious manner so as to enable the goals of this Act to be met through the control of both point and nonpoint sources of pollution."

The goals of the Act are achieved primarily through a system of water quality standards, discharge limitations, and permits. The Act authorizes the USEPA to require owners and operators responsible for point source discharges to monitor, sample, and maintain effluent records.

If the water quality of a water body is potentially affected by a proposed action (e.g., construction of a waste water treatment plant), a National Pollutant Discharge Elimination System (NPDES) permit (Section 402) may be required. In most cases the USEPA has turned this responsibility over to the states as long as the state program is deemed acceptable.

Similarly, if a project may result in placement of material into waters of the USCOE Dredge and Fill Permit (Section 404) may be required. It should be noted that the 404 permit also pertains to activities in wetlands and riparian areas.

Prior to issuance of either a NPDES or 404 permit, the applicant must obtain a Section 401 certification. This declaration states that any discharge complies with all applicable effluent limitations and water quality standards. Certain federal projects may be exempt from the requirements of Section 404 if the conditions set forth in Section 404(r) are met.

ENDANGERED SPECIES ACT OF 1973 (P.L. 93-205)

The purpose of this Act is to provide protection for animal and plant species that are currently in danger of extinction (endangered) and those that may become so in the foreseeable future (threatened).

Section 7 of this Act requires federal agencies to ensure that all federally associated activities within the United States do not have adverse impacts on the continued existence of threatened or endangered species or on designated areas (critical habitats) that are important in conserving those species. Action agencies must consult with the U.S. Fish and Wildlife Service (USFWS), which maintains current lists of species that have been designated as threatened or endangered, to determine the potential impacts a project may have on protected species.

Section 9 of the Act prohibits any person subject to United States jurisdiction to possess, sell, deliver, carry, transport, or ship any species listed under this Act, except by authorized permit.

The USFWS has established a system of informal and formal consultation procedures. Preparation by USFWS of a "Biological Opinion" will conclude formal consultation. The result of informal or formal consultations with USFWS under Section 7 of the Endangered Species Act Amendments of 1978 should be described and documented in the EA or EIS. This should include:

> A list of endangered, threatened, or candidate species occurring in the project areas and what impacts, if any, the project could have on endangered fish and wildlife and their habitat.
>
> Action or project features included to enhance, mitigate, or reduce adverse impacts on threatened or endangered species.
>
> A description of the formal and informal consultation with the USFWS and the Biological Opinion, if appropriate.

The "Alternatives Including the Recommended Plan" chapter should specify any threatened and endangered species mitigation or enhancement features included in the proposed alternative and the reasonable alternatives.

The "Affected Environment and Environmental Consequences" chapter should compare threatened and endangered species impacts for the proposed alternative, the "Without Project (no action)" alternative, and all reasonable alternatives. If a threatened or endangered species is located within the project area and is affected by the project, it may be desirable to attach a more detailed endangered species assessment to the end of the EA or EIS.

Additional detail on Endangered Species Act compliance is found in Reclamation Instructions (RI) 376.6.

EXECUTIVE ORDER 11514 (AMENDED BY EXECUTIVE ORDER 11991 PROTECTION AND ENHANCEMENT OF ENVIRONMENTAL QUALITY, 1977)

This Executive Order requires federal agencies to initiate measures needed to direct their policies, plans, and programs toward meeting national environmental goals.

Federal agencies are responsible for developing procedures (i.e., public hearings, information on alternative courses of action) to ensure timely public review and understanding of federal plans and programs that impact the environment and to allow opportunity for public comment.

This order directs the Council on Environmental Quality (CEQ) to develop regulations requiring EIS's to be more concise, clear, and to the point, and therefore more useful to decision-makers. CEQ has also issued regulations for implementing the procedural provisions of NEPA (40 CFR 6).

EXECUTIVE ORDER 11593, 1971 (PROTECTION AND ENHANCEMENT OF THE CULTURAL ENVIRONMENT) (16 U.S.C 470)

This Executive Order requires federal agencies to take a leadership role in preservation by surveying all lands under their ownership or control and nominating to the National Register all properties that appear to qualify. It also requires agencies to avoid inadvertently destruction of such properties prior to completing their inventories (codified as part of 1980 amendments to the National Historic Preservation Act).

EXECUTIVE ORDER 11988 (FLOODPLAIN MANAGEMENT, 1977)

This Executive Order requires construction agencies to avoid, where practicable alternatives exist, the short- and long-term adverse impacts associated with floodplain development.

Federal agencies are required to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values served by floodplains in carrying out agency responsibility.

EXECUTIVE ORDER 11990 (PROTECTION OF WETLANDS, 1977)

This Executive Order requires executive agencies, in carrying out their land management responsibilities, to minimize the destruction, loss, or degradation of wetlands, and take action to preserve and enhance the natural and beneficial values of wetlands.

Each agency shall avoid undertaking or assisting in wetland construction projects unless the head of the agency determines that there is no practicable alterative to such construction and that the proposed action includes measures to minimize harm.

Also, agencies shall provide opportunity for early public review of proposals for construction in wetlands, including those projects not requiring an EIS.

FISH AND WILDLIFE COORDINATION ACT OF 1958 (P.L. 85-624)

The objective of this Act is to ensure that wildlife conservation receives equal consideration and be coordinated with other features of water-resource development programs.

Sections 1 and 2 of the Fish and Wildlife Coordination Act (FWCA) mandate that fish and wildlife receive equal consideration with water resources development programs throughout planning, development, operation, and maintenance. Whenever the U.S. Bureau of Reclamation proposes to impound, divert, channelize, or otherwise alter or modify any stream, river, or other body of water for any purpose, it must first consult and coordinate its actions and projects with the USFWS and the affected state fish and game agency(ies) wherein the impoundment, diversion, or other control facility is to be constructed. This consultation and coordination will address ways to conserve wildlife resources by preventing loss of and damage to such resources as well as to further develop and improve these resources.

Compliance with FWCA must be completed before the draft EIS is filed.

The USFWS is authorized to survey, investigate, prepare reports, and recommend methods to determine possible damage to wildlife resources and to determine means and measures that should be adopted to prevent loss of or damage to such wildlife resources, as well as to concurrently develop and improve such resources. The FWCA report shall be made a part of any Bureau of Reclamation report submitted to Congress. The Bureau of Reclamation shall give full consideration to the report of the state agency. The project plan shall include such justifiable fish and wildlife means and measures as deemed necessary to obtain maximum overall project benefits.

The usual USFWS procedure is to provide the Bureau of Reclamation with periodic planning aid memoranda or planning aid letters throughout the planning process, and to provide an FWCA report as part of the EA or EIS.

The recommendations of the USFWS must be summarized in the EA or EIS and responses to each recommendation included. This summary is usually made a part of the Consultation and Coordination section. If a recommendation is not included in the plan, the reasons must be given. Additional details on FWCA compliance are found in RI 376.13.

THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (NEPA), as amended (P.L. 91-90, 42 U.S.C. 4321 *et seq.*)

This Act establishes a national policy for protection and enhancement of the environment and directs federal agencies to use a systematic interdisciplinary approach that ensures the integrated use of natural and social sciences and the design arts in planning and decision-making affecting the human environment. The Act also establishes the Council on Environmental Quality.

RESOURCE CONSERVATION AND RECOVERY ACT OF 1976 (RCRA) (P.L. 94-580)

Identification and Listing of Hazardous Waste -40 CFR 261. Standards Applicable to Generators of Hazardous Waste-40 CFR 262.

The objectives of RCRA are to promote the protection of health and the environment and to conserve valuable material and energy resources. Passage of this Act marked the first serious federal attempt to address the problems of solid waste and hazardous waste management.

Subtitle C of RCRA establishes a hazardous waste program designed to regulate all areas of hazardous waste management, from generation to disposal. States can assume authority for implementation of a hazardous waste program (40 CFR 271), and to date only a few have not exercised this authority. State programs must be at least equivalent to the federal program and many are more stringent.

SAFE DRINKING WATER ACT OF 1974 (P.L. 93-523), AS AMENDED BY THE SAFE DRINKING WATER ACT AMENDMENTS OF 1986

National Primary Drinking Water Regulations-40 CFR 141.
National Interim Primary Drinking Water Regulations Implementation-40 CFR 142.
National Secondary Drinking Water Regulations-40 CFR 143.

The Safe Drinking Water Act provides for the safety of drinking water supplies throughout the United States by establishing national standards that the states are responsible for enforcing.

The Act provides for the establishment of primary regulations for protection of the public health and secondary regulations relating to the taste, odor, and appearance of drinking water. Primary drinking water regulations, by definition, include either a maximum contaminant level (MCL) or, when a MCL is not economically or technologically feasible, a prescribed treatment technique that would prevent adverse health effects on humans. An MCL is the permissible level of a contaminant in water that is delivered to any user of a public water system. Primary and secondary drinking water regulations are stated in 40 CFR 141 and 143, respectively.

STATE OF NEVADA ENACTMENTS

BUREAU OF AIR QUALITY

Permit to Construct

The Nevada Division of Environmental Protection, Bureau of Air Quality, within the Department of Conservation and Natural Resources, is responsible for issuing air quality permits for the construction phase of projects. The purpose of these permits is to ensure, through enforceable permit conditions, that adequate air pollution control equipment is used in industrial processes to protect the ambient air quality standards and public health and safety, prevent injury to plant and animal life, prevent damage to property, and preserve visual, scenic, aesthetic, and historic values within the state.

Nevada Revised Statutes (NRS) 445.401 through 445.601 embody the powers and duties of the State Environmental Commission (SEC) and the Department of Conservation and Natural Resources as they pertain to air quality. The SEC is statutorily granted the authority to adopt regulations necessary to accommodate the statement of purpose. The Department is responsible for implementing and enforcing the SEC's regulations as well as providing recommendations and technical assistance. The regulations applicable to sources of air pollution in the State of Nevada are contained in Nevada Administrative Code (NAC).

Operating Permit

The Nevada Division of Environmental Protection, Bureau of Air Quality, within the Department of Conservation and Natural Resources, is responsible for issuing air quality permits for the operations phase of projects. The purpose of these permits is to reaffirm, through testing, inspection, and/or monitoring, that the initial determination of compliance relied on for issuance of the permit to construct is valid. This is accomplished through the use of enforceable permit conditions and orders to achieve the overall goals of protecting public health and welfare, preventing damage to plant and animal life and property, and preserving visual, scenic, aesthetic and historic values within the state.

NRS 445.401 through 445.601 embody the powers and duties of the SEC and the Department of Conservation and Natural Resources as they pertain to air quality. The SEC is statutorily granted the authority to adopt regulations necessary to accommodate the statement of purpose. The Department is responsible for implementing and enforcing the SEC's regulations as well as providing recommendations and technical assistance. The regulations applicable to sources of air pollution in the State of Nevada are contained in NAC.

BUREAU OF WATER PERMITS AND COMPLIANCE

Nevada State Groundwater Permit

The Nevada Division of Environmental Protection, Bureau of Water Permits and Compliance, within the Department of Conservation and Natural Resources is responsible for issuing groundwater permits under the authority of NRS, Chapter 445. The purpose of these permits is to prevent pollution of groundwater and to protect the environment.

NRS 445.131 through 445.354 embody the powers and duties of the SEC and the Division of Environmental Protection as they pertain to water pollution control. The SEC is statutorily granted the authority to adopt regulations necessary to accommodate the statement of purpose. The Division is responsible for implementing and enforcing the SEC's regulations as well as providing recommendations and technical assistance when needed. The regulations applicable to control of water pollution in the State of Nevada are contained in NAC.

BUREAU OF WATER PERMITS AND COMPLIANCE

National Pollutant Discharge Elimination System (NPDES) Permit

The Nevada Division of Environmental Protection, Bureau of Water Permits and Compliance, within the Department of Conservation and Natural Resources, has the responsibility for issuing NPDES permits. The purpose of these permits is to regulate discharge into "Waters of the U.S." to prevent water pollution, protect the environment, and preserve the beneficial uses that have been designated for those waters.

NRS 445.131 through 445.354 embody the powers and duties of the SEC and the Division of Environmental Protection as they pertain to water pollution control. The SEC is statutorily granted the authority to adopt regulations necessary to accommodate the statement of purpose. The Division is responsible for implementing and enforcing the SEC's regulations as well as providing recommendations and technical assistance when needed. The regulations applicable to control of water pollution in the State of Nevada are contained in NAC.

BUREAU OF MINING REGULATION AND RECLAMATION

Nevada Water Pollution Control Permit

The Nevada Division of Environmental Protection, Bureau of Mining Regulation and Reclamation, within the Department of Conservation and Natural Resources, has responsibility for protecting waters of the state from discharges associated with mining activities. This responsibility is met through issuance of water pollution control permits and requirements for surface stabilization and reclamation upon closure.

NRS 445.131 through 445.354 embody the powers and duties of the SEC and the Division of Environmental Protection as they pertain to water pollution control. The SEC is statutorily granted the authority to adopt regulations necessary to accommodate the statement of purpose. The Division is responsible for implementing and enforcing the SEC's regulations as well as providing recommendations and technical assistance when needed. The regulations applicable to control of water pollution in the State of Nevada are contained in NAC.

Nevada Mining Reclamation Permit

The Nevada Division of Environmental Protection, Bureau of Mining Regulation and Reclamation, within the Department of Conservation and Natural Resources, has the responsibility for protecting the environment from adverse impacts associated with mining activities. This responsibility is met through issuance of exploration project and mining operation reclamation permits.

NRS 519A.010 through 519A.290 embody the powers and duties of the SEC and the Division of Environmental Protection as they pertain to mine reclamation. The SEC is statutorily granted the authority to adopt regulations necessary to accommodate the statement of purpose. The Division is responsible for implementing and enforcing the SEC's regulations as well as providing recommendations and technical assistance when needed. The regulations applicable to mine reclamation in the State of Nevada are contained in NAC Chapter 519A.

BUREAU OF WASTE MANAGEMENT

Hazardous Waste Management Permit

The Nevada Division of Environmental Protection, Waste Management Bureau, within the Department of Conservation and Natural Resources, is authorized to regulate hazardous wastes and to issue RCRA permits under authority of NRS 459.400 through 459.600. The basis for regulation of hazardous wastes and issuance of these permits is to ensure proper management of hazardous wastes by generators, transporters, and treatment, storage, and disposal facilities.

NEVADA DIVISION OF WILDLIFE

Industrial Artificial Pond Permit

The Nevada Division of Wildlife within the Department of Conservation and Natural Resources has responsibility for protecting wildlife from Industrial Artificial Ponds under authority of NRS 502.390. An operator of a mining operation which develops or maintains an artificial body of water containing chemicals directly associated with the processing of ore must first obtain a permit authorizing the development or maintenance of the body of water. A description of bodies of water that are lethal to wildlife is contained in NAC 502.460 through 502.495.

APPENDIX A

BOOTSTRAP SOIL CHARACTERISTICS

TABLE A
Soil Profile Characteristics

Soil Type	Site No.	Surface Coarse Fragments (%)	Horizons & Depth (in)	Boundary (dist.-topo.)[1]	Coarse Fragment % Volume g-c-s-b[2]	Texture (USDA)[3]	Color[4] Dry	Color[4] Moist	Structure grade-size-type[5]	Consistence (dry-moist-wet)[6] and Plasticity[7]	Roots (class type)[8]	Efferv[9]	K Factor[10]	Comments
ML	SS-12	45	A1 0-5	CW	21-0-0-0	L	10YR 6/4	10YR 3/3	f-gr	so-fr-os-ps	mf,fm,fc	0	0.26	
			A2 5-12	CW	17-20-0-0	L	10YR 6/3	10YR 3/4	m-sbk	so-fr-ss-ps	cf,fc	0	0.23	
			B 12-21	CW	23-10-0-0	C	7.5YR 6/8	7.5YR 4/8	m-sbk	so-fr-os-ps	fc	0	0.1	
			C 21+	--	10-10-0-0	IND	--	--	--	--	--	e	--	
RI	VS-7	10	A 0-6	B	20-10-0-0	L	--	10YR 5/4	gr	so-vfr-os-op	cf	ev	--	Top of Round Mountain
			C 6+	--	--	R	--	--	--	--	--	ev	--	
MSD	SS-3	40	A 0-4	CW	12-0-0-0	L	10YR 7/2	10YR 3/4	wf-sbk	so-vfr-ss-ps	mf,fm	es	0.38	
			B 4-19	CW	11-0-0-0	L	10YR 7/2	10YR 4/4	mm-sbk	sh-fi-ss-ps	cf,fm	e	0.43	
			C 19+	--	--	R	--	--	--	--	--	e	--	
RG	VS-2	50	A 0-4	CI	20-5-0-0	L	10YR 6/3	10YR 4/6	f-gr	so-fr-ss-ps	mf	0	--	
			C 4+	--	--	R	--	--	--	--	--	--	--	
SWS	SS-5	20	A 0-10	CW	9-0-0-0	L	10YR 5/3	10YR 3/3	gr	so-vfr-s-p	mf,fm	0	0.29	
			B1 10-19	CW	9-10-0-0	SiL	10YR 5/3	10YR 3/4	wf-sbk	sh-fr-ss-ps	cf,fm	e	0.44	
			B2 19-28	CW	9-10-0-0	L	--	10YR 7/4	mm-sbk	h-fi-s-p	ff,fm	ev	--	
			C 28+	--	40-30-0-0	R	--	--	massive	--	--	ev	--	
SWR	SS-1	50	A 0-8	CS	26-0-0-0	L	10YR 7/3	10YR 3/3	wf-sbk	h-fi-s-p	mf	0	0.33	
			B1 8-13	CS	23-0-0-0	L	10YR 7/4	10YR 3/6	wf-sbk	h-fi-s-p	cf	0	0.32	
			B2 13-26	W	19-0-0-0	L	10YR 7/6	10YR 4/6	wf-sbk	h-fi-s-p	ff	0	0.32	
			C 26+	--	10-70-0-0	R	--	--	massive	--	--	e	--	
TS	SS-9	30	A 0-9	CW	12-0-0-0	L	10YR 6/4	10YR 3/4	wm-sbk	so-vfr-ss-ps	fc,fm	0	0.33	
			B 9-21	CW	9-0-0-0	L	10YR 7/4	10YR 5/6	wm-sbk	sh-fr-ss-ps	ff,fm	0	0.39	
			C 21+	--	--	IND	--	--	--	--	--	e	--	

TABLE A (continued)
Soil Profile Characteristics

Soil Type	Site No.	Surface Coarse Fragments (%)	Horizons & Depth (in)		Boundary (dist.-topo.)[1]	Coarse Fragment % Volume g-c-s-b[2]	Texture (USDA)[3]	Color[4]		Structure grade-size-type[5]	Consistence (dry-moist-wet)[6] and Plasticity[7]	Roots (class type)[8]	Efferv[9]	K Factor[10]	Comments
								Dry	Moist						
TS	VS-10	15	A	0-9	CW	12-0-0-0	L	10YR 6/4	10YR 3/4	wm-sbk	so-vfr-ss-ps	cf,fm	0	--	
			B	9-21	CW	9-0-0-0	L	10YR 7/4	10YR 5/6	wm-sbk	sh-fr-ss-ps	ff,fm	0	--	
			C	21+	--	--	IND	--	--	--	--	--	e	--	
STD	SS-4	20	A	0-6	CW	15-0-0-0	L	10YR 8/3	10YR 3/3	wf-sbk	so-vfr-os-op	mf	0	0.38	
			B1	6-20	CW	12-0-0-0	SiL	10YR 6/6	10YR 4/6	mm-sbk	so-fr-os-op	cf	0	0.39	
			B2	20-31	CW	13-0-0-0	L	10YR 6/5	10YR 6/5	mm-sbk	sh-fi-ss-ps	ff	0	0.34	
			C	31+	--	50-0-0-0	IND	--	--	--	--	--	e	--	
FN	SS-11	25	A	0-10	CW	19-0-0-0	CL	10YR 7/4	10YR 4/3	mm-sbk	sh-fr-ss-ps	cf,fm	0	0.26	
			C	10+	CS	10-20-0-0	IND	--	10YR 5/8	--	--	--	0	--	
PD	SS-15	70	A	0-8	CW	49-20-0-0	CL	10YR 7/3	10YR 5/3	mf-sbk	sh-fi-ps-ss	mf-cc	0	0.29	
			C	8+	--	--	R	--	--	--	--	--	0	--	
DP	SS-14	70	A	0-7	CS	38-0-0-0	L	10YR 5/3	10YR 3/3	wf-sbk	sh-fr-ss-ps	mf	0	0.29	
			B	7-15	CW	36-50-0-0	L	--	10YR 3/3	mm-sbk	h-fi-s-p	cf	0	0.24	
			C	15+	--	50-20-0-0	R/C	--	10YR 3/6	massive	vh-vfi-vs-vp	ff	0	--	
X	VS-24	70	A	0-6	--	30-20-20-0	CL	--	10YR 3/2	wf-sbk	sh-fi-ss-ps	ff	0	--	
			AC	6-11	--	25-40-0-0	CL	--	10YR 3/2	wf-sbk	h-fi-s-p	ff	0	--	
			C	11+	--	--	R	--	--	--	--	--	0	--	
PDX	VS-17	80	A	0-11	CW	10-30-0-0	L	10YR 7/3	10YR 5/3	mf-sbk	sh-fi-ps-ss	mf-cc	0	--	
			C	11+	--	30-40-0-0	R	--	--	-	--	--	0	--	
SW	SS-13	--	A	0-5	CW	36-0-0-0	L	10YR 7/2	10YR 3/2	gr/wf-sbk	so-vfri-op-os	--	0	0.37	Profile variable throughout drainage. Clayey to gravelly.
			B	5-18	CW	5-0-0-0	L	10YR 6/2	10YR 3/2	mm-sbk	h-fi-s-p	--	0	0.38	
			C	18+	--	60+-0-0-0	R/C	--	10YR 3/6	massive	vh-vfi-vs-vp	--	0	--	

TABLE A (continued)
Soil Profile Characteristics

Soil Type	Site No.	Surface Coarse Fragments (%)	Horizons & Depth (in)		Boundary (dist.-topo.)[1]	Coarse Fragment % Volume g-c-s-b[2]	Texture (USDA)[3]	Color[4]		Structure grade-size-type[5]	Consistence (dry-moist-wet)[6] and Plasticity[7]	Roots (class type)[8]	Efferv[9]	K Factor[10]	Comments
								Dry	Moist						
DPX	SS-16	50	A	0-6	CW	20-0-0-0	L	10YR 5/3	10YR 3/3	wf-sbk	sh-fr-ss-sp	cf	0	0.35	
			AC	6-11	CW	25-25-0-0	L	--	10YR 3/4	wf-sbk	sh-fr-ss-sp	ff	0	--	
			C	11+	--	--	R	--	--	--	--	--	0	--	
Y	SS-18	--	A	0-8	CW	28-10-0-0	L	10YR 6/3	10YR 3/3	m-sbk	sh-fr-op-ps	cf,fm	0	0.34	
			B	8-11	CW	31-10-0-0	C	10YR 5/8	10YR 5/6	m-sbk	s-fr-op-os	ff,fm	0	0.13	
			C	18+	--	--	R	--	--	--	--	--	--	--	
BN	SS-20	0	A	0-8	CW	19-0-0-0	CL	10YR 6/3	10YR 3/3	mm-sbk	h-fi-ss-ps	cf	0	0.29	Clay skins below "A" horizon.
			B	8-24	CW	6-0-0-0	L	10YR 7/4	10YR 4/6	mm-pr	h-fi-os-op	cm	0	0.4	
			C	24+	--	--	IND	--	--	--	--	--	e	--	
RBN	SS-22	50	A1	0-5	CW	21-0-0-0	L	10YR 7/3	10YR 3/3	mf-sbk	sh-fr-ss-ps	cf	0	0.38	Clay skins below "A" horizon
			A2	5-10	CW	17-15-0-0	CL	10YR 7/3	10YR 4/3	mm-sbk	h-fi-s-p	cf	0	0.3	
			B	10-16	CW	10-50-0-0	SiC	--	10YR 4/6	mm-sbk	--	ff	0	--	
			C	16+	--	--	R	--	--	--	--	--	0	--	
TER	SS-23	20	A	0-8	CW	2-0-0-0	L	10YR 6/4	10YR 3/4	wf-sbk	sh-fr-ss-ps	mf,cm	0	0.46	
			B1	8-23	CW	2-0-0-0	L	10YR 6/4	10YR 4/6	mm-sbk	h-fi-s-p	cf,cm	0	0.4	
			B2	23-33	CW	6-5-0-0	L	10YR 7/6	10YR 4/6	sm-sbk	h-fi-s-p	ff,cm	0	0.42	
			C	33+	--	--	R	--	--	--	--	--	0	--	
WS	VS-6	20	A	0-6	CW	20-20-0-0	L	--	10YR 5/4	gr	so-fr-os-op	cf	es	--	Fractured bedrock below 6-8 inch depth
			C	6+	--	-- Total	R	--	--	--	--	--	es	--	
RD	VS-8		A	0-5	CW	10-0-0-0	LS	--	5YR 3/3	gr	so-vfr-os-op	cf	--	--	
			C	5+	--	80 Total	--	--	--	--	--	--	--	--	

TABLE A (continued)
Soil Profile Characteristics

Soil Type	Site No.	Surface Coarse Fragments (%)	Horizons & Depth (in)		Boundary (dist.-topo.)[1]	Coarse Fragment % Volume g-c-s-b[2]	Texture (USDA)[3]	Color[4]		Structure grade-size-type[5]	Consistence (dry-moist-wet)[6] and Plasticity[7]	Roots (class type)[8]	Efferv[9]	K Factor[10]	Comments
								Dry	Moist						
LBN	SS-19	0	A	0-6	CS	7-0-0-0	L	10YR 7/2	10YR 3/3	mm-sbk	h-fi-s-p	mf	0	0.24	Clay skins below "A" horizon.
			B	6-20	CS	33-10-0-0	CL	10YR 6/6	10YR 5/8	mm-pr	vh-vfi-vs-vp	cf	0	0.26	
			C	20+	--	--	R	--	-	-	--	--	r	--	
RS	VS-21	30	A	0-5	CW	10-5-0-0	--	--	7.5YR 3/4	gr	so-vfr-os-op	cf	0	--	
			AC	5-8	CW	5-60-0-0	L	--	7.5YR 3/4	gr	so-vfr-os-op	cf	0	--	
				C8+	--	--	R	--	--	-	--	--	[illegible]	--	

[1] See **Figure 3-9** for soil mapping units

[2] **Distinctness:** A = abrupt; C = clear; G = gradual; D = diffuse. **Topography:** S = smooth; W = wavy; I = irregular; B = broken

[3] gravel (g) - cobbles (c) - stones (s) - boulders (b)

[4] C = clay; L = Loam; LS = Loamy Sand; IND = Indurate; R = Rock; CL = Clay Loam; SiC = Silty Clay.

[5] Munsell Soil Color Chart Notation determined from rubbed samples. In place soils may have varied colors.

[6] **Grade:** m = massive; 1 = weak; 2 = moderate; 3 = strong. **Size:** f = fine; m = medium; c = coarse. **Type:** gr = granular; pr = prismatic; clr = columnar; abk = angular blocky; sbk = subangular blocky.

[7] **Dry:** lo = loose; so = soft; sh = slightly hard; h = hard; vh = very hard; eh = extremely hard. **Moist:** lo = loose; vfr = very friable; fr = friable; fi = firm; vfi = very firm; efi = extremely firm. **Wet:** so = nonsticky; ss = slightly sticky; s = sticky; vs = very sticky.

[8] po = nonplastic; ps = slightly plastic; p = plastic; vp = very plastic

[9] **Class:** f = few; c = common; m = many; n = none. **Type:** f = fine; m = medium; c = coarse.

[10] Effervescence (Indicates presence of $CaCO_3$): o = none; e = slight; es = strong; ev = violent.

[11] Soil Erodibility Factor without consideration for profile coarse fragments.

Source: Grass Land 1995

TABLE B
Soil Laboratory Data

Site[1]	Map Unit	Horizon Depths (inches)	Particle Sizes S-Si-C-fS[2]	Texture (USDA)[3]	Organic Matter (%)	pH[4]
SS-1	SWR	0-8	29-46-17-8	L	1.8	-
		8-18	25-46-23-6	L	0.5	-
		13-26	28-37-21-14	L	0.5	-
SS-9	MSD	0-4	27-48-12-13	L	2.2	5.7
		8-18	28-45-12-15	L	1.8	6.0
SS-4	STD	0-6	27-50-14-9	L	1.6	5.7
		6-20	26-51-16-7	SiL	2.1	5.7
		20-31	29-44-18-9	L	1.0	5.7
SS-9	SWS	0-10	25-50-14-11	L	2.1	5.7
		10-19	26-52-10-12	SiL	1.8	5.7
SS-9	TS	0-9	30-45-13-12	L	0.5	5.7
		9-21	31-41-15-13	L	0.1	5.7
SS-11	PD	0-10	29-32-28-11	CL	0.9	6.0
SS-12	ML-DIS	0-5	36-35-17-12	L	0.1	-
		5-12	33-32-26-9	L	1.1	-
		12-21	33-19-44-4	C	0.9	-
SS-13	SW	0-5	34-44-13-9	L	0.9	5.8
		5-18	37-36-19-8	L	0.7	6.0
SS-14	DP	0-7	37-44-15-4	L	2.1	5.8
		7-15	38-30-22-10	L	1.0	-
SS-15	PD	0-8	41-41-13-5	L	0.1	5.8
SS-16	DPX	0-6	28-46-19-7	L	1.1	6.8
SS-13	Y	0-8	29-46-19-6	L	0.5	-
		8-18	24-18-50-8	C	0.5	-
SS-14	LBN	0-6	25-43-23-9	L	1.8	5.8
		6-20	23-38-30-9	CL	0.9	5.8
SS-22	BN	0-8	16-49-33-2	CL	1.8	5.7
		8-24	27-40-20-13	L	0.5	-
SS-22	RBN	0-5	29-48-18-5	L	1.1	6.2
		5-10	25-41-29-5	CL	0.9	-
SS-23	TER	0-8	29-43-16-12	L	1.8	6.2
		8-23	29-39-18-14	L	0.6	6.8
		23-33	31-41-16-12	L	0.4	-

1 See **Figure 3-9** for soil sample sites.
2 S = Sand; Si = Silt; C = Clay; fS = Fine Sand
3 L = Loam; SiL = Silty Loam; CL = Clay Loam; C = Clay. Source: USDA 1993.
4 Measured in the field during Order 2 Soil Survey (Grass Land 1995).

TABLE C Soil Erosion Characteristics					
		Erosion Factors-Surface Layer		Hazard of Erosion	
Mapping Unit	Wind Erodability Group (WEG)	K Factor	T Factor (Tons/acre/yr)	Water	Wind
ML-DIS	5	0.26	1	Moderate to High	None
DIS-RI-RO	4L	--	1	High	None
MSD	4L	0.38	1	Moderate	Variable[2]
DIS	--	--	--	High	None
RG	4	--	1	High	None
RG-DIS	--	--	1	High	None
SWS	5	0.26	1	High	None
SWR	5	0.33	1	High	None
TS	5	0.38	1	Moderate	Variable[2]
STD	5	0.38	2	High	Variable[2]
FN	4	0.26	1	Moderate	None
RD	5	0.29	1	Moderate	None
RD	5	0.29	1	High	None
RD	5	--	1	High	None
X	4	--	1	High	None
PDX	5	--	1	High	None
DPX	5	0.35	1	High	None
SW	5	0.38	1	Slight	Variable[2]
Y	5	0.38	1	Moderate	None
BN	4	0.26	1	Moderate	Moderately Erodible
RBN	5	0.38	1	Moderate	None
TER	5	0.46	2	Moderate	Variable[2]
LT	5	--	2	High	Slightly Erodible
WS-RO	4L	--	1	High	None
RD	--	--	1	High	None
LBN	4	0.24	1	High	Moderately Erodible
RS	5	--	1	High	None
RI-RO	5	--	1	High	None

[1] See Figure 3-9 for soil mapping units

[2] Hazard of Wind Erosion is variable depending upon mixing of coarse fragment content. Hazard varies from none to moderately erodible.

Source: USDA 1980 and 1993.

TABLE D
Location and Classification of Soil Samples

Soil Type[1]	Sample Site[2]	Legal Description[3]	Study Classification
ML	SS-12	750'E, 700'N of SW Corner of Sec 2	Fine loamy, mixed, frigid Xeric Haplargid
RI	VS-7	150'W, 200'N of SE Corner of Sec 3	Fine loamy, mixed, mesic Dystric Lithic Xerochrept
MSD	SS-3	150'W, 1200'N of SE Corner of Sec 10	Coarse loamy, mixed, mesic Lithic Xeric Haplocambid
RG	VS-2	700'W, 750'N of SE Corner of Sec 10	Fine loamy, mixed, frigid Dystric Lithic Xerochrept
SWS	SS-5	700'W, 500'N of SE Corner of Sec 10	Coarse loamy, mixed, mesic Xeric Gypsiargid
SWR	SS-1	1250'W, 2600'S of NE Corner of Sec 15	Fine loamy, mixed, frigid Xeric Haplargid
RS	VS-21	200'W, 2800'S of NE Corner of Sec 15	Fine loamy, mixed, mesic Dystric Lithic Xerochrept
TS	VS-10 SS-9	1650'E, 200'S of NW Corner of Sec 14 1650'E, 1950'S of NW Corner of Sec 14	Coarse loamy, mixed, mesic Xeric Haplocambid
STD	SS-4	150'W, 450'S of NE Corner of Sec 15	Coarse loamy, mixed, mesic Xeric Haplocambid
FN	SS-11	1350'E, 2350'N of SW Corner of Sec 11	Fine loamy, mixed, mesic Lithic Xeric Haplocambid
PD	SS-15	1800'W, 700'N of SE Corner of Sec 2	Loamy-skeletal, mixed Lithic Ultic Argixeroll
PD	SS-11	1800'W, 950'N of SW Corner of Sec 2	Loamy-skeletal, mixed Lithic Ultic Argixeroll
X	VS-24	2700'W, 1250'S of NE Corner of Sec 11	Loamy-skeletal, mixed Lithic Ultic Haploxeroll
PDX	VS-17	1700'W, 850'S of NE Corner of Sec 11	Loamy-skeletal, mixed, mesic Lithic Xeric Haplocambid
DPX	SS-15	1500'W, 100'S of NE Corner of Sec 11	Fine loamy mixed Lithic Ultic Haploxeroll
SW	SS-13	2000'E, 250'N of SW Corner of Sec 2	Coarse loamy, mixed, mesic Lithic Xeric Haplargid
Y	SS-18	650'W, 1700'S of NE Corner of Sec 11	Loamy skeletal over clayey, mixed Lithic Xeric Haplargid
RD	SS-20	1050'W, 2200'N of SE Corner of Sec 11	Fine loamy, mixed, mesic Lithic Xeric Haplocambid
RBN	SS-22	1700'W, 1900'N of SE Corner of Sec 11	Fine loamy, mixed, mesic Lithic Xeric Haplargid
TER	SS-23	2350'W, 750'S of NE Corner of Sec 14	Coarse loamy, mixed, mesic Xeric Haplocambid
WS	VS-6	800'W, 2200'S of NE Corner of Sec 10	Loamy-skeletal, mixed, mesic Dystric Lithic Xerochrept
RD	VS-6	750'E, 2000'S of NW Corner of Sec 14	Loamy-skeletal, mixed Lithic Ultic Haploxeroll
LBN	SS-19	2600'W, 2250'S of NE Corner of Sec 11	Fine loamy, mixed, mesic Lithic Xeric Haplargid
LT	None	----	Coarse loamy, mixed, mesic Xeric Haplocambid
RR	None	----	Coarse loamy, mixed, mesic Xeric Haplocambid
Dis	None	----	---

[1] See Figure 3-9 for soil type locations.
[2] SS = sample site; VS = verification site.
[3] All sample sites are located in T36N, R49E.

Source: Grass Land 1995

APPENDIX B

List of Vascular Plant Species Documented for the Bootstrap Project Study Area

APPENDIX B

List of Vascular Plants Documented for the Bootstrap Project Study Area[1]

Binomial	Common Name	Floodplain	Wyoming Sagebrush-Burned	Wyoming Sagebrush-Burned and Seeded	Wetlands
NATIVE PERENNIAL GRAMINOIDS					
Agropyron smithii	Western wheatgrass	x	x	x	
Agropyron spicatum	Bluebunch wheatgrass		x		
Agropyron trachycaulum	Slender bentgrass	x[2]			
Agrostis exarata	Spike bentgrass		x	x	x
Carex douglasii	Douglas's sedge	x			
Carex geyeri	Elk sedge	x			
Carex praegracilis	Blackcreeper sedge				x
Carex saxatilis	Russet sedge				x
Distichilis stricta	Saltgrass	x			x
Eleocharis pauciflora	Fewflowered spikerush	x			
Elymus cinereus	Basin wildrye	x	x	x	
Elymus elymoides	Bottlebrush squirreltail	x	x	x	
Elymus multisetus	Big squirreltail	x			
Festuca idahoensis	Idaho Fescue		x		
Juncus arcticus	Arctic rush	x			x
Juncus ensifolius var. montanus	Swordleaf rush				x
Juncus filiformis	Thread rush				x
Juncus longistylis	Longstsyle rush				x
Poa nevadensis	Nevada bluegrass		x	x	
Poa secunda	Sandberg bluegrass	x	x	x	
Scirpus cespitosus	Deerhair bulrush				x
Scirpus microcarpus	Panicled bulrush				x
Stipa comata	Needle-and-thread	x[2]	x		
Stipa lettermanii	Letterman needlegrass	x	x	x	
Stipa thurberiana	Thurber needlegrass		x		
INTRODUCED PERENNIAL GRAMINOIDS					
Agropyron cristatum	Crested wheatgrass	x		x	
Agrostis stolonifera	Redtop	x			x
Bromus inermis	Smooth brome		x		
Poa palustris	Fowl bluegrass				x
Poa pratensis	Kentucky bluegrass	x			
NATIVE ANNUAL GRAMINOIDS					
Deschampsia danthonioides	Annual hairgrass		x		
Festuca octoflora	Six week fescue		x		
Juncus bufonius	Toad rush				x

APPENDIX B (continued)

List of Vascular Plants Documented for the Bootstrap Project Study Area[1]

Binomial	Common Name	Floodplain	Wyoming Sagebrush-Burned	Wyoming Sagebrush-Burned and Seeded	Wetlands
INTRODUCED ANNUAL GRAMINOIDS					
Bromus tectorum	Cheatgrass brome	x	x	x	x
Polypogon monspeliensis	Rabbitfoot grass				x
NATIVE PERENNIAL FORBS					
Achillea millefolium	Common yarrow	x			x
Agoseris glauca	Mountain dandelion		x	x	
Allium spp.	Wild onion		x	x	
Antennaria rosea	Rosy pussytoes		x		
Antennaria species	Pussytoes		x	x	
Arenaria fendleri	Sandwort		x		
Aster scopulorum	Crag aster		x	x	
Astragalus purshii	Milkvetch	x	x	x	
Balsamorhiza hookeri	Hooker's balsamroot		x		
Calochortus spp.	Sego lily	x		x	
Castilleja spp.	Paintbrush species		x		
Cirsium spp.	Thistle	x	x		
Crepis acuminata	Tapertip hawksbeard		x		
Crepis spp.	Hawksbeard			x	
Erigeron aphanactis	Hairy daisy		x	x	
Eriogonum spp.	Buckwheat		x		
Hydrophyllum spp.	Waterleaf		x		
Iris missouriensis	Rocky Mountain Iris				x
Iva axillaris	Poverty weed	x	x	x	
Lewisia rediviva	Bitterroot		x		
Lomatium spp.	Lomatium species		x		
Lupinus argenteus	Silvery lupine		x	x	
Lupinus brevicaulis	Short stem lupine	x			
Lupinus caudatus	Spurred lupine		x	x	
Mentha spp.	Mint species				
Mertensia spp.	Bluebell species		x		
Mimulus guttatus	Monkey-flower				x
Mimulus spp.	Monkey-flower species	x	x		
Penstemon spp.	Penstemon species	x	x		
Perideridia spp.	Yampah species		x		
Phlox longifolia	Long-leaf phlox	x	x	x	
Phoenocaulis chieranthoides	Daggerwood		x		

INDEX

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P

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S

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V

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