ENVIRONMENTAL ASSESSMENT

DOI-BLM-NV-W010-2010-0010-EA

Coeur Rochester Mine Expansion Project

October 2010

Prepared by:

U.S. Bureau of Land Management
Winnemucca District Office
Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, NV 89445-2921

Nevada Department of Wildlife
Cooperating Agency

BLM

Winnemucca District Office / Nevada

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

BLM/NV/WN/EA/10/30+1792

DOI-BLM-NV-W010-2010-0010-EA

Cover photo by Lynn Harrison

COEUR ROCHESTER, INC.
ROCHESTER MINE EXPANSION PROJECT
PERSHING COUNTY, NEVADA
ENVIRONMENTAL ASSESSMENT

CONTENTS

Page

FIGURES

TABLES

ACRONYMS

AAQC	Ambient Air Quality Standards
ABA	acid-base accounting
ACEC	Area of Critical Environmental Concern
AEE	AGRA Earth & Environmental, Inc.
AGP	acid generating potential
AIRFA	American Indian Religious Freedom Act
AMR	Agriculture, Mining, and Recreation
amsl	above mean sea level
ANFO	Ammonium Nitrate and Fuel Oil
ANP	acid neutralizing potential
ARPA	Archaeological Resources Protection Act
AST	aboveground storage tank
BAPC	Bureau of Air Pollution Control
BEA	Bureau of Economic Analysis
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BMP	best management practice
BMRR	Bureau of Mining Regulation and Reclamation
BRF	Black Ridge Fault
BSP	Barren Solution Pipeline
CAA	Clean Air Act
CAP	Corrective Action Plan
CBC	catch basin central
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	Cumulative Effects Study Area
CFR	Code of Federal Regulations
CH_4	methane
cm	centimeter(s)
Coeur	Coeur Rochester, Inc.
CO	carbon monoxide
COPC	Constituents of Potential Concern
CWA	Clean Water Act
EA	Environmental Assessment
EHS	extremely hazardous substance
EIS	Environmental Impact Statement
EMA	Environmental Management Associates, Inc.
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Endangered Species Act
ET	evapo-transpiration
°F	degrees Fahrenheit
FAA	Federal Aviation Administration
FICA	Federal Insurance Contributions Act
FLPMA	Federal Land Policy and Management Act

FR	Federal Register
FY	fiscal year
GAP	Gap Analysis Program
GCL	geosynthetic clay liner
GHG	greenhouse gases
gpm	gallons per minute
H_2S	hydrogen sulfide
HAP	hazardous air pollutant
HCT	humidity cell test
HDPE	high density polyethylene
HFC	hydro fluorocarbon
Hg	mercury
HQ	Hazard Quotient
IM	Instruction Memorandum
KOP	key observation point
LDL	leak detection line
MACT	Maximum Achievable Control Technology
MBTA	Migratory Bird Treaty Act
MCL	maximum contaminant level
MDB&M	Mount Diablo Base and Meridian
MFP	Management Framework Plan
MFST	MODFLOW-SURFACT®
Mine	Rochester and Nevada Packard Mine
MM	million
MMPA	Mining and Mineral Policy Act
MOU	Memorandum of Understanding
MSHA	Mine Safety and Health Act
MWMP	meteoric water mobility procedure
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NAG	net acid generating
NAGPRA	Native American Graves Protection and Repatriation Act
NAICS	North American Industry Classification System
NCP	National Contingency Plan
NDEM	Nevada Division of Emergency Management
NDEP	Nevada Division of Environmental Protection
NDOW	Nevada Department of Wildlife
NEPA	National Environmental Policy Act
NGO	Non-Governmental Organization
NHPA	National Historic Preservation Act
NMCP	Nevada Mercury Air Emissions Control Program
NNHP	Nevada Natural Heritage Program
NNP	net neutralization potential
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPDES	National Pollution Discharge Elimination System

NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRS	Nevada Revised Statute
NRV	Nevada Reference Value
NSM	Nevada State Museum
NSPS	New Source Performance Standard
NVCRIS	Nevada Cultural Resource Information System
O_3	ozone
OPLA	Omnibus Public Lands Act
PA	Programmatic Agreement
PAG	potentially acid generating
PFC	perfluorocarbon
PFYC	Potential Fossil Yield Classification
PILT	payments-in-lieu-of-taxes
PL	Public Law
PM	particulate matter
POA	Plan of Operations Amendment
ppm	parts per million
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RDS	rock disposal site
RFFA	Reasonably Foreseeable Future Actions
ROD	Record of Decision
ROW	right-of-way
SARA	Superfund Amendments and Reauthorization Act
sec	second
SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SLERA	Screening Level Ecological Risk Assessment
SO_2	sulfur dioxide
SOC	Schedule of Compliance
SPCC	Spill Prevention, Control, and Countermeasures
SPLP	synthetic precipitation leaching procedure
SWPPP	Stormwater Pollution Prevention Plan
SWS	Schlumberger Water Services
tpy	tons per year
TRI	Toxic Release Inventory
TSCA	Toxic Substances Control Act
UDL	underdrain detection line
$\mu g/m^3$	micrograms per cubic meter
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USDI	U.S. Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service

USGS	U.S. Geological Survey
VOC	volatile organic compound
VRM	Visual Resources Management
WAD	weak acid dissociable
WPCP	Water Pollution Control Permit
WRCC	Western Regional Climate Center

COEUR ROCHESTER, INC.
ROCHESTER MINE EXPANSION PROJECT
ENVIRONMENTAL ASSESSMENT

1 INTRODUCTION

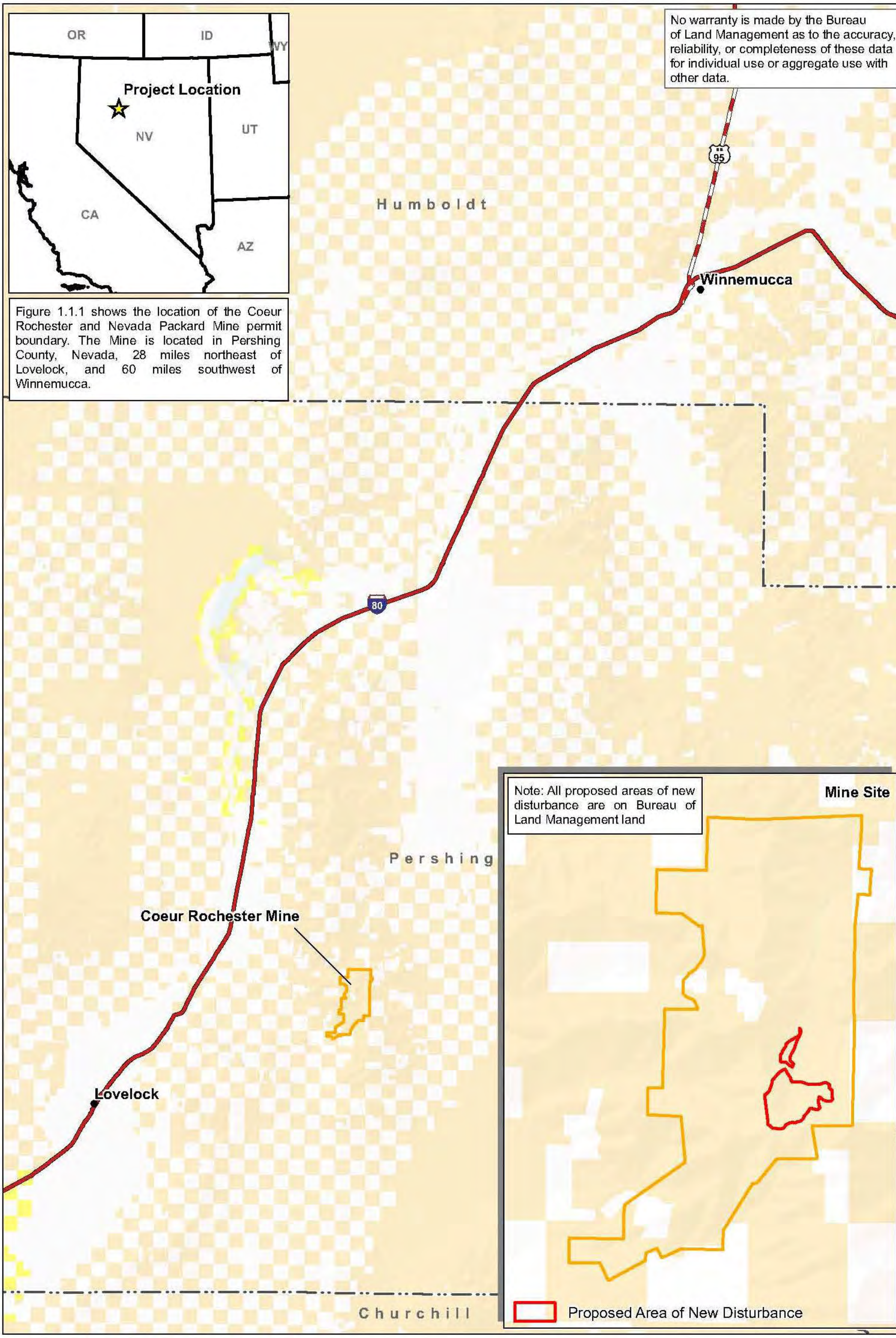
1.1 Overview

Coeur Rochester, Inc. (Coeur) operates the Rochester and Nevada Packard Mine (Mine), located approximately 28 miles northeast of Lovelock, in Pershing County, Nevada (**Figure 1.1.1**). The Mine site is located on public lands managed by the Humboldt River Field Office of the U.S. Department of the Interior (USDI), Bureau of Land Management (BLM), and private (patented) lands owned by Coeur. The Mine site is located within all or portions of Township 28 North, Range 34 East, sections 2, 3, 11, 9, 10, 15, 16, 21, 22, 27, 28, 29, 32 and 33, Mount Diablo Base and Meridian (MDB&M), at elevations ranging from approximately 5,400–7,300 feet above mean sea level (amsl). Primary access to the Mine is provided via the Lovelock/Unionville Road (a county road) from Interstate 80 at the Oreana-Rochester Exit (Exit 119) located between Lovelock and Winnemucca.

On August 5, 2009, Coeur submitted Plan of Operations Amendment N64629, No. 8 (POA No. 8) to BLM to address proposed changes in the current operations. Under POA No. 8, Coeur proposes to extend the existing Rochester Open Pit by 38.6 acres into existing waste rock facilities located to the west and southwest of the pit, construct a 7-acre layback to the North Highwall of the open pit, backfill the pit to preclude formation of a pit lake, build and operate a Stage III Heap Leach Facility, and construct a buttress against the southeast pit wall to provide a conveyor/pipeline corridor from the ore crushing facility to the Stage III Heap Leach Facility and the process plant. At closure, the northern portion of the Stage III Heap Leach Facility would be covered with high density polyethylene (HDPE) liner to minimize infiltration. The remainder of the facility would have an engineered soil cover. Spent process water from the Stage III Heap Leach Facility would be managed separately from the other leach facilities in 2 evaporation ponds. One 3.5-acre pond would be within the liner of the Stage III Heap Leach Facility and the other 3.0-acre pond would be within an undisturbed portion of the ancillary area adjacent to the Stage II Heap Leach Facility. Constructing the Stage III Heap Leach Facility and ancillary facilities would specifically disturb approximately 162.0 acres. The 162.0 acres of new disturbance would occur on public lands administered by BLM. The other proposed facilities covered in this Environmental Assessment (EA) (i.e., the expanded pit and layback of North Highwall) would be constructed on areas previously disturbed and would cover approximately 45.6 acres.

Submittal of POA No. 8 was made in accordance with BLM's Surface Management Regulations contained in Title 43 of the Code of Federal Regulations (CFR), Part 3809, inclusive (43 CFR 3809). POA No. 8 was also submitted to the Nevada Division of Environmental Protection (NDEP), Bureau of Mining Regulation and Reclamation (BMRR) in accordance with Nevada Revised Statute (NRS) 519A, Reclamation of Land Subject to Mining Operations or Exploration Projects, and Nevada Administrative Code (NAC) 519A, Regulation of Mining Operations and Exploration Projects.

Left Blank Intentionally



NATIONAL SYSTEM OF PUBLIC LANDS

WINNEMUCCA DISTRICT OFFICE
Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, Nevada 89445

Legend

Permit Boundary (Coeur Rochester and Packard)

Land Status

Bureau of Land Management

Bureau of Reclamation

Interstate Highway

U.S. Highway

County Boundary

Town/City

N

Miles 0 5

July 2010

Figure 1.1.1

Project Location

Coeur Rochester Mine Expansion Environmental Assessment

Left Blank Intentionally

1.2 Project History and Background

Coeur submitted its initial Mine Plan of Operations to BLM in 1985 describing the development of an open pit/heap leach operation to recover silver from the ore mined at the Rochester site. Under the initial Plan of Operations, proposed facilities included an open pit mine, the Stage I and Stage II heap leach facilities, the Merrill-Crowe processing plant, rock disposal facilities, haul and access roads, and topsoil stockpiles.

An EA was prepared under the National Environmental Policy Act (NEPA) and the initial Plan of Operations was approved by BLM and NDEP in February 1986 and given case file number N26-86-002P, which was later serialized to the current case file number N64629. Subsequent to the approval of the initial Plan of Operations, the following amendments were submitted to BLM and NDEP by Coeur:

- Amendment No. 1—Approved by BLM and NDEP in September 1988 authorizing development and construction of the South Rock Disposal Site (RDS).
- Amendment No. 2—Modification to the facility plan in 1990 based on a drilling program that identified additional ore reserves.
- Amendment No. 3—Proposed to extend the plan boundary to the north, south, and west to allow construction of the Stage IV Heap Leach Facility and expand the South and West RDS. The proposal was approved in March 1993.
- Amendment No. 4—Approved by BLM and NDEP in June 2000 and included expansion of the West RDS, in-pit backfill of the Rochester Pit, and expansion of the Stage II Heap Leach Facility.
- Amendment No. 5—Incorporated the Nevada Packard Project and was approved in February 2002.
- Amendment No. 6—Approved in August 2003 and included expansion of the Rochester Pit as well as the in-pit disposal of development rock. In addition, Coeur also proposed a modification to the footprint for the Nevada Packard Project, expansion of the Stage IV Heap Leach Facility, and a minor adjustment to the West RDS.
- Amendment No. 6.5—Approved in April 2004 and included expansion of the Stage IV Heap Leach Facility, 3 borrow sites, and an equipment staging area within an existing disturbed area.

Amendment No. 7 was submitted to BLM and NDEP in November 2003 and included a plan for the reclamation and closure of the Rochester and Nevada Packard sites, as stipulated in the Decision Record for Plan Amendment No. 6. Amendment No. 7 also included a proposed height increase for the Stage II Heap Leach Facility and development and construction of the proposed Stage III Heap Leach Facility. BLM initiated preparation of an Environmental Impact Statement (EIS) for Amendment No. 7 in February 2004. In July 2008, Amendment No. 7 was withdrawn and the NEPA process ended because of the need for further baseline information in order to fully evaluate the alternatives as they pertained to closure. A site-wide closure study plan has been developed and is being implemented to acquire necessary data for a final permanent mine closure plan. Upon completion of the study, a final site closure plan would be submitted by Coeur and analyzed in detail. The closure study plan is expected to be completed in 2012.

The Plan of Operations boundary encompassed 4,370 acres. To date, 1,568 acres have been disturbed by construction of the pit, heap leach facilities, RDS, stockpiles, haul and access roads, and processing facilities. Mining methods employed at the Mine have included typical open pit techniques where ore and development rock is drilled, blasted, loaded, crushed and hauled or conveyed to leach facilities (ore), or hauled as run-of-mine ore to leach facilities or RDS (development rock). Production at the Mine has historically averaged approximately 22,500 tons of ore and 33,000 tons of development rock per day. Silver and gold are leached from ore placed on leach pads through application of a weak sodium cyanide solution from a drip irrigation system. The heap leach pregnant solution is gathered in a collection system and pumped to the Merrill-Crowe processing plant for silver and gold recovery. Active mining operations were suspended at the Mine in August 2007 although active leaching of ore at the Stage II and Stage IV heap leach facilities continues to occur.

This EA has been prepared in compliance with NEPA to examine the potential effects of the Proposed Action, Alternative B. Alternative B in this case is POA No. 8, including restarting mining operations and expanding the Rochester Pit, constructing the Stage III Heap Leach Facility, managing process solutions by directing them to the processing plant and recycling fluids back to the heap for reuse, backfilling portions of the Rochester Pit, and managing process water from the Stage III Heap Leach Facility after closure separately in the 2 evaporation ponds.

BLM is the lead agency for preparation of this EA. The Nevada Department of Wildlife (NDOW) is participating as a cooperating agency. This document follows the Council on Environmental Quality regulations implementing the provisions of NEPA (40 CFR 1500-1508) and BLM’s NEPA Handbook (H-1790-1), and is organized as follows:

- Chapter 1 describes the project history and background, purpose and need for Alternative B, the role of BLM, conformance with existing BLM land use plans, the relationship to other statutes, regulations, policies, plans, and environmental analyses, issues, and the existing operations at the Mine.
- Chapter 2 describes alternatives A–D.
- Chapter 3 describes the affected environment in the project area.
- Chapter 4 discloses potential direct and indirect environmental consequences.
- Chapter 5 describes the cumulative effects that could occur as a result of the implementing each alternative.
- Chapter 6 discusses mitigation and monitoring.
- Chapter 7 includes the list of preparers and reviewers for the preparation of this EA.
- Chapter 8 describes consultation and coordination.
- Chapter 9 discusses public involvement.
- Chapter 10 presents a list of references used in the development of this EA.

1.3 Purpose and Need

The purpose of this federal action is to provide Coeur the opportunity to resume and expand mining operations at the Rochester Mine necessary to recover silver and gold, including continued mining and closure of the Rochester Pit and the construction, operation, and conceptual closure of an additional heap leach pad on public lands.

The need for the federal action is established by BLM's responsibility under its 2008 Energy and Mineral Policy, the Federal Land Policy and Management Act of 1976 (FLPMA), and BLM Surface Management Regulations at 43 CFR 3809, to respond to a Plan of Operations and to take any action necessary to prevent unnecessary or undue degradation of the lands.

1.4 Land Use Plan Conformance

BLM has the responsibility and authority to manage mineral resources on public lands within its charge in accordance with the requirements of applicable federal laws and regulations. The proposed action is in conformance with BLM's Winnemucca District *Sonoma-Gerlach Environmental Impact Statement* and associated Record of Decision (ROD) for *Sonoma-Gerlach Resource Area Management Framework Plan (MFP)* approved July 9, 1982.

1.5 Relationship to Laws, Regulations, and Other Plans

The Mine site is located on BLM administered public lands and patented (private) lands owned by Coeur. Mining operations on BLM administered public lands are conducted in accordance with the General Mining Law of 1872; BLM's Surface Management regulations contained in 43 CFR Part 3809, inclusive; the Mining and Mineral Policy Act of 1970 (MMPA); and the FLPMA of 1976.

Mining operations on federal and private land in the state of Nevada are also conducted in accordance with NAC 445A.350 through 445A.447, Mining Facilities; NRS 519A, Reclamation of Land Subject to Mining Operations or Exploration Projects; and NAC 519A, Regulation of Mining Operations and Exploration Projects. In addition, Coeur maintains all other applicable permits and approvals to conduct operations at the Mine as required by applicable federal, state, and local laws and regulations.

Coeur maintains a reclamation financial guarantee for the Mine in accordance with the requirements of 43 CFR 3809, NRS 519A, and NAC 519A. This financial guarantee presently is held by BLM. Upon approval of POA No. 8, and before commencing construction activities, Coeur would revise the reclamation cost estimate to reflect the activities associated with the amended Plan of Operations as required by the appropriate federal and state statutes and regulations. The financial guarantee would then be adjusted to meet the revised reclamation cost estimate.

The Pershing County zoning classification for the area encompassing the Mine is Agricultural-Mining-Recreation (AMR). The activities proposed for POA No. 8 are consistent with the Pershing County planned land use for the area.

1.6 Issues

A scoping letter describing Alternative B and soliciting comments was sent by BLM to interested parties on November 12, 2009. These parties included local, state, and federal agencies; non-governmental organizations (NGOs); and the general public. BLM subsequently held 2 public meetings, 1 in Winnemucca, Nevada on November 30, 2009, and 1 in Lovelock, Nevada on December 1, 2009. The public comment period for scoping closed on December 11, 2009.

BLM considers each document in response to the request for public comment as a "comment document," including emails, faxes, and completed written comment forms. Each comment document therefore could include more than one comment. The Lovelock meeting resulted in 15 comment documents submitted on comment forms provided by BLM. No written comment documents were received during the meeting in Winnemucca. The scoping process also resulted in an additional 18 comment documents submitted to BLM as letters and attachments to email for a total of 33 comment documents. In summary, BLM received comment submittals from the following: 14 individuals; 9 business and service organizations; 6 state and local regulatory agencies; 2 federal agencies; one NGO; and one unidentified commenter. The following is a list of key issues raised during the internal and external scoping process:

- Evaluate the current extent of water quality impacts from the Mine and determine how these would be affected by the proposed expansion during operations and after closure. As part of this process, fully characterize the geochemical behavior of all materials and wastes, including prediction of and proposed mitigation for acid generation. Update previous predictions of releases to ground and surface water and describe the potential for future releases. Describe the chemistry of and potential risks from any open water ponds.
- Assess the potential impacts to air quality, including releases of and impacts from mercury and other hazardous air pollutants. Update previous predictions of air emissions and predict releases from the proposed expansion.
- Determine the potential impacts to special status wildlife species and habitat including the pygmy rabbit, the western sage grouse, and other wildlife species and habitats as appropriate.
- Emphasize the positive socioeconomic benefits to the City of Lovelock and Pershing County that would result from implementation of POA No. 8.
- Assess visual resources including the need to retain "dark sky attributes."
- Assess the positive environmental effects of the proposed pit backfill.
- Provide a general update on Mine site-wide environmental effects that have occurred since 1986 in the Affected Environment section.
- Determine the availability of sufficient cover material for successful reclamation. Evaluate the potential for hazardous material loadings, including mercury, to soils.

1.7 Previous and Existing Operations

Previously permitted operations included open pit mining and the use of cyanide heap leach facilities to produce approximately 5 million ounces of silver and 40,000 ounces of gold annually during full production. Mining methods employed at the Mine have included typical open pit mining techniques where ore and waste rock are drilled, blasted, loaded, and hauled to either the crusher facility (ore) or RDS also known as non-ore rock stockpiles. To date, mining at the Rochester Mine has disturbed 1,563 acres. Ore from the open pits was hauled to the primary crusher and then conveyed to the Stage II and Stage IV heap leach facilities. Mining has ceased at Packard and the pit and waste rock dumps are being reclaimed; no activities are proposed at Packard under POA No. 8. Mining operations at the Rochester site were suspended in August 2007 due to metal prices and limited leaching capacity within the existing facilities.

Production at the Mine historically averaged approximately 22,500 tons of ore and 33,000 tons of non-ore rock per day. Silver and gold are leached from ore through application of a weak sodium cyanide solution from a drip irrigation system and occasional use of “wobbler” sprinklers. Silver and gold are extracted from the process solution using the Merrill-Crowe zinc precipitation method.

Three heap leach pads have been constructed at the Mine. The Stage I Heap Leach Facility was actively leached until 1998 and is currently in the closure process. The Stage II and Stage IV heap leach facilities are projected to continue being leached through 2012 and 2014, respectively, at which time residual draindown would begin.

The valley-fill design of Coeur's current heap leach facilities (stages I, II, and IV) allows for process solutions to be stored within the crushed ore placed on the pads, eliminating the need for large process solution ponds. The solutions are contained in the voids within the ore and in the lower portion of the ore heap (*phreatic zone*) behind the dike structures and pumped into the counter-current process circuit. A counter-current fluid management system allows Coeur to circulate process solution within a single pad, or recirculate solution through both the Stage II and Stage IV heap leach facilities for enrichment purposes.

In addition to ore storage capabilities, the heap leach facilities are designed to contain the volume of water produced by a 25-year peak storm event and solutions from a 48-hour draindown of the heap due to power failures.

1.7.1 Open Pit

Excavation of the Rochester Pit began in 1986 on the peak of Nenzel Hill, at an elevation of approximately 7,000 feet amsl. Under the current authorizations, the eastern portions of the open pit have been permitted to extend downward to an elevation of approximately 5,950 feet amsl. The approved pit design results in ultimate pit floor elevations ranging from 5,950 to 6,500 feet amsl.

BLM approved POA No. 4 in June 2000 with stipulations that backfilling the Rochester Pit, where mining has occurred below the pre-mining water table (estimated at that time to be approximately 6,120 feet amsl), can only be completed using waste rock that has been carefully characterized to demonstrate the absence of acid generating potential (AGP). The western portion of the Rochester Pit above the pre-mining water level was backfilled with waste rock beginning in 1995. However, in 2009, BLM rescinded authorization to backfill the eastern portion of the pit, pending further analysis, when low pH water was observed in the very bottom of the Rochester Pit.

1.7.2 Mining Methods

During active mining operations, Coeur uses conventional drilling and blasting techniques to break up the rock for removal and segregation. Holes are drilled to a depth of 30 feet on a nominal 14- by 14-foot grid pattern using track mounted blast-hole drills. Drill holes are loaded with a mixture of ammonium nitrate and fuel oil (ANFO) (70 percent) and emulsion explosive (30 percent), and then detonated using 2.5-pound cast boosters and a non-electrical initiation system. Each blast is typically composed of 300–400 drill holes, yielding approximately 160,000 tons of blasted material. Blasts are usually scheduled 1–2 times per week.

During blast hole drilling, a composite sample is taken from each hole and assayed for gold and silver content. The assay results are entered into a computerized data base and plotted onto maps where ore blocks are determined based on an economic cut-off. In the field, blasted rock is coded with a system of colored pin flags, which are used by the loader operators to distinguish between ore and non-ore rock. Front-end loaders are used to load the broken rock into 100-ton haul trucks. Non-ore rock is transported to the RDS. During the most recent mining operations, all ore was transported to the primary crusher for processing. The primary crusher (48- by 60-inch jaw crusher) reduces the ore to less than 9 inches in diameter. From there, the ore is conveyed to the secondary crusher (7-foot standard cone crusher) where it is crushed to less than 3 inches in diameter. The ore is then conveyed to a scalping screen system, which separates the nominal minus 3/8-inch material and conveys it directly to the product belt. The oversize material is conveyed into 2 tertiary crushers (8-foot long head cone crushers). These tertiary crushers reduce the oversize to minus 3/8-inch. Lime is added to ensure proper alkalinity (pH 10) for cyanide processing and safety considerations. A series of overland conveyors delivers the ore to the load-out area stockpile. The ore is loaded onto 100-ton haul trucks for delivery to the heap leach pads. Historically, lower-grade ore was transported directly to the heap leach pads for immediate processing.

1.7.3 Non-Ore Rock Disposal Sites

At the Mine, approximately 263.8 million tons of non-ore rock have been removed from the Rochester Pit and placed in 6 surface valley-fill RDS: the North, South, East, Low Grade, West, and Charlie (**Figure 1.1.1**). These RDS have been constructed from the top down.

1.7.4 Heap Leach Facilities

1.7.4.1 Stage I

The Stage I Heap Leach Facility was constructed in 1986, with continuous ore loading through 1990. Leaching operations ended in 1997. The Stage I Heap Leach Facility was constructed with a primary synthetic liner comprised of 80-mil HDPE material and a secondary liner comprised of compacted clay. Two underdrain collection systems—Catch Basin East and Catch Basin West (located north of the facility) —were designed to capture pre-existing seasonal spring flows from beneath the pad and to convey the flows to the process ponds. In addition, flow in the southeast portion of the heap underdrain system flowed southeast to the South American Canyon Sump (located east of the Stage I Heap Leach Facility).

The Stage I Heap Leach Facility contains approximately 3.4 million square feet of lined area, covers approximately 85 acres, and holds approximately 24.7 million tons of ore. Ore was placed in 20-foot lifts and stacked to a height of approximately 200 feet. Dikes were constructed at both the northern and southern ends of the pad to contain pregnant solution. The north and south dikes are compacted rock-filled structures overlaid with filter rock, which is overlaid with clays. An 80-mil HDPE liner was placed on the upstream side facing the heap. Pregnant solution flowed into the main collection ditch where it was collected in a cistern just upstream from the north dike. The dike was constructed with a double-walled pipe that carried the solution through the dike and into the pregnant solution ponds. In 1991, the counter-current fluid management system was installed and use of the drain and solution ponds was discontinued.

Coeur began to decommission the pad in March 1997, and in April 1997, solution application was discontinued to allow draindown of remaining processing solutions within the leach pad. The draindown solution was used as makeup water for the remaining leach pads. Additionally, to enhance the removal of the hydraulic head from the Stage I liner, high rate evaporative sprinklers were installed and operated resulting in application of residual leach solution. By October 1997, over 55 million gallons of process solution were removed from the leach pad. The Stage I Heap Leach Facility was fully decommissioned in April 1998, at which time all barren solution (i.e., without precious metals) was diverted to the Stage II and Stage IV heap leach facilities, while draindown solution from Stage I was recycled to the counter-current solution management system.

The Stage I Heap Leach Facility was covered with 10 inches nominal of growth media (salvaged soil). The growth media was extended over the area of the containment liner and contoured.

1.7.4.2 Stage II

The majority of the Stage II Heap Leach Facility was constructed in 1988 and contains approximately 6.0 million square feet of lined area. The facility is constructed with a primary and a secondary liner. The leak detection structure for Stage II is the Stage II sump, located to the east of the pad. A sand and pipe drainage system between the liners serves as the leak detection system. The primary liner is composed of 80-mil HDPE, while the secondary liner consists of 12–24 inches of clay compacted to between $1x10^{-5}$ centimeters per second (cm/sec) and $1x10^{-7}$ cm/sec permeability. Crushed ore was loaded onto Stage II through 1996 in 20-foot lifts and stacked to a height of approximately 300 feet. In 1997, Coeur began stacking run-of-mine ore on Stage II. Since 2000, the heap was expanded with additional phases, and Coeur continued to place crushed and run-of-mine ore in 25- to 30-foot lifts to a height of approximately 300 feet (the maximum permitted height) over the remaining area of Stage II that had not already been stacked to 300 feet.

The Stage II pad covers approximately 130 acres with a current capacity of approximately 55 million tons of ore. Stage II has been regraded to promote side slope leaching and future reclamation.

Residual leaching of the Stage II Heap Leach Facility is scheduled to end in 2012. At that point, draindown of the facility would commence.

1.7.4.3 Stage IV

Initial construction and operation of the Stage IV Heap Leach Facility began in 1994. Through a series of phases from 1996 through 2004, Stage IV was expanded to approximately 222 acres. It has a permitted height of 330 feet and has the capacity to contain 113 million tons of ore.

The Stage IV Heap Leach Facility was constructed with a primary synthetic liner comprised of 80-mil HDPE and a secondary liner comprised of compacted clay with $1x10^{-6}$ cm/sec permeability. A leak detection system was installed between the 2 liner systems. An underdrain detection system was also constructed under the secondary liner. Leak collection structures were placed between the primary and secondary liners (leak detection line [LDL] #1 through LDL #8) and under the secondary liner (underdrain detection line [UDL] #1 through UDL #3). All of these lines report to sumps located east of the Stage IV dike. Portions of the Stage IV pad have been resloped to accommodate leaching and promote future reclamation and final permanent closure.

Construction included a dike of compacted rock at the eastern side of the Stage IV pad in order to contain pregnant solution within the heap. The dike was constructed to buttress into bedrock and crests at 5,925 feet amsl. An 80-mil HDPE liner was placed on the upstream side of the dike facing the heap.

Residual leaching of the Stage IV Heap Leach Facility is scheduled to end in 2014. At that point, draindown of the facility would commence.

1.7.5 Ore Crushing and Storage

The original ore crushing facilities were constructed in 1986. They were modified in 1987, with the addition of a fourth tertiary cone crusher and the scalping screen system, and again in 2003 with installation of the new tertiary system replacing all but the primary and secondary systems. The primary crusher system consists of an apron feeder, a standard grizzly (screen), and a jaw crusher. The current maximum permitted throughput is 1,700 tons per hour averaged over a one-hour period. The secondary crusher system consists of a vibrating grizzly (screen) and a cone crusher. The current maximum permitted throughput is also 1,700 tons per hour averaged over a one-hour period. The crusher is permitted to operate 24 hours per day.

1.7.6 Process Fluid Management System

The counter-current system of process solution management was developed in 1991 to manage process solutions without the use of pregnant and barren solution storage ponds, thereby addressing wildlife mortality concerns by minimizing open solution storage ponds. Because Coeur's heap leach facilities are a valley-fill design, process solutions are stored within the heap leach facilities instead of in solution ponds. The counter-current fluid management system directs the flow of process solutions throughout the heap leach facilities and process system.

The pregnant solution from Stage II is either pumped directly into the process facility or diverted to a common barren sump where it is supplemented with make-up cyanide and then applied to the Stage IV ore. The pregnant solution from Stage IV is pumped to the process facility where the precious metals are extracted. It is important to note that all process solutions are recycled and are operated to be contained within a closed system at all times. Cyanide is normally added to the system at the barren sump.

1.7.7 Solution Processing Facility

The process building was built in 1986 to recover silver and gold using the Merrill-Crowe zinc precipitation process. The pregnant solution is clarified with 1 of 3 clarifiers, as necessary. Next, the solution is de-aerated (i.e., the oxygen is removed) using a vacuum tower. Zinc dust is then added to the solution to precipitate precious metals, which are filtered out of the solution with 1 of 3 press filters. Filtered precipitate is cleaned from the presses weekly, dried, mixed with fluxes, and smelted in a reverberatory furnace. During the drying process, mercury is removed from the precipitate by heating within retorts, trapped in a condenser, transferred to a designated mercury flask, and sold as a product. The current maximum allowable throughput of Coeur's reverberatory furnace is 2.5 tons of precipitate per batch. The furnace may be operated 10 hours per day, not to exceed 3,000 hours per calendar year.

In 1994, a wet electrostatic precipitator was installed, replacing the existing scrubber for the reverberatory furnace. The electrostatic precipitator provides air pollution control on the emissions from the reverberatory furnace. The liquid cyanide storage area is located west of the process building. It is comprised of a 21,000-gallon capacity storage tank located on a cement secondary containment area within a separately fenced compound. Lime is also located in the same area and used on an as-needed basis for maintaining pH levels in the process solution. The secondary containment area was designed to drain into the barren solution pond should any accidental release of liquid cyanide from the storage tanks occur. The barren solution pond was completely relined with 80-mil HDPE liner in 2002. Sodium cyanide is currently transported to the site as solid briquettes within a tanker truck. Barren solution is added and the dissolved briquette solution is transferred to the storage tanks. This system minimizes the exposure potential to both humans and wildlife. The on-site laboratory contains specialized rooms to perform fire assay, metallurgical, and atomic absorption analyses.

1.7.8 Process Solution Ponds

Two pregnant solution ponds (designated as the East and West Pregnant Ponds), 1 barren solution pond, and 1 storage pond were built along with the Stage I Heap Leach Facility in 1986. The capacities of these ponds are as follows:

- East Pregnant Pond – 2.6 million gallons
- West Pregnant Pond – 2.6 million gallons
- Barren Pond – 2.2 million gallons
- Storage Pond – 748,000 gallons

The ponds were constructed and lined with an 80-mil HDPE primary liner on top of a geonet leak detection zone. Each pond was built with a separate leak detection system. The 2 pregnant solution ponds and the barren pond were eliminated from regular operations in 1991 when the counter-current fluid management system was implemented; however, they are maintained in good working order as a part of Coeur's emergency fluid management system.

1.7.9 Storm Water and Emergency Management Ponds

In addition to the 2 pregnant solution ponds and barren pond mentioned above, 4 emergency and storm water management ponds were built in the Mine area to provide additional storage capacity during emergency situations such as power outages and extreme storm events. One natural basin with a compacted clay liner is located near the Stage I Heap Leach Facility in South American Canyon. A second natural basin with a compacted clay liner is located immediately north of the process facilities in American Canyon. A third pond with an 80-mil HDPE liner and automated pump back system is located below the Stage IV Heap Leach Facility buttress in American Canyon. The fourth system is 2 small ponds located just south of water supply well PW-2. These ponds were originally constructed as emergency overflow ponds for the now-abandoned open process ponds and were incorporated into the system in 2001.

1.7.10 Access and Haul Roads

Access to the Mine is provided via Interstate 80 to the Oreana-Rochester Exit #119. A Pershing County road and then finally a mine road provide access to the Mine facilities. Pershing County maintains the County Road from I-80 to the cattle guard at the Limerick Canyon Summit/Spring

Valley Pass. Coeur maintains and would continue to maintain the road from the cattle guard into the permit area throughout the Mine’s active life and post-mining responsibility period. Maintenance consists of repair of erosion control structures and drainage systems; removal of debris from culverts and ditches; noxious weed control; replacement of road surface material as needed; and snow removal during winter.

Coeur also maintains approximately 72 acres of light vehicle access and haul roads located within the permit boundary that provide access to operations. These existing roads include: (1) the North Haul Road (4.5 acres) for development rock management in the RDS; (2) the Southwest Haul Roads (15 acres) for run-of-mine ore transport to the Stage II Heap Leach Facility; (3) the Packard Haul Road (34.1 acres) between the Nevada Packard Pit and the Rochester site; and (4) other ancillary roads (18.2 acres) around the Mine. Maintenance consists of regrading and dust control; repair of erosion control structures and drainage systems; and removal of debris from culverts and ditches. These roads would be reclaimed as part of the closure process.

2 PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action and Alternatives

2.1.1 Alternative A – No Action

Alternative A (No Action) – No additional mining or placement of ore on existing heap leach facilities. Permanent pit lake formed at closure.

Alternative B (Proposed Action) – Mining of additional 50 million tons of ore. Construction of the Stage III Heap Leach Facility. Backfilling of the pit to approximately 6,175 feet elevation amsl to create flow through condition and preclude pit lake.

Alternative C (Hydrologic Sink) – Same as Alternative B except backfilling to approximately 6,150 feet elevation amsl to create hydrologic sink and preclude pit lake.

Alternative D (Out-of-Heap Solution Management) – Same as Alternative B except excess solution storage in a 6.5 acre pond outside of the Stage III Heap Leach Facility footprint.

Alternative A maintains the status quo under which Coeur would continue to operate existing leaching and processing facilities and then close the Mine under the currently approved Plan of Operations. No additional mining or backfilling would occur and the existing lake would remain in the Rochester Pit. **Figure 2.1.1** depicts the site layout under Alternative A. The current pit configuration, including existing in-pit RDS is shown in **Figure 2.1.2**. Lime would continue to be added to the existing lake as needed to maintain neutral conditions. After closure, the lake would recover to approximately the 6,100 feet amsl elevation, which would cover about 16.5 acres at its largest and be approximately 125 feet deep at its deepest part. The size of the lake would vary seasonally in response to water inputs and evaporative processes.

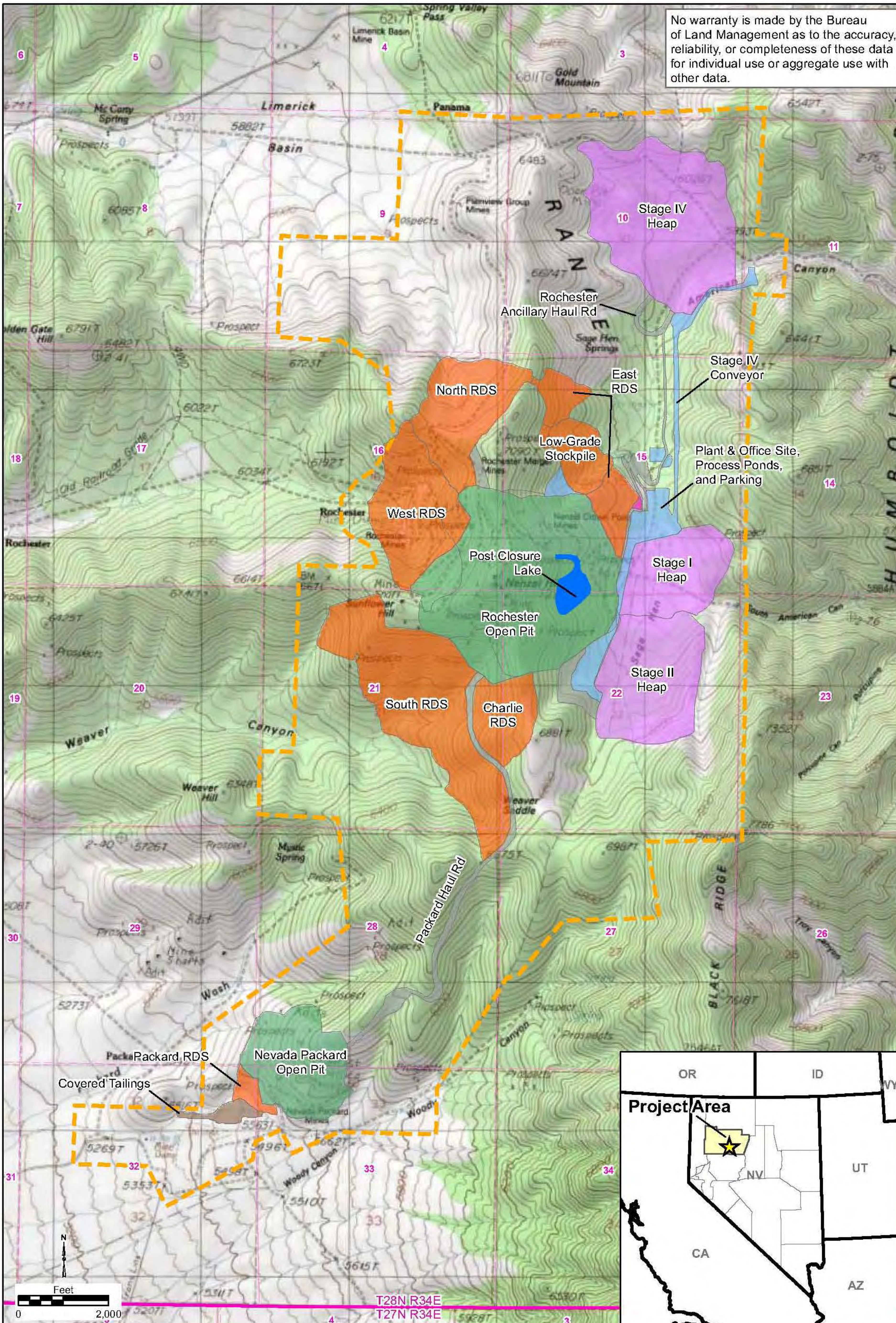
No additional material would be placed on the Stage II or Stage IV heap leach facilities. Residual leaching is scheduled to be completed in the Stage II Heap Leach Facility in 2012 and residual leaching of Stage IV would end in 2014 after which the facilities would be closed. The site-wide closure study plan would continue to be implemented to acquire necessary data for a final mine closure plan. The closure study plan is expected to be completed in 2012. Final permanent closure plans would then be submitted per NAC 445A.

2.1.2 Alternative B – Proposed Action

The Proposed Action to be analyzed is the resumption of mining operations and resumed operational leaching at the Mine as set out in POA No. 8 dated August 3, 2009 (Coeur 2009a). All proposed activities lie within the currently approved Plan of Operations permit boundary. POA No. 8 consists of:

- Extension of the existing Rochester Pit into the existing RDS located west and southwest of the pit by 38.6 acres.
- Construction of a 7-acre layback of the North Highwall within the currently approved pit disturbance boundary.
- Full backfill of the eastern portion of the Rochester Pit up to an elevation of approximately 6,175 feet amsl in order to eliminate and preclude a post-mining pit lake.
- Construction, operation, and conceptual closure of a new heap leach pad, Stage III, resulting in 145.7 acres of new disturbance. At closure, the northern portion of the facility (approximately 80 acres) would be covered with HDPE while the remaining areas would have an engineered soil cover.

Left Blank Intentionally



NATIONAL SYSTEM OF PUBLIC LANDS

WINNEMUCCA DISTRICT OFFICE
Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, Nevada 89445

Legend

- Permit Boundary (Coeur Rochester and Packard)
- Approximate Post Closure Lake

Mine Site Components

- Ancillary Facilities
- Heaps
- Parking Area
- Open Pits
- Haul Roads
- RDS
- Tailings

Source: Coeur 2009a

July 2010

Figure 2.1.1

Alternative A - No Action

Coeur Rochester Mine Expansion Environmental Assessment

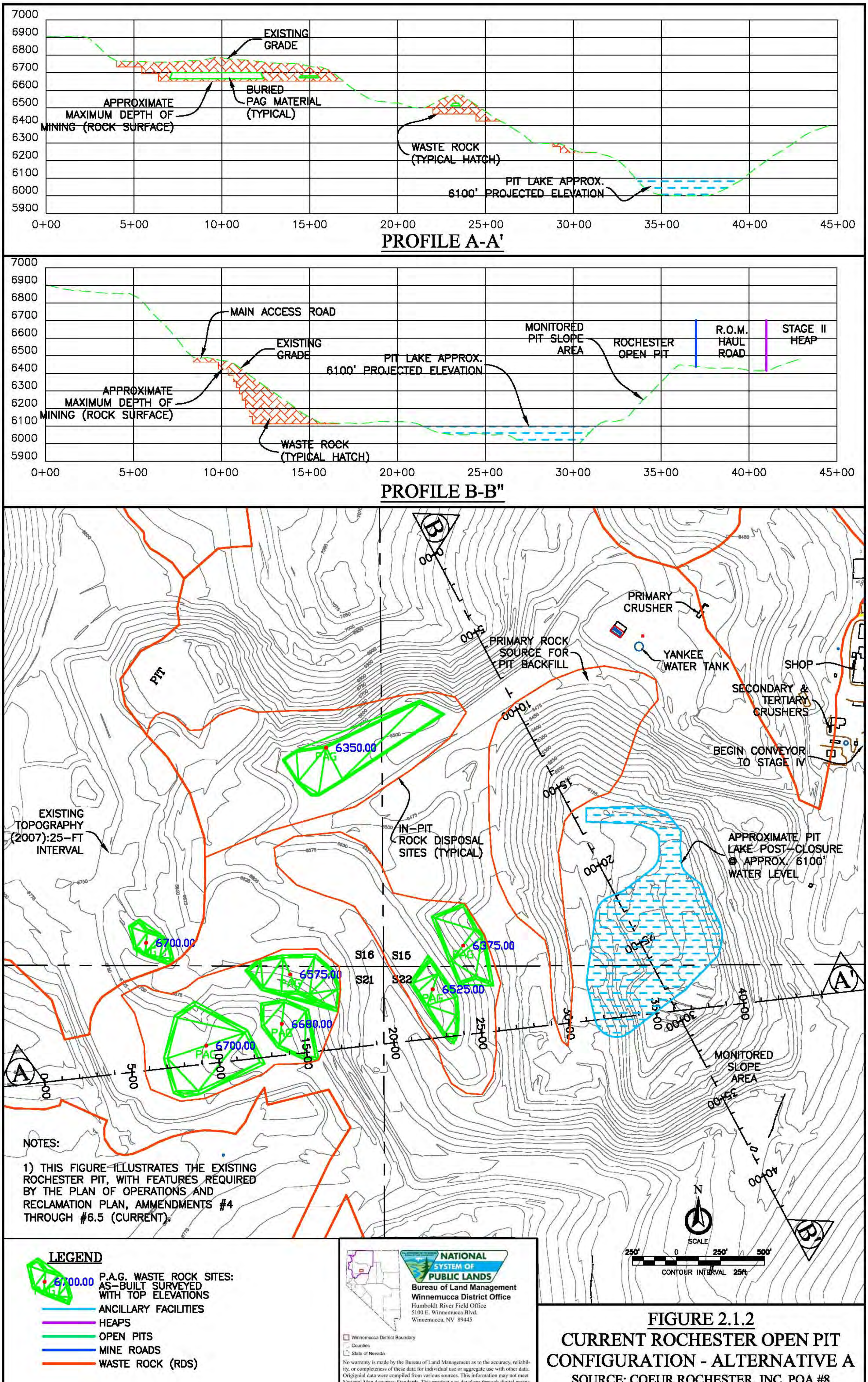


FIGURE 2.1.2
CURRENT ROCHESTER OPEN PIT CONFIGURATION - ALTERNATIVE A
SOURCE: COEUR ROCHESTER, INC. POA #8

- Construction of a conveyor and pipeline corridor (<1 acre) from the tertiary crusher to the proposed Stage III Heap Leach Facility, which would be located between the Rochester Pit and the existing Stage I and Stage II heap leach facilities.
- Construction of a buttress against the southeast pit wall in order to stabilize this portion of the pit to allow construction of the conveyor/pipeline corridor from the Stage III Heap Leach Facility to the process plant north of the pit.
- Construction of 2 evaporation ponds for heap draindown solution management at closure. One would be located at the low-point in the Stage III Heap Leach Facility liner. The second would be located just north of the heap and would be lined
  (**Figure 2.1.3**). The combined pond area would be approximately 6.5 acres.
- Pumping of the Black Ridge Fault (BRF) at an average rate of 277 gpm for water supply needs. This rate is consistent with previous water supply pumping for full-scale mining operations; current pumping rates are lower.

Figure 2.1.3 is a general site map that shows the proposed layout of the expanded Rochester Open Pit, the Stage III Heap Leach Facility, and the acreage that would be affected by the Proposed Action. A summary of the proposed disturbance under POA No. 8 is provided in **Table 2.1.1**. All proposed new disturbance is on public lands administered by BLM. Most facilities at the Mine (processing plant, existing ponds, roads, etc.) would remain unchanged. **Figure 2.1.4** provides a more detailed view of the areas addressed in POA No. 8. Resumption of mining would add approximately 5–7 years to the life of the Mine.

Table 2.1.1: POA No. 8 Disturbance Summary

Proposed Disturbance	Area (acres)
Stage III Heap Leach Facility	145.7
Pit Expansion (1)	45.6
Ancillary Facilities, including closure ponds and conveyor facility areas (1)	16.4
Total Disturbance	207.7
(1) These areas are within the existing Plan of Operations boundary. The pit expansion area has previously been disturbed, while the ancillary facilities area has generally not been previously disturbed.	

2.1.2.1 Mining Operations

Mining would be performed using the same methods as previous operations as described in Section 1.7–*Previous and Existing Operations*. Approximately 50 million tons of leach grade ore material and 50 million tons of non-ore development rock would be excavated under POA No. 8. Of the 50 million tons of non-ore rock, about 33 million tons that were excavated during previous operations would be re-handled from the in-pit RDS and used for pit backfill/buttress construction. The remaining 17 million tons would be newly excavated material.

The pit would be backfilled to an approximate elevation of 6,175 feet amsl, as shown in **Figure 2.1.5**. A minimum of approximately 10 million tons of non-ore development rock is needed to backfill to this elevation. This would eliminate the existing and future pit lake and create a groundwater “flow-through” condition in the backfill. Only non-potentially acid generating rock (PAG) would be backfilled below the projected post-mining water table. Non-PAG material is defined as non-ore development rock with a sulfur content of less than 0.4 percent. Further, any non-PAG material with an acid neutralization potential to acid generation potential (ANP:AGP) ratio of less than 3:1 would be amended with alkaline material (e.g., lime) to ensure that the ratio is exceeded prior to backfilling.

As described in POA No. 8, Coeur would implement a backfill monitoring program. This program would include pre-placement monitoring to determine the ANP:AGP ratio. These data would be used to determine the volume of alkaline material amendment necessary to ensure that ANP:AGP ratios of greater than 3:1 are maintained for all backfill to be placed below the pre-mining water table. In addition, Coeur would conduct metals mobility testing of the backfill material. Finally, groundwater monitoring would be performed to measure actual groundwater recovery levels in the backfilled pit.

As also shown in **Figure 2.1.5**, PAG materials encountered during resumed mine operations would be placed in portions of the pit backfill above elevation 6,175 amsl. These materials would be covered with a minimum of 50 feet of non-PAG material.

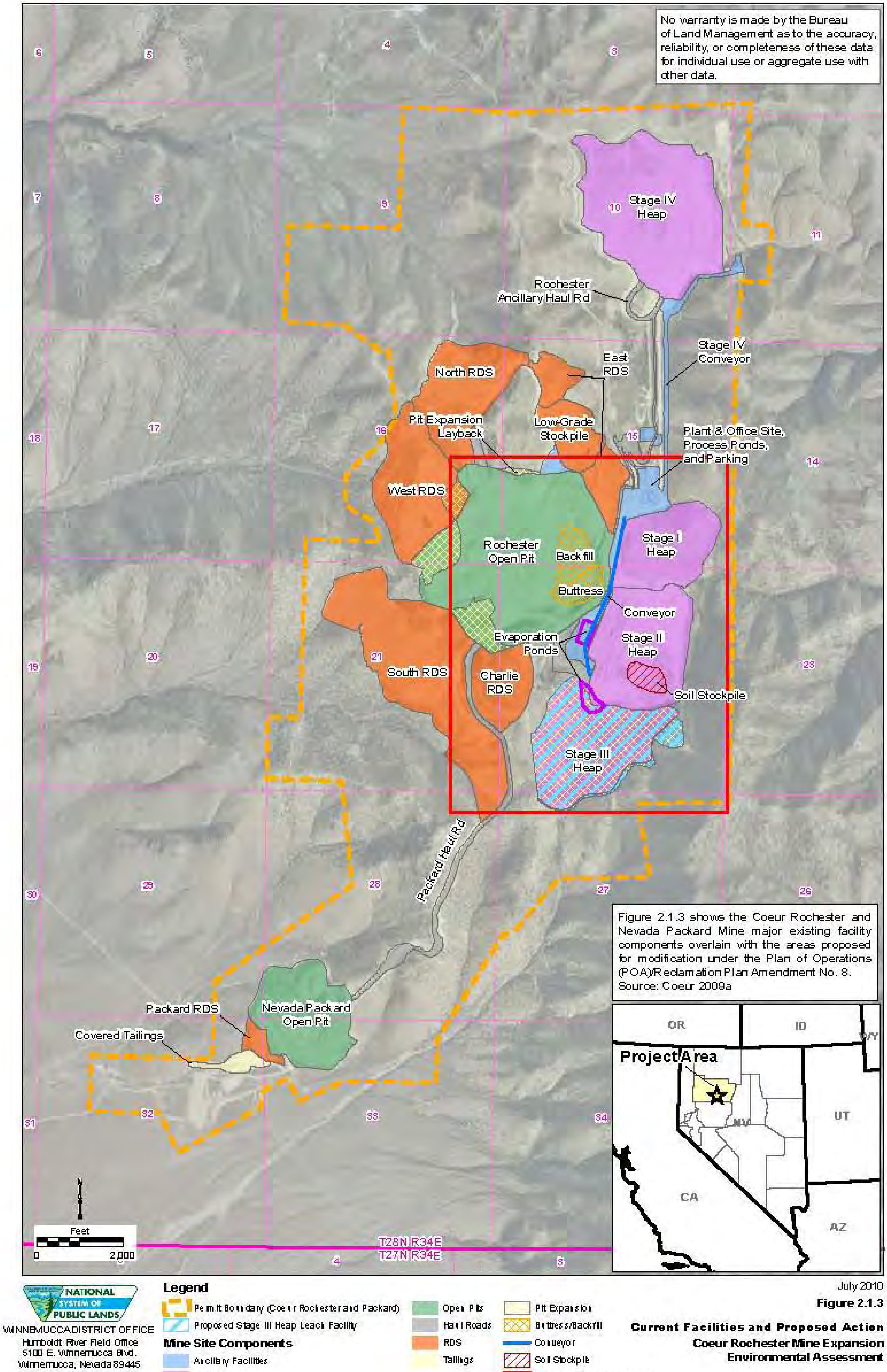
Under the Proposed Action for mining operations, air emission sources would consist of blasting, bulldozers, ore loading, and light plants. Air emission sources associated with backfilling would consist of ore unloading, bulldozing, wind erosion, haul trucks, and traffic. New sources of lighting in the pit would consist of 4 light plants.

2.1.2.2 Buttress and Ore Conveyor System

To avoid the Stage II liner and ensure adequate area for conveyor, pipeline, and road access to the Stage III Heap Leach Facility, Coeur would place approximately 4 million tons of non-ore development rock across the east and southeast portions of the Rochester Pit to form a buttress and compacted embankment. The embankment and buttress would be constructed using a portion of the existing in-pit backfill that would need to be relocated to accommodate Mine expansion and recovery of ore (see above discussion). Placement of the buttress would also provide additional geotechnical stability to the east wall of the pit.

Transporting crushed ore to the proposed Stage III Heap Leach Facility would require that the existing conveyor system be relocated. After completion of the buttress in the Rochester Pit, a compacted non-ore rock fill embankment would be placed to support the conveyor corridor. This embankment would provide sufficient area on which to locate the conveyor and associated solution pipelines, utilities, and roadway, and to provide an added buffer zone to the Stage II Heap Leach Facility.

Under the Proposed Action for the buttress and ore conveyor system, air emission sources would consist of haul trucks, material transfer, conveyance, crushing, and screening. New lighting sources associated with the conveyor system would consist of lights on the overland conveyor from the tertiary crusher to the Stage III Heap Leach Facility.



July 2010

Figure 2.1.3

Current Facilities and Proposed Action
Coeur Rochester Mine Expansion
Environmental Assessment

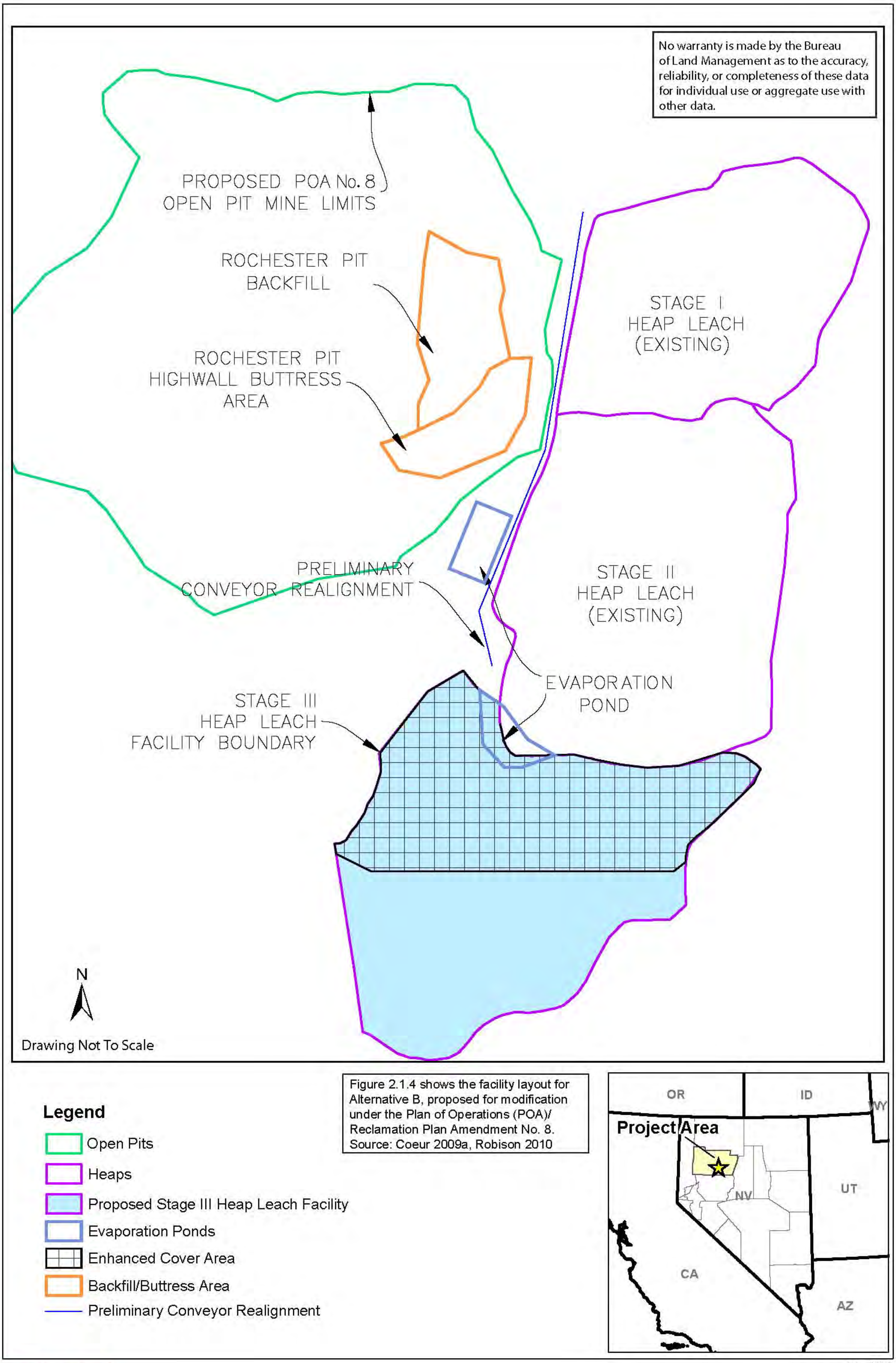


Figure 2.1.4 shows the facility layout for Alternative B, proposed for modification under the Plan of Operations (POA)/ Reclamation Plan Amendment No. 8. Source: Coeur 2009a, Robison 2010

NATIONAL SYSTEM OF PUBLIC LANDS
WINNEMUCCA DISTRICT OFFICE
Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, Nevada 89445

July 2010
Figure 2.1.4
Alternative B – Proposed Action Heap Leach Facilities
Coeur Rochester Mine Expansion Environmental Assessment

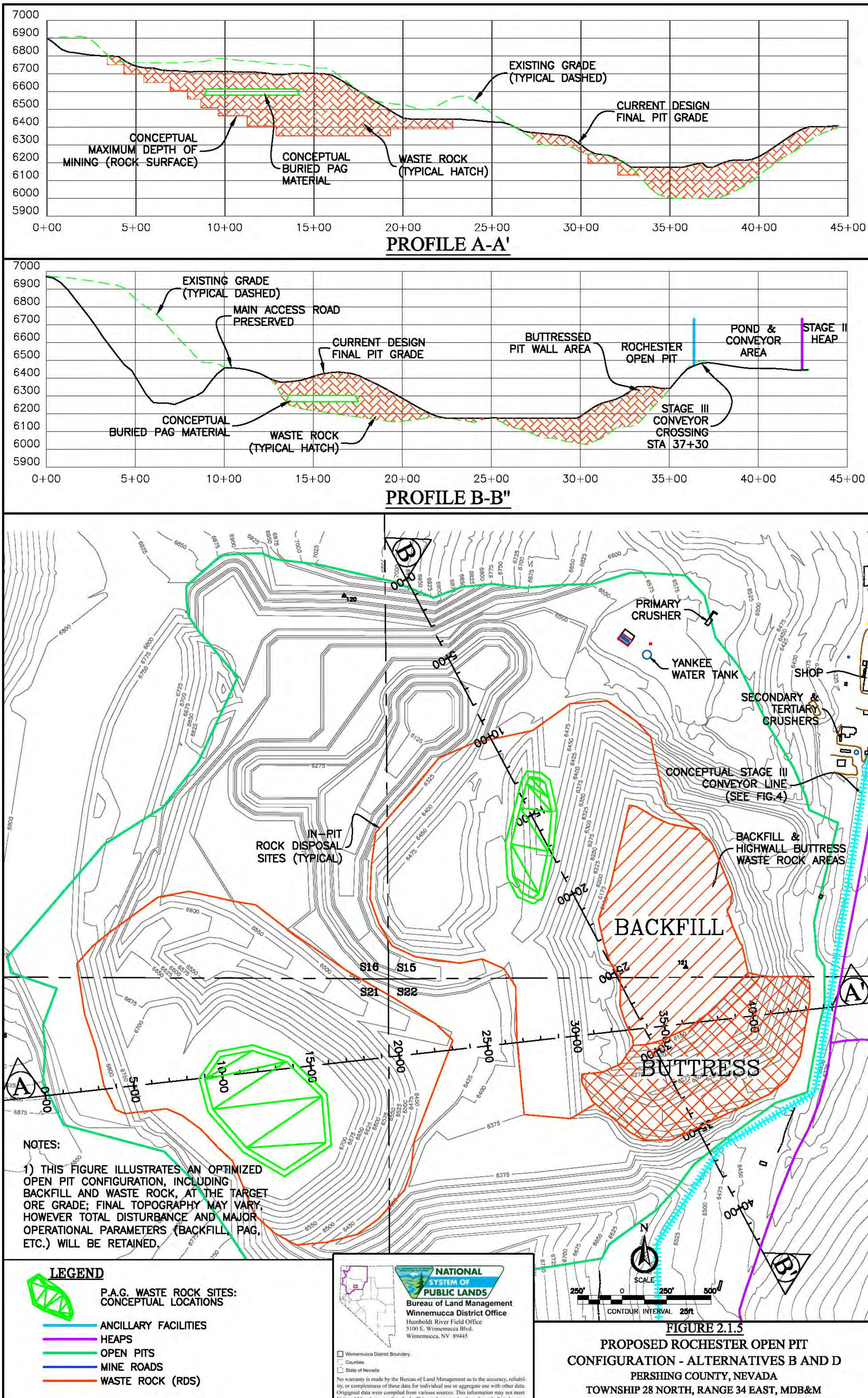


FIGURE 2.1.5
PROPOSED ROCHESTER OPEN PIT CONFIGURATION - ALTERNATIVES B AND D
PERSHING COUNTY, NEVADA
TOWNSHIP 28 NORTH, RANGE 34 EAST, MDB&M
SOURCE: COEUR ROCHESTER, INC. POA #8

Left Blank Intentionally

2.1.2.3 Leaching Operations

Under Alternative B, Coeur would construct the Stage III Heap Leach Facility adjacent to, and south of, the existing Stage II Heap Leach Facility. Geotechnical design information is presented in the Draft Prefeasibility Report (Knight Piesold 2008). The leach pad is designed to ultimately contain approximately 50 million tons of ore. Loaded to its final configuration, the maximum height would be approximately 330 feet above the existing ground surface. The leach pad would be constructed in accordance with state and federal requirements in the following stages:

Clearing and Grubbing

The leach pad footprint would be cleared and grubbed of vegetation. Vegetation would be placed in the proposed growth media stockpile areas and would be mixed in with stockpiled soil to increase the organic matter content of reclamation soils. Coeur would salvage and stockpile all soil material suitable for use as growth media within the Stage III Heap Leach Facility footprint; 400,000 to 600,000 cubic yards is anticipated. Salvaged growth media would be temporarily stockpiled on top of the Stage II Heap Leach Facility and seeded to establish a vegetative cover that would prevent or limit soil movement from the stockpile in response to wind and/or water erosion. Coeur would implement other best management practices (BMPs) to further reduce loss of growth media from the stockpile by mulching, adding organic matter, interim seeding, or leaving slopes in roughened condition, as well as by water management.

Subgrade Preparation and Dike Construction

The Stage III Heap Leach Facility would be based on a valley-fill design constructed in phases (Knight Piesold 2008). A dike would be constructed at the southern end of the Stage II Heap Leach Facility beginning at an elevation of 6,600 feet amsl and rising to a crest elevation of 6,675 feet amsl. Dike construction would be preceded by removal of haul road fill material previously placed in the proposed dike location. The dike would be constructed as a compacted rock-filled structure with filter rock covering the rock fill and a clay material placed over the filter rock. The width of the dike at its crest would be approximately 80 feet.

Subsoil (not suitable for growth media) and selected borrow materials would be blended and compacted to form the subgrade for the Stage III liner system. If insufficient material is available to meet grade requirements after growth media salvage, Coeur would place non-acid generating borrow materials to ensure the grade design is met. The subgrade layer would be 12–24 inches thick and would be compacted to attain a permeability of $1x10^{-6}$ cm/sec. In the case where there is insufficient material in the footprint of the Stage III Heap Leach Facility to meet the permeability requirement for the subgrade design, Coeur would install a geosynthetic clay liner (GCL) to address any shortfall.

Synthetic Liner and Piping Installation

An 80-mil double-textured, HDPE liner would be placed on the upstream side of the dike facing the heap (Knight Piesold 2008). The dike would be constructed with a double-walled pipe to allow pregnant solution that ponds behind the dike to be pumped to the processing plant via HDPE piping installed in HDPE-lined conveyance channels (Knight Piesold 2008). The barren solution pumped from the process plant to the Stage III pad would also be located within the HDPE-lined conveyance channels. Channels would be designed to contain maximum potential flow volumes plus the flow resulting from a 100-year, 24-hour storm event plus the maximum capacity of the piping, and serve as secondary containment in case of a release.

The liner and piping would be installed in accordance with industry standards, including inspection of seams. A leak detection system would be installed under areas of concentrated flow, such as solution collection headers, to monitor potential seepage through the liner system. Perforated pipe would be installed in 80-mil HDPE-lined trenches cut into subgrade material beneath key areas in the leach pad liner system (Knight Piesold 2008). The leak detection system piping would flow to a collection sump monitored by site personnel. The base of the dike would be fitted with 2 pipes booted through the HDPE liner. These pipes would be used to allow free-draining of solutions that pond behind the dike during final closure and decommissioning of the leach facility and to manage long-term draindown.

Twelve inches of fine-grained (90 percent passing a ½-inch sieve) gravel would be placed on top of the HDPE liner as a protective layer (Knight Piesold 2008). The heap leach facility would be constructed in accordance with Nevada regulations and final design would require state approval.

<u>Ore Processing</u>

Ore would be placed on the heap leach pad in lifts ranging from 15–30 feet depending on topography and processing needs. Benches approximately 30 feet wide would separate each lift. The surface of each lift would be ripped to facilitate process solution percolation. Solution flow rates to the Stage III pad would be designed for 5,000 gallons per minute (gpm). Consistent with past leach practices, weak (500–750 parts per million [ppm]) sodium cyanide barren solution would be applied to the surface using a drip irrigation system. The barren solution would come from the existing processing plant. The initial barren solution loading would consist of the processed solution from Stage II and Stage IV. Later, when Stage III solution is collected, it would be sent to the processing plant along with pregnant solution from Stage II and Stage IV. The cyanide solution would migrate through the ore, dissolve the gold and silver contained in the ore, and drain to a central collection point at the base of the dike. Pregnant solution (containing dissolved gold and silver) would be pumped through a double-walled pipe in the dike to the existing processing plant. There it would be processed along with pregnant solution from the Stage II and Stage IV heap leach facilities, at least until residual leaching operations end at these facilities. Barren solution would then be recycled back to the leach pad for reuse in leaching operations.

The valley-fill design of the Stage III Heap Leach Facility under Alternative B allows for all process solution to be stored within the crushed ore on the heap. The facility would be constructed to provide the capacity to completely contain flows from the 100-year, 24-hour storm event plus a 48-hour draindown of the heap, while maintaining 5 feet of freeboard at the crest of the dike. Similar to past operations, the counter-current fluid management system would direct the flow of solution throughout the leach pad and process system. During operations, solution inventories would be managed by vertical turbine pumps located within the Stage III Heap Leach Facility.

<u>Closure</u>

As required under NAC, a final permanent closure plan for the Stage III Heap Leach Facility would be submitted at least 2 years prior to final closure. The final closure plan may modify the closure components detailed in this EA. The final closure plan will be fully analyzed under NEPA.

The Stage III Heap Leach Facility would be hydraulically independent of the other facilities (no comingling of long-term draindown solutions). Two lined evaporative ponds covering a total of

6.5 acres would be constructed after residual leaching of Stage III was completed and would be used to collect draindown solutions from the heap. The ponds would be lined with 80-mil HDPE. The ponds have been designed to facilitate evaporation of the annual volume of fluid resulting from an infiltration rate of approximately 7 percent of the total precipitation falling on the closed heap.

Coeur proposes to install an enhanced closure cover system on the northern portion of the Stage III Heap Leach Facility. The area to be covered is shown in **Figure 2.1.4**. The cover would include 30-mil HDPE liner overlaid by 4 feet of non-PAG, well-draining development rock (Knight Piesold 2010a). The liner is proposed in the area with the greatest snow accumulation to achieve the target infiltration of no more than 7 percent through the entire heap (Knight Piesold 2010b), which is the design basis for the post-closure evaporation ponds under alternatives B–D. The remaining area of the heap would be covered with at least 10 inches of growth media.

An estimated 195,000 cubic yards of growth media would be needed for at least a 10-inch cover over the entire heap. If, as expected, the Stage III Heap Leach Facility yields more growth media (up to 600,000 cubic yards), and the growth media is not used elsewhere for site reclamation, more than 10 inches could be used for the cover.

Infrastructure, including the conveyor and loadout, would need to be removed prior to constructing the closure pond downgradient from the Stage III dike. The closure pond upgradient of the Stage III dike would be completed after the Stage III pregnant solution pumps were removed.

Once mining ceases, reclamation of the facilities would begin as each facility is decommissioned. Slope stability, and fluid management would be monitored and maintained throughout the reclamation period (see Section 2.2.1.2). In the post-closure period, access to the site, the Stage III closure pond(s) and associated facilities such as monitoring wells and fencing would be regularly monitored and maintained for as long as the facilities are needed, as would the in-pit monitoring well.

Under the Proposed Action, air emission sources for the Stage III Heap Leach Facility would consist of ore unloading, bulldozing, and wind erosion. New light sources would consist of 2 portable light plants for stacking of the facility.

2.1.2.4 Storm Water Management

The site is at the headwaters of 2 easterly-draining watersheds: American Canyon and South American Canyon. The 500-year storm event is anticipated to generate 7.4 acre-feet of runoff (about 26 percent of the total precipitation). This volume would be incorporated into the final Stage III design. However, the 7.4 acre-feet of flow is not expected to impact the design, which preliminarily includes about 59 acre-feet of storage.

The Stage III Heap Leach Facility would have a minimal impact on storm water events. Heap construction would eliminate runoff from 86 acres of the watershed. The Stage III Heap Leach Facility would be constructed at the head of the watershed, upstream of the Stage II Heap Leach Facility. Diversion channels would divert runoff to the northeast into South American Canyon and to the northwest into American Canyon.

2.1.3 Alternative C – Backfill Pit to Create an Evaporative Sink

Under Alternative C, the pit would be backfilled to a level to eliminate the pit lake while still allowing evaporation to occur, thereby creating an evaporative sink (see **Figure 2.1.6**). The water surface would remain in a steady state just below the top of the backfilled rock. This would allow for evaporation of any water falling on the pit but not result in any permanent open water surface. With the evaporative sink, there would be no long-term flow through to the underlying ground water. This configuration would direct ground water to flow to the pit instead of to the pre-mine flow direction away from the pit. The backfill elevation for this alternative is approximately 6,150 feet amsl, as shown in **Figure 2.1.6**. A minimum of 7 million tons of non-ore development rock is needed to backfill to this elevation.

In POA No. 8, the backfill required to create a flow through condition was originally predicted to be approximately 6,150 feet amsl. Subsequent analysis showed that the flow-through condition occurs with backfill to approximately 6,175 feet amsl (Alternative B) and backfill to approximately 6,150 feet amsl creates a hydrologic sink (Alternative C).

2.1.4 Alternative D – Out-of-Heap Solution Management

This alternative was developed to compare an external heap leach process pond system to the proposed in-heap storage under Alternative B. **Figure 2.1.7** shows the facility layout for Alternative D. Under this alternative, mining operations would proceed as described under Alternative B. Leaching would be the same as Alternative B, except that the Stage III Heap Leach Facility would operate as a free draining system rather than providing for in-heap storage. Pregnant solution would be routed through a pipe and lined conveyance channel to an enclosed tank and pump system. Except during planned or unplanned process plant unavailability or high precipitation conditions, pregnant solution would be pumped from the tank via pipeline directly to the process plant. During plant shutdown or high flow conditions, excess pregnant solution could be routed to a 6.5-acre storage pond located adjacent to the Stage II Heap Leach Facility.

The storage pond would have a capacity of 30.5 million gallons. This represents the total volume of a 24-hour draindown of pregnant solution plus the water from a 100-year, 24-hour storm event falling on the entire Stage III pad footprint. The pond would be double-lined with a leak detection system.

The ore conveyor would have to be re-aligned from Alternative B to avoid the pond and associated facilities. At closure, the 6.5-acre pond would take the place of the 2 evaporative ponds proposed for heap draindown under Alternative B.

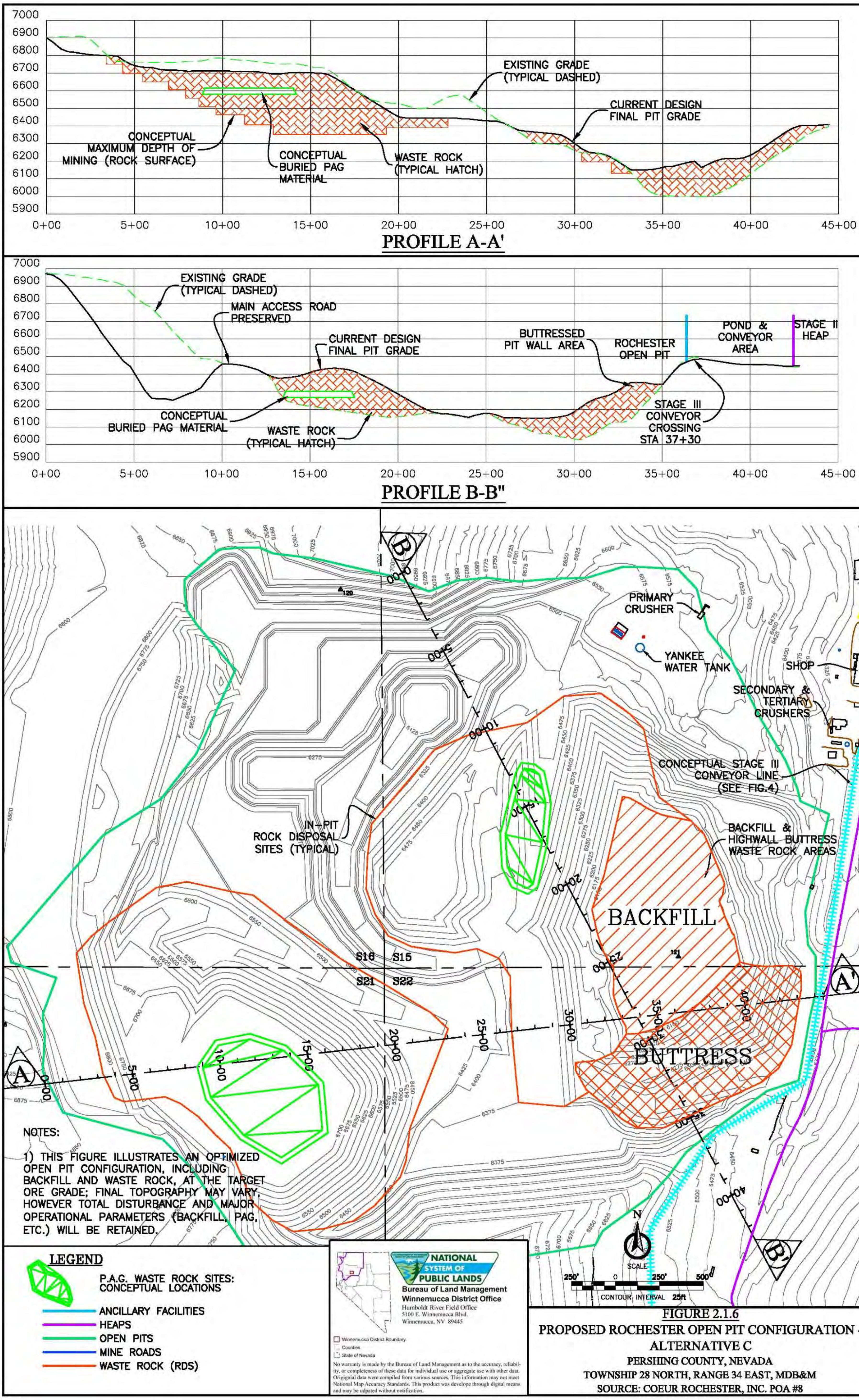
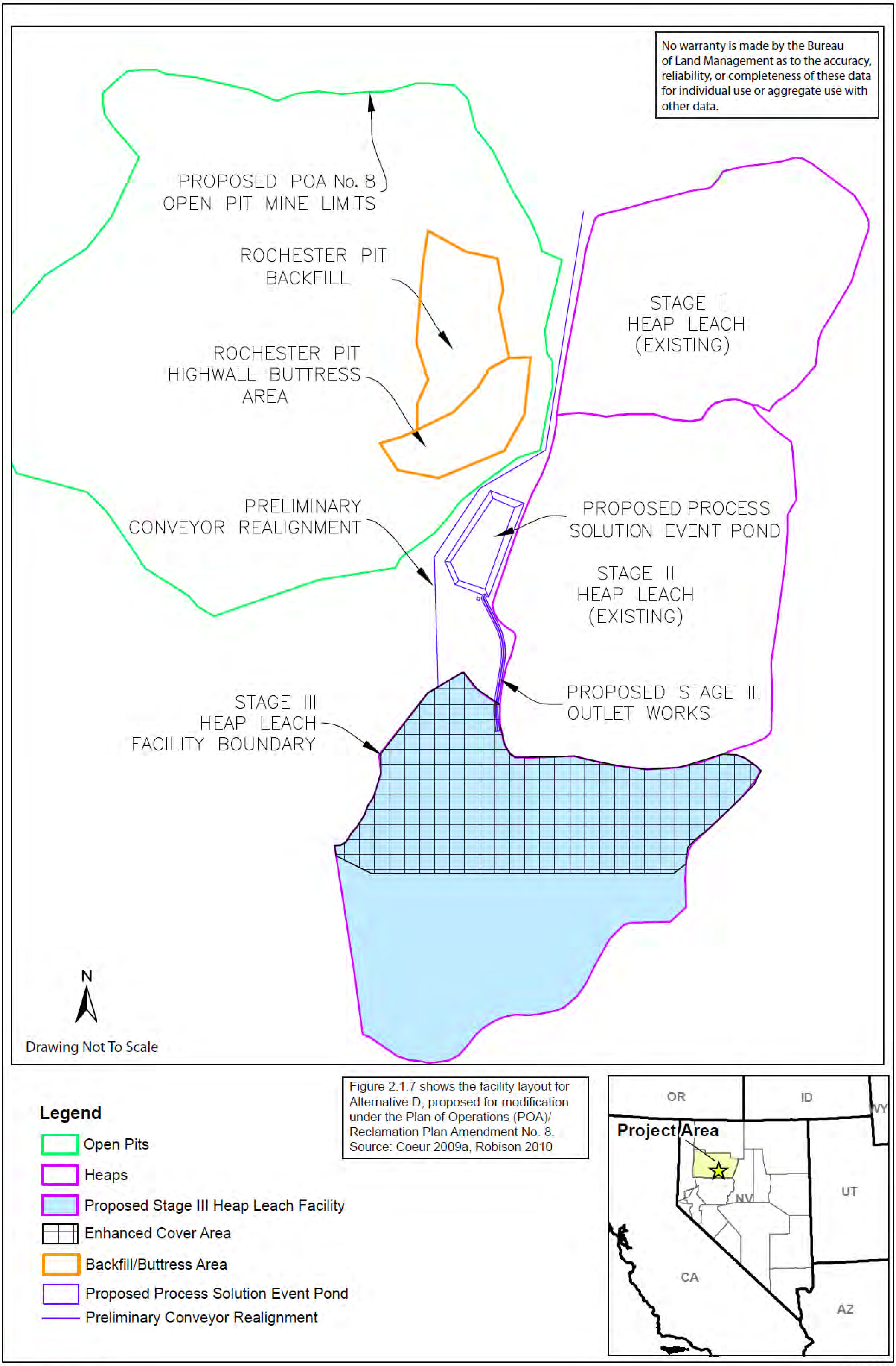


FIGURE 2.1.6
PROPOSED ROCHESTER OPEN PIT CONFIGURATION - ALTERNATIVE C
PERSHING COUNTY, NEVADA
TOWNSHIP 28 NORTH, RANGE 34 EAST, MDB&M
SOURCE: COEUR ROCHESTER, INC. POA #8



NATIONAL SYSTEM OF PUBLIC LANDS
WINNEMUCCA DISTRICT OFFICE
Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, Nevada 89445

July 2010
Figure 2.1.7
Alternative D -
Out-of-Heap Solution Management
Coeur Rochester Mine Expansion
Environmental Assessment

2.2 Environmental Protection Measures and Monitoring

2.2.1 Environmental Protection Measures

This section presents the environmental protection measures that would be implemented as part of the alternatives in order to avoid, minimize, or mitigate impacts to the environment during construction, operation, and reclamation activities. Note that the Reclamation Plan currently in effect would apply to Alternative A while the Reclamation Plan associated with POA No. 8 would apply to alternatives B–D. Environmental measures discussed below are associated with the Proposed Action and alternatives.

2.2.1.1 Proposed Environmental Measures

To reduce visual impacts to the landscape, the following BMPs are proposed to be implemented under alternatives B–D:

- To the extent possible, buildings would be painted in colors that are compatible with the natural environment.
- Existing utility corridors, roads, and areas of disturbed land would be utilized wherever possible, and the construction of new roads would be avoided to the extent possible.

To reduce light pollution and maintain dark sky attributes the following BMPs are proposed to be implemented under alternatives B–D:

- Screens that do not allow light bulbs to shine up or out would be used.
- All proposed lighting would be located/directed to avoid light pollution onto any adjacent lands as viewed from a distance.
- All lighting fixtures would be hooded and shielded; faced downward; located within soffits as appropriate; and directed on to the pertinent site only, and away from adjacent parcels or view areas.
- Where possible, existing topography would be used to “terrain shield” portable light equipment from adjacent parcels or view areas.

2.2.1.2 Reclamation Plan

Environmental protection measures as outlined in the POA No. 8 Reclamation Plan applicable to alternatives B–D are as follows:

- All available soil suitable for use as growth media would be salvaged.
- The seed mix for revegetation efforts would be a BLM- or NDEP-approved seed mix. Annual weed surveys would be conducted to direct weed control efforts. Certified weed free straw bales would be used for sediment control.
- Evaporation ponds would be adequate to evaporate the draindown volume predicted for the Stage III Heap Leach Facility.
- Runoff control ditches, toe berms, and sediment ponds would remain functional during the regrading, capping/growth media placement, and seeding/revegetation phases of closure and reclamation of the Stage III Heap Leach Facility.

- Any soil movement from the reclaimed surface of the leach facility would be captured by the runoff control system and would be returned to the reclaimed area. Runoff control systems and sediment control structures would remain in-place and functional until vegetative cover and stability of the reclaimed area meets the approval of BLM and NDEP.

2.2.1.3 Spill Prevention Plan

The Mine's Spill Prevention Plan identifies specific spill response guidelines for chemicals to ensure any spill event is addressed properly under all alternatives. Potential spills would be cleaned up as soon as possible using materials and equipment stored on-site.

2.2.1.4 Stormwater Pollution Prevention Plan (SWPPP)

BMPs implemented during stormwater discharges are designed to prevent, control, and minimize the generation, migration, and transport of any pollutants, including sediments, to natural drainages. Under all alternatives, these BMPs would consist of structural controls to segregate stormwater from potential pollutant sources and minimize erosion potential (e.g., diversion ditches, settling ponds); good housekeeping measures and other non-structural controls to address daily activities (e.g., daily visual inspections, employee training); and other management plans to address specific emergency events (e.g., Hazardous Waste Management Plan).

2.2.1.5 Water Pollution Control Permit (WPCP)

Coeur currently holds a WPCP and submits quarterly monitoring reports to NDEP as required by the permit. Under all alternatives, Coeur would continue to operate under a WPCP that provides for protection of ground and surface water resources.

2.2.1.6 Nevada Department of Wildlife (NDOW)

Coeur currently holds an NDOW Special License and Permit (SLAP) for the existing ponds associated with leaching operations. As part of the SLAP, Coeur must implement the following measures to prevent wildlife mortality:

- Fencing - The minimum standard fence shall be 8 feet high, the bottom 4 feet of which shall be composed of woven or mesh wire with not greater than 2 inch mesh on the bottom 2 feet and a maximum of 8 inch mesh on the top. The remainder of the fence above the woven or mesh wire shall be smooth or barbed wire with a spacing of 10 inches, 12 inches, 12 inches and 14 inches beginning from the top of the woven or mesh wire. If cyclone or chain-link fence is to be used then the only conditions to be met are the 8 foot height and tight to the ground.
- Covering/containment - All waters that contain any chemical in solution at levels lethal to wildlife (e.g., barren and pregnant solution ponds) must be covered or contained in a manner that shall preclude access by birds and bats. All covers or containers shall be maintained in a manner that shall continue to preclude access by wildlife for as long as the pond or container contains chemicals in solution at levels lethal to wildlife.

2.2.1.7 Existing Plan of Operations Stipulations

The following stipulations currently apply to the Plan of Operations.

General

No work is authorized under the Plan of Operations until Coeur has complied with all other applicable state, federal, and local regulations and has obtained all necessary permits.

The operator shall protect all survey monuments found within the Plan of Operations boundary. Survey monuments include, but are not limited to, General Land Office and BLM Cadastral Survey corners, reference corners, witness points, U.S. Coastal and Geodetic benchmarks and triangulation stations, military control monuments, and recognizable civil (both public and private) survey monuments. Prior to obliteration or disturbance of any of the above, the operator shall submit plans for installing new survey monuments to the authorized officer and the respective installing authority, if known, for review and approval. Prior to obliteration or disturbance of any survey monuments, the operator shall secure the services of a registered land surveyor or a BLM Cadastral surveyor to place new survey monuments. New survey monuments shall be placed using survey procedures found in the *Manual of Surveying Instructions for the Survey of Public Lands of the United States*, latest edition. The operator shall record such surveys in the appropriate county and send a copy to BLM authorized officer. If BLM Cadastral surveyor or other federal surveyors are used to restore the disturbed survey monument, the operator shall be responsible for the cost.

Cultural Resources

When cultural or paleontological resources, including but not limited to historic ruins, prehistoric artifacts and fossils, are discovered on public lands in the performance of the permit, the resources shall be left intact and immediately brought to the attention of the BLM authorized officer.

The operator shall instruct all employees in the laws governing collection of cultural artifacts and historical items in the project area.

Pursuant to 43 CFR 10.4(g), the holder of this permit shall notify the BLM authorized officer, by telephone, with written confirmation, immediately upon the discovery of human remains, funerary objects, sacred objects, or objects of cultural patrimony (as defined in 43 CFR 10.2). Further pursuant to 43 CFR 10.4(c) and (d), the operator shall immediately stop all activities in the vicinity of the discovery and protect it for 30 days or until notified to proceed by the BLM authorized officer.

Migratory Birds

The Migratory Bird Treaty Act (MBTA) prohibits the destruction of nests (nests with eggs or young) of migratory birds. Most of the "songbirds" that occur in this area are migratory birds and are protected by this provision. Nesting season runs from approximately April 15 to July 15. A careful examination of each area to be disturbed (including cross-country travel routes) during the breeding season, should be done to assure no nests with eggs or young are present. If such nests are found, they should be avoided by an appropriate distance to prevent destruction of the nest and disturbance of the nesting birds.

Native American Religious Concerns

Pursuant to 43 CFR 10.4(g), Coeur shall notify BLM authorized officer, by telephone, and with written confirmation, immediately upon the discovery of human remains, funerary objects, sacred objects, or objects of cultural patrimony (as defined in 43 CFR 10.2). Further pursuant to 43 CFR 10.4(c) and (d), the operator shall immediately stop all activities in the vicinity of the discovery and not commence again for 30 days or when notified to proceed by BLM authorized officer.

Paleontology

In the event that previously undiscovered paleontological resources are discovered during project construction or operations, the item(s) or condition(s) shall be left intact and immediately brought to the attention of BLM authorized officer. If significant paleontological resources are found, avoidance, recordation, and/or data recovery would be required.

Waste

Self contained portable chemical toilets shall be used for human waste in remote locations away from the immediate mine site. The human waste and toilet chemicals shall not be buried on site.

Mud pits shall be constructed in cut, not fill. The uncontrolled discharge of drilling mud onto the ground shall be prevented by the use of excavated mud pits and, if necessary, additional portable mud pits. Mud pits shall be sized to contain all drilling mud, drill cuttings, and subsurface fluids. If either mud pit contains standing fluid at the time of drill rig release, the operator shall construct a fence completely around the mud pits for that exploration hole to exclude wildlife and livestock. The mud pits shall be dried prior to being backfilled and reclaimed. All drill cuttings shall be buried in the mud pits, except for those used in plugging the exploration hole.

No hazardous or toxic waste, waste oil or lubricants shall be disposed of on public lands. Trash and other debris shall be contained on the work site and then hauled to an approved landfill. Burial and/or burning of trash and other debris are not authorized without specific permits from BLM and other appropriate agencies.

Erosion

Surface disturbance shall be prohibited during periods when muddy conditions exist. Muddy conditions are defined as those periods when ruts develop that are six or more inches deep.

Waterbars shall be spaced according to the grade of the road. A general guide for spacing of waterbars on roads is as follows: 0-5% slope – 800-foot intervals, 5-10% slope – 400-foot intervals, 10-15% slope – 250-foot intervals, over 15% slope shall be reviewed by the authorized officer. (4)

Water

Drill sites, trenches, discovery pits, and other exploration excavations shall not be constructed in springs, perennial creeks, or intermittent drainage channels or within 200 feet of springs, perennial creeks, or riparian areas.

Perennial creeks and intermittent drainages shall be crossed at or near right angles unless contouring down to the creek or drainage would result in less potential creek or drainage bank erosion. Entrances and exits to the creek or drainage shall be constructed to prevent water from flowing down the roadway.

Culverts shall be placed, as required, to prevent blockage of perennial creeks and prominent intermittent drainages. Culverts shall be sized to handle a ten-year, 24-hour storm. The area adjacent to the culverts shall be protected from erosion by adequate riprap. At the time of reclamation, the culverts shall be removed and the creek or drainage channel restored to its pre-disturbance configuration.

Protection measures shall be taken to control potential artesian groundwater flows. In the event an uncontrollable artesian flow occurs, the artesian flow shall immediately be brought to the attention of the BLM authorized officer. The operator shall be responsible for all costs associated with any releases of subsurface fluids resulting from their exploration drilling operations and practices.

Coeur will monitor groundwater sources according to NDEP standards and will maintain water quality and quantity for wildlife, livestock, and human consumption to State of Nevada standards.

The operator shall conduct operations in such a manner as to not disturb the Packard Flat water pipeline and its associated water sources and developments.

Noxious Weeds

The operator shall be responsible for controlling all noxious weeds and other undesirable invading plant species in the reclaimed area until the revegetation activities have been determined to be successful and signed off by the BLM authorized officer. The operator shall obtain approval from the BLM authorized officer for any and all applications of herbicide, including types and quantities. All seed shall be tested for purity, noxious, poisonous and/or prohibited plant species, and the test results submitted to and approved by the BLM authorized officer, unless certified weed free seed is procured for this reclamation project.

The operator shall ensure that all exploration equipment, including drill rigs, dozers and support equipment, is power washed, including body and undercarriage, prior to initial entry onto the site to deter the introduction of noxious weeds into the project area.

Reclamation

Growth media and vegetation removed during site preparation will be stockpiled for final reclamation and rehabilitation measures.

A map will be submitted to the BLM Winnemucca Field Office on or before April 15 of each year, showing topography, township, range and sections, locations of existing facilities, new areas of disturbance, areas that have been reclaimed with month and year the area was regraded or reseeded.

Seeding is recommended from October through December. Spring seeding is generally too late for successful establishment of vegetation.

2.2.2 Monitoring

Monitoring that is currently being implemented at the site includes:

- Pit lake water quality
- Monitoring results from underdrains, leak detection sumps, sumps, and recovery systems

- Water levels and analytical results of fluids collected from monitoring wells, pit lake, collection sumps, and catch basins
- Analytical results of mined waste rock, including details for PAG
- A record of spills and releases and the remedial actions taken in accordance with the approved Emergency Response Plan
- Supplemental water quality reporting and trends of constituents of concern over time in the Stage I, Stage IV, American Canyon, BRF, and pit lake areas
- Precipitation data from the meteorological station on the reclaimed Stage I Heap Leach Facility

Under alternatives B–D, Coeur would coordinate development of a water monitoring program with NDEP and BLM. As part of their 2010 application to NDEP for a WPCP for the Stage III Heap Leach Facility, Coeur referred to their existing, detailed water monitoring plan which includes the following:

- Quarterly monitoring of 37 internal and external monitoring wells for analytes listed in NDEP Profile 1, and depth to groundwater.
- Quarterly monitoring (NDEP Profile 1) and weekly flow measurements of 11 sumps and catch basins.
- Quarterly monitoring of 3 production wells for NDEP Profile 1 analytes.
- Bi-annual sampling of 4 barren and pregnant leach solutions for NDEP Profile II analytes.
- Quarterly sampling of 1 barren and pregnant leach solution for NDEP Profile 1 analytes and piezometric head (feet above liner).
- Quarterly collection of 4 surface water samples for NDEP Profile 1 analytes and monthly water elevations in the pit lake.
- Quarterly sampling of 9 leak detection lines for NDEP Profile I analytes including daily flow measurements.
- Quarterly sampling of 3 under drain lines for NDEP Profile I analytes including daily flow measurements.
- Quarterly sampling of Stage II barren solution pipeline(s) leak detection ports for NDEP Profile I analytes including weekly flow measurements.

Additional details of the current monitoring plan are described in the Coeur Field Sampling Protocols submitted under WPCP NEV0050037 in February 2008. The overall water monitoring plan for alternatives B-D would be determined by the NDEP as part of the WPCP process and is anticipated to be similar to what has been required for previous leaching activities. One new groundwater monitoring well would be installed within the pit backfill for the Stage III Heap Leach Facility. A leak detection system would be installed as described in Section 2.1.2.3.

Coeur shall also maintain a record of any wildlife mortalities that occur in association with the permitted facility. Those reports shall be provided quarterly to NDOW. In addition, Coeur shall report, by telephone to NDOW, all wildlife mortalities that are associated with chemical-containing tanks or impoundments by the beginning of the next working day following the occurrence or observation of those mortalities.

2.3 Impacts Summary

Table 2.3.1 presents a summary of the impacts on each resource by alternative.

Table 2.3.1: Impacts Summary by Alternative

Resource	Impact	Alternative A	Alternative B	Alternative C	Alternative D
Air quality—Air Emissions	Effects of emissions on air quality including mercury and GHG emissions	Modeling of maximum potential air emissions shows levels below NAAQS/AAQS. Based on 2009 data, actual air emissions very low and expected to continue to decline as refinery operations diminish. Annual mercury emissions below 4 pounds (2009 testing). 1,350 tons of GHG gas emissions annually, less than 0.00002 percent of national emissions and below EPA's reporting threshold.	Air emissions extended for an additional 5 to 7 years. Emissions levels higher than Alternative A, particularly fugitive dust associated with mining operations. Modeling of maximum potential air emissions shows levels below NAAQS/AAQS. Annual mercury emissions between 4 and 10 pounds - with recent controls installed. 4,000 tons of GHG gas emissions annually, less than 0.00005 percent of national emissions and below EPA's reporting threshold.	Same as Alternative B.	Same as Alternative B.
Water Resources—Surface Water	Effects on stream flow and water quality Current and pit lake	No additional impacts on ephemeral drainages in mine area. No effects on downstream perennial stream flow or quality. Pit lake continues to exist with relatively low pH and otherwise poor water quality. Effects mitigated by continued lime addition. Post-closure pit lake forms up to 175 years after closure (maximum of about 16.5 acres); potential risk to wildlife (see below) and humans from some metals in pit lake water.	No additional impacts on ephemeral drainages in mine area. No effects on downstream perennial stream flow or quality. Existing pit lake eliminated by backfill. No pit lake after closure.	Same as Alternative B, although seasonal shallow wetland would develop in pit approximately 60 years after mining (with lower backfill level). Limited potential risk to mule deer from boron uptake.	Same as Alternative B.

Table 2.3.1: Impacts Summary by Alternative

Resource	Impact	Alternative A	Alternative B	Alternative C	Alternative D
Water Resources—Ground Water	Effects on underlying aquifers including the BRF	Mine area impacts on alluvial and, to some extent, non-BRF ground water quality from past operations continue; no impacts on BRF quality. No post-closure impacts from pit on groundwater quality.	No impacts on groundwater quality predicted due to Stage III Heap Leach Facility design. Potential for acid generation in backfill mitigated by handling plan for PAG and non-PAG materials. After closure, precipitation and run-off into the pit would evaporate in part, but some ground water infiltration would occur, recharging the aquifer at a low rate of approximately 2 gpm after 200 years. Levels of cadmium, lead, and manganese may exceed standards but are within the range of background conditions.	Same as Alternative B, except post-closure ground water levels would rise with flow directed towards the pit, creating a hydrologic sink. No post-closure effects on ground water quality from pit.	Same as Alternative B.
Soils	Disturbance, modification of physical characteristics, and decreased biological activity	No additional disturbance to soils.	Approximately 162 acres of new disturbance would occur throughout the project area. Moderate to severe water erosion potential and slight wind erosion potential. Soil mixing would reduce organic material, lowering productivity and increasing coarse fragments in the surface soil. Soil compaction and pulverization would lead to loss of structure and decreased permeability. Reclamation of the Stage III Heap Leach Facility would begin in approximately 9 years and take approximately 8 years to complete.	Same as Alternative B	Same as Alternative B *except:* Additional disturbance of approximately 6.5 acres of soil for solution containment pond versus 3 acres post-closure under Alternative B
Vegetation	Acres of disturbance	No additional disturbance.	145.7 acres would be newly disturbed within the footprint of the proposed Stage III Heap Leach Facility and ancillary facility area. Relatively long-term impacts to juniper woodland and xeric mixed sagebrush shrubland vegetation communities (up to 100 years to recover post-reclamation).	Same as Alternative B *except:* Seasonal, shallow wetland would form post-closure on the surface of the pit backfill.	Same as Alternative B *except:* Additional disturbance of approximately 6.5 acres of soil for solution containment pond versus 3 acres post-closure under Alternative B.

Table 2.3.1: Impacts Summary by Alternative

Resource	Impact	Alternative A	Alternative B	Alternative C	Alternative D
Invasive, Non-Native Species	Increased abundance	No additional disturbance that would create habitat or promote spread of noxious weeds.	Disturbance of 145.7 acres of established vegetation would create potential habitat for noxious weeds. Impacts would be minimized based on environmental protection measures.	Same as Alternative B.	Same as Alternative B *except:* Additional disturbance of approximately 6.5 acres of soil for solution containment pond versus 3 acres post-closure under Alternative B.
Wildlife	Loss of habitat, disturbance, mortality	No additional habitat impacts during operations. Slight potential for traffic-related injury or mortality and very minor disturbances resulting from noise, dust, traffic, human presence, and nighttime lighting. Potential risk of exposure to COPCs for mule deer and northern bobwhite quail and species with similar exposure pathways.	Additional surface water (evaporation ponds at closure) would create additional opportunity for mammal, reptile, and avian use of the Mine area. Large mammals would be restricted from evaporation ponds by fencing, although other wildlife (birds and bats) would be able to access the ponds. Pit backfilling would prevent formation of pit lake and eliminate potential pit lake risk to wildlife. Increased potential for traffic-related mortality due to increased number of weekly roundtrips and greater disturbances resulting from noise, dust, traffic, human presence, and nighttime lighting during active mining operations. Mitigation serves to reduce risk during operations and historic track record of low wildlife mortality has been very good. Impacts to big game, bat, other mammal, reptile, and avian habitat associated with new disturbance but all effects at individual versus population level.	Same as Alternative B *except:* Slight potential risk of exposure to COPCs to mule deer and northern bobwhite quail and species with similar exposure pathways from uptake from seasonal, shallow wetland on post-closure pit backfill surface.	Same as Alternative B *except:* Increased potential for wildlife mortality if they are exposed to toxic water in out-of-heap solution containment pond during operations or closure or are unable to escape lined pond after entering.

Table 2.3.1: Impacts Summary by Alternative

Resource	Impact	Alternative A	Alternative B	Alternative C	Alternative D
Migratory Birds	Loss of habitat, disturbance, mortality	Mitigation measures, e.g., timing and spatial restrictions implemented to limit potential impacts to migratory birds. Potential risk of exposure to COPCs for rough-winged swallow and species with similar exposure pathways.	Long-term impacts on migratory birds with suitable habitat in juniper woodland and sagebrush shrubland. Mitigation measures, e.g., timing and spatial restrictions, implemented to limit potential impacts to migratory birds. Potential effects from exposure to closure evaporation ponds. No risk associated with backfill. All potential impacts at individual rather than population level.	Same as Alternative B.	Same as Alternative B *except:* Increased potential for avian mortality during operations if they are exposed to toxic water in out-of-heap solution containment pond.
Special Status Species	Loss of habitat, disturbance, mortality	<u>*Plants:*</u> No additional loss of habitat. <u>*Wildlife:*</u> Greater sage-grouse not expected to visit the pit lake and would not be affected. Golden eagles, northern goshawks, Swainson's hawks, prairie falcons, and peregrine falcons may visit the pit lake for drinking water and may feed on mammals that ingest pit lake water. No COPC exposure risk potential identified for red-tailed hawk (surrogate species). Burrowing owls, short-eared owls, and long-eared owls may visit the pit lake for drinking water and may feed on mammals that ingest pit lake water. No COPC exposure risk potential identified for common barn owl (surrogate species). Pygmy rabbits are not expected to visit the pit lake and would not be affected.	<u>*Plants:*</u> Disturbance of approximately 38.6 acres of marginal Lahontan milkvetch habitat, although adverse impact to individuals or habitat is unlikely. <u>*Wildlife:*</u> Pit backfilling would prevent formation of pit lake and eliminates potential toxicity to wildlife from pit lake water. Increased potential for traffic-related mortality due to increased number of weekly roundtrips and greater disturbances resulting from noise, dust, traffic, human presence, and nighttime lighting during active mining operations. Direct impact to approximately 53.5 acres of greater sage-grouse habitat (big and low sagebrush communities). Potential for impact is low due to small number of sage-grouse in the area. All of the proposed habitat removal would constitute long-term impact to golden eagle foraging habitat.	Same as Alternative B.	Same as Alternative B *except:* Increased potential to impact special status bats and birds if they are exposed to toxic water in out-of-heap solution containment pond.

Table 2.3.1: Impacts Summary by Alternative

Resource	Impact	Alternative A	Alternative B	Alternative C	Alternative D
Special Status Species		Townsend's big-eared bat, California myotis, small-footed myotis, and western pipistrelle bats may visit the pit lake for drinking water and feed on insects that ingest pit lake water. No COPC exposure risk potential identified for the little brown bat (surrogate species). Very slight potential for traffic-related injury or mortality. Minor disturbances resulting from noise, dust, traffic, human presence, and nighttime lighting.	Approximately 91.1 acres of potential hunting habitat (juniper woodland) for the northern goshawk would be removed. Long term impact to approximately 144.6 acres foraging and nesting habitat for the Swainson's hawk. Approximately 53.5 acres of potential foraging habitat (sagebrush shrubland) for the peregrine falcon would be removed. Long term impact to approximately 53.5 acres of potential nesting and foraging habitat for the burrowing owl. In addition, could cause disturbance to and abandonment of nesting burrowing owls if they are present within approximately 250 feet of project activities. Long term impact to approximately 144.6 acres of potential foraging habitat for the long-eared owl. Long term impact to approximately 144.6 acres of foraging and nesting habitat for the short-eared owl. Approximately 8.9 acres of potentially suitable habitat (big sagebrush shrubland) for pygmy rabbits would be removed. Potential impact is low given that pygmy rabbits are not known or expected to occupy the area. Approximately 91.1 acres of potential foraging habitat (juniper woodland) for Townsend's big-eared bats would be removed. No impacts to hibernating bats due to mitigation plan for removal. No hibernation roosts would be affected.		

Table 2.3.1: Impacts Summary by Alternative

Resource	Impact	Alternative A	Alternative B	Alternative C	Alternative D
Special Status Species			Long-term impact to approximately 144.6 acres of suitable foraging habitat for a variety of bat species, including small-footed myotis, California myotis, and western pipistrelle. All potential impacts at individual level not population level.		
Cultural Resources	Effects on historic property	No additional impact.	No impact associated with additional disturbance.	Same as Alternative B.	Same as Alternative B.
Native American Religious Concerns	Impacts on resources important to Native American groups	No additional impact.	No impact associated with additional disturbance.	Same as Alternative B.	Same as Alternative B.
Paleontology	Damage, destruction or loss of fossils or valuable scientific information	No additional impact.	Minimal risk of impacts due to additional disturbance.	Same as Alternative B.	Same as Alternative B.
Visual Resources	Impacts to viewshed	No additional impacts on visual landscape from mining facilities. Mine lighting would remain the same as current status, until building closure begins in 2014. Nearly all lighting removed by 2020. Voluntary mitigation measures implemented to minimize visual impacts and retain dark sky conditions.	Loss of vegetation within the 145.7-acre footprint of Stage III Heap Leach Facility. New buildings and lighting associated with Stage III Heap Leach Facility. No impact to recreation areas, towns, or roadways. Occasional hunter or recreationist could view area. Impacts consistent with BLM visual resource management system classification requirements. Environmental measures implemented to minimize visual impacts and minimize impacts to dark sky conditions. Lighting impacts continue through approximately 2025.	Same as Alternative B.	Same as Alternative B.

Table 2.3.1: Impacts Summary by Alternative

Resource	Impact	Alternative A	Alternative B	Alternative C	Alternative D
Socioeconomics		Impact to local economic and social resources due to reduced workforce at the mine and associated indirect/induced employment. Loss of sales/use tax revenue, property tax revenue, and net proceeds tax revenue.	Impact to local economic and social resources due to increased employment (200 full-time mine jobs and 140 indirect/induced jobs) over 5-7 year period. Collection of sales/use tax revenue, property tax revenue, and net proceeds tax revenue increases substantially from current condition.	Same as Alternative B.	Same as Alternative B.

3 AFFECTED ENVIRONMENT

3.1 Introduction

This chapter is organized by resource. Each resource section is generally introduced by a description of the regulatory or management framework for that resource, followed by a description of the current conditions (affected environment). Mining operations at the Mine have been ongoing for more than 20 years. As a result, the affected environment includes mining-related disturbances resulting from previous and existing operations.

BLM is required to address specific elements of the environment (i.e., Supplemental Authorities) that are subject to requirements specified in statute or regulation or by executive order in all environmental documents. Supplemental Authorities determined to be not present or present/not affected need not be carried forward for analysis or discussed further in the document. Supplemental Authorities determined to be present/may be affected must be carried forward for analysis in the document.

Table 3.1.1 lists the elements that must be addressed in all environmental analyses and denotes if the Proposed Action or alternatives would affect those elements and in which sections of the EA those elements are discussed.

Table 3.1.1: Supplemental Authorities

Element	Not Present	Present, Not Affected	Present, May be Affected	EA Reference Section
Air Quality			X	Sections 3.2, 4.2, and 5.4.1
Areas of Critical Environmental Concern (ACECs)	X			Not applicable
Cultural Resources		X		Sections 3.3 and 4.3
Environmental Justice		X		No communities/residences within 5-mile radius of mine; no disproportionate effects to minority/low-income populations
Flood Plains	X			Not applicable
Invasive and Nonnative Species			X	Sections 3.4, 4.4, and 5.4.6
Migratory Birds			X	Sections 3.5, 4.5, and 5.4.7
Native American Religious Concerns		X		Sections 3.6 and 4.6
Prime or Unique Farmlands	X			Not applicable
Threatened or Endangered Species	X			Sections 3.11, 4.11, and 5.4.7
Wastes, Hazardous or Solid		X		
Water Quality (Surface and Ground)			X	Sections 3.3, 4.3, and 5.4.2
Wetlands and Riparian Zones		X		Sections 3.12, 4.12, and 5.4.5
Wild and Scenic Rivers	X			Not applicable
Wilderness	X			Not applicable

Additional affected resources that have been considered for this EA are listed in **Table 3.1.2**. This table denotes if the Proposed Action or alternatives would affect those elements and in which sections of the EA those elements are discussed.

Table 3.1.2: Additional Affected Resources

Element	Not Present	Present, Not Affected	Present, May be Affected	EA Reference Section
Economics and Social Values			X	Sections 3.8, 4.8, and 5.4.8
Geology and Minerals		X		Sections 3.3 and 4.3 (Water Resources)
Paleontology		X		Sections 3.9 and 4.9
Soils			X	Sections 3.10, 4.10, and 5.4.4
Special Status Species			X	Sections 3.11, 4.11, and 5.4.7
Vegetation			X	Sections 3.12, 4.12, and 5.4.5
Visual Resources			X	Sections 3.13, 4.13, and 5.4.3
Wildlife			X	Sections 3.14, 4.14, and 5.4.7

3.2 Air Quality

This section presents information on the regulatory framework related to air quality in the project area. It also provides descriptions of site conditions and climate.

3.2.1 Regulatory Framework

Ambient air quality and the emission of air pollutants are regulated under both federal and state of Nevada laws and regulations, as discussed below.

3.2.1.1 Federal Clean Air Act

The Federal Clean Air Act (CAA) and the subsequent Federal CAA Amendments of 1990 (Amendments) require the U.S. Environmental Protection Agency (EPA) to identify National Ambient Air Quality Standards (NAAQS) to protect public health and welfare (EPA 2010a). The CAA and Amendments established NAAQS for 7 pollutants, known as "criteria" pollutants, because the ambient standards set for these pollutants satisfy criteria specified in the CAA. These ambient air quality standards are quantitatively set for the following criteria air pollutants: nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM) less than 10 microns in diameter, often referred to as the coarse PM fraction (PM_{10}), particulate matter less than 2.5 microns in diameter, often referred to as the fine PM fraction ($PM_{2.5}$), carbon monoxide (CO), ozone (O_3), and lead.

A list of the criteria pollutants regulated under the CAA and the currently applicable NAAQS set by EPA for each are listed in **Table 3.2.1**.

Federal Prevention of Significant Deterioration (PSD) regulations limit the maximum allowable increase in ambient particulate matter in a Class I area resulting from a major or minor stationary source to 4 micrograms per cubic meter ($\mu g/m^{3)}$ (annual geometric mean) and 8 $\mu g/m^3$ (24-hour average). Increases in other criteria pollutants are similarly limited. Specific types of "listed facilities" that emit, or have the potential to emit, 100 tons per year (tpy) or more of PM, PM_{10}, or other criteria air pollutants, or any facility that emits, or has the potential to emit, 250 tpy or more of PM, PM_{10}, or other criteria air pollutants, is considered a major stationary source. However, fugitive emissions are not counted as part of the determination of major source status for PSD for non-listed facilities such as gold mines. Neither the existing air pollutant emission sources at the Mine nor the emission sources under any of the alternatives are major stationary sources subject to PSD regulatory requirements.

New Source Performance Standards (NSPS), also required under the CAA, are set by EPA for specific types of new or modified stationary sources. NSPS set fixed emission limits for classes of sources to prevent deterioration of air quality from the construction of new sources and to reduce control costs by building pollution controls into the initial design of sources. In establishing NSPS, EPA is required to consider cost, non-air impacts, and energy requirements. Certain project units used to process metallic minerals are subject to the NSPS found in 40 CFR Part 60, Subpart LL (Standards of Performance for Metallic Mineral Processing Plants).

The CAA Amendments of 1990 introduced a new facility-wide permitting program known as the Federal Operating Permit, or "Title V," program, that requires facilities with the potential to emit more than 100 tpy of any regulated pollutant (excluding PM), 10 tpy of any single hazardous air pollutant (HAP), or 25 tpy or more of any combination of HAPs, to submit a Federal Operating Permit application. The Mine is not currently subject to Title V requirements, nor would it be under any of the alternatives.

The CAA directs EPA to delegate primary responsibility for air pollution control to state governments, which comply with certain minimum requirements. State governments, in turn, often delegate this responsibility to local or regional governmental organizations. The State Implementation Plan (SIP) was originally the mechanism by which a state set emission limits and allocated pollution control responsibility to meet the NAAQS. The function of a SIP broadened after passage of the CAA Amendments and now includes the implementation of specific technology-based emission standards, permitting of sources, collection of fees, coordination of air quality planning, and PSD of air quality within regional planning areas and statewide.

Coeur's operations at the Mine are subject to annual reporting under Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA), which is commonly known as EPA Toxic Release Inventory (TRI) program. Under EPA TRI program, the threshold for facilities to report mercury (Hg) (mercury compounds) is 10 pounds per calendar year. TRI defines a mercury compound as "any unique chemical substance that contains mercury as part of the chemical's infrastructure." TRI reporting calculates emissions from releases to air (fugitive and point sources), water discharges, land, transfers off site and other waste management activities.

Table 3.2.1: National Ambient Air Quality Standards

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide (CO) (9)	9 ppm (10 mg/m^3)	8-hour (1)	None	
	35 ppm (40 mg/m^3)	1-hour (1)		
Lead (Pb)	0.15 µg/m^3 (2)	Rolling 3-Month Average	Same as Primary	
	1.5 µg/m^3	Quarterly Average		
Nitrogen Dioxide (NO_2)	0.053 ppm (100 µg/m^3)	Annual (Arithmetic Mean)	Same as Primary	
	0.100 ppm	1-hour (3)	0.5 ppm (100 µg/m^3)	Annual (Arithmetic Mean)
Particulate Matter (PM_{10}) (10)	150 µg/m^3	24-hour (3)	Same as Primary	
Particulate Matter ($PM_{2.5}$) (11)	15.0 µg/m^3	Annual (4) (Arithmetic Mean)	Same as Primary	
	35 µg/m^3	24-hour (5)		
Ozone (O_3) (12)	0.075 ppm (2008 std)	8-hour (6)	Same as Primary	
	0.08 ppm (1997 std)	8-hour (7)		
	0.12 ppm	1-hour (8) (Applies in limited areas only)		
Sulfur Dioxide (SO_2)	0.03 ppm	Annual (Arithmetic Mean)	0.5 ppm (1300 µg/m^3)	3-hour (1)
	0.14 ppm	24-hour (1)		

Source: EPA 2010a
µg/m^3 = micrograms per cubic meter
ppm = parts per million
std = standard
(1) Not to be exceeded more than once per year.
(2) Final rule signed October 15, 2008.
(3) Not to be exceeded more than once per year on average over 3 years.
(4) To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m^3.
(5) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m^3 (effective December 17, 2006).
(6) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective May 27, 2008).
(7) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm. (b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
(8) (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than 1. (b) As of June 15, 2005, EPA revoked the 1-hour ozone standard in all areas except the 8-hour ozone nonattainment Early Action Compact (EAC) Areas.
(9) State of Nevada has an additional 8-hour standard of 6 ppm for CO for areas equal to or greater than 5,000 feet amsl.
(10) The state of Nevada retained the PM_{10} annual arithmetic mean of 50 µg/m^3.
(11) The state of Nevada has not formally adopted the federal $PM_{2.5}$ standard.
(12) State of Nevada has an additional 1-hour Ozone standard of 0.10 ppm for the Lake Tahoe Basin and furthermore, has not formally adopted the revised federal 8-hour standard.

3.2.1.2 Nevada State Air Quality Program

The Bureau of Air Pollution Control (BAPC) is the agency in the state of Nevada that has been generally delegated the responsibility for implementing the SIP. Included in the SIP are the state of Nevada air quality permit programs (NAC 445B.001 through 445B.3497, inclusive). The Nevada Ambient Air Quality Standards (AAQS) also are part of the SIP. The Nevada AAQS generally are identical to the NAAQS, with the exception of the following: an additional standard for CO in areas with an elevation in excess of 5,000 feet amsl; and an additional 1-hour O_3 standard in the Lake Tahoe Basin. Furthermore, Nevada has yet to adopt the new and revised 8-hour O_3 standard; the revised NAAQS for PM_{10} (the state of Nevada has retained the annual arithmetic mean standard); recently promulgated NAAQS for $PM_{2.5}$ (Nevada has yet to adopt the new and revised standard); and a 1-hour hydrogen sulfide (H_2S) standard. Finally, a violation of a state standard occurs with the first annual exceedance of an ambient standard, while federal standards generally are not violated until the second annual exceedance. In addition to establishing the Nevada AAQS, the BAPC is responsible for permit and enforcement activities throughout the state of Nevada.

The BAPC permitting program implements the Title V Federal Operating Permit program, as well as the minor source permitting program for facilities that emit less than 100 tpy of all criteria pollutants and are not a major source of HAPs. Coeur's current operations are regulated by 2 air quality permits, an air quality operating permit and a mercury operation permit. Operations at the existing Mine are permitted under BAPC's minor source permitting program via air quality operating permit AP1044-0063.03. The construction of the proposed Stage III Heap Leach Facility would be permitted under a Surface Area Disturbance Permit Fugitive Dust Control and Process Equipment Emission Control Plan as found in AP1044-0063.03, submitted on January 21, 2010. The state of Nevada adopted regulations on May 4, 2006, that require facilities to obtain a mercury operation permit to construct and regulate certain controls of mercury emissions for thermal units that emit mercury which are located at stationary sources that conduct mining of gold or silver ore (NAC 445B.2 through 445B.41). This program, known as the Nevada Mercury Air Emissions Control Program (NMCP) requires mercury air emission controls at precious metal mining facilities through a new permitting program. The new permit requirement applies to precious metal mining facilities that process mercury-containing ore with thermal treatment processes that have the potential for liberating mercury into the atmosphere.

Mercury controls are subject to a Maximum Achievable Control Technology (MACT) determination, as well as testing, sampling, operation, maintenance, monitoring, recordkeeping, and reporting as permit requirements. Pursuant to NMCP regulations, Coeur must report annual mercury and mercury co-product emissions. Operations at the existing Mine are permitted under a Phase I Mercury Operating Permit AP1044-2242.

The NMCP has explicit testing and data requirements that differ from TRI. The NMCP only allows the use of EPA Reference Test Method 29, approved by the NMCP, from the same calendar year as the reporting year. An NMCP-approved test consists of an NMCP-approved protocol and an NMCP-approved test report. A facility may use an NMCP-approved source test for TRI reporting, but other data sources acceptable for TRI reporting are not acceptable for NMCP reporting. Therefore, TRI and NMCP data values may be different for the same unit.

Additional air pollutants that are of concern in Nevada are greenhouse gases (GHG). In December 2009, EPA promulgated the Mandatory Reporting of Greenhouse Gases Rule. The rule requires reporting of GHG emissions from large sources and suppliers in the United States. Under the rule, suppliers of fossil fuels or industrial GHG, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions are required to submit annual emission reports to EPA. For the purpose of reporting annual emissions, GHG include CO, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfurhexafluoride (SF_6).

In addition to EPA's mandatory reporting of GHG, in 2007, the state of Nevada mandated that electrical generating power plants in the state must report their GHG emissions. Affected units are those units that produce electricity for sale, have a maximum output design capacity of 5 megawatts or greater, and produce GHG. Affected power generating units must report annual GHG emissions to the Climate Registry. The Mine is not classified as an electrical generating power plant; therefore, they are not required to submit annual GHG emissions to the Climate Registry (Carter Lake Consulting 2009).

3.2.2 Affected Environment

3.2.2.1 Background

The Mine is located on private and public lands in the central portion of the Humboldt Range in northwestern Nevada in Pershing County. The Mine occupies elevations ranging from 5,400 to 7,300 feet amsl with high relief over a majority of the area. According to EPA's green book of non-attainment areas and the BAPC, Pershing County has been designated as in attainment for all criteria air pollutants that have an NAAQS/AAQS (EPA 2010c; BAPC 2010).

3.2.2.2 Climate

The climate of the project area is arid, characterized by warm, dry summers and moderately wet, cold winters. Meteorological values for the project area are derived from 2 sources of climatological data. The first source of climatological data is site-specific data collected from the Rochester Mine Meteorological Monitoring Station from 1988 to 2006 which indicates the average maximum and minimum annual temperatures are 73.7 and 30.3 degrees Fahrenheit (°F), respectively (Coeur 2007). The average annual precipitation including snowfall and rainfall is 13.41 inches. The majority of precipitation occurs during the spring (March, April, and May), with monthly average precipitation ranging between 1.32 to 1.94 inches per month. Monthly average precipitation in the winter (December, January, and February) ranges between 1.39 to 1.61 inches per month.

The second source of climatological data is derived from the Lovelock Federal Aviation Administration (FAA) Airport, Nevada weather station (264700). **Table 3.2.2** shows meteorological data from the Lovelock FAA Airport, Nevada weather station (264700) for the period of record through 2009 (i.e., 1948 to 2009) (Western Regional Climate Center [WRCC] 2010). Based on these data, the average maximum and minimum annual temperatures are 68.1 and 34.5 °F, respectively, and the average annual precipitation at Lovelock Airport, including snowfall and rainfall is 4.91 inches (WRCC 2010).

Table 3.2.2: Monthly Climate Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg Max Temp (°F)	43.2	50.6	57.9	65.6	75.3	85.0	95.2	92.3	83.4	70.2	54.6	44.2	68.1
Avg Min Temp (°F)	16.8	22.0	26.3	32.9	42.1	49.6	55.7	52.3	43.8	33.0	22.8	16.9	34.5
Avg Total Precipitation (in.)	0.54	0.43	0.41	0.46	0.59	0.49	0.15	0.27	0.32	0.33	0.45	0.47	4.91
Avg Total Snowfall (in.)	2.3	1.1	0.5	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.5	2.1	6.8
Avg Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0
Source: WRCC Lovelock FAA Airport, Nevada weather station (2664700)—7/1/1978 to 11/30/2009 (WRCC 2010)													

3.3 Cultural Resources

3.3.1 Regulatory Framework

BLM manages cultural resources under a number of federal laws, including the Antiquities Act of 1906 (Public Law [PL] 59-209), the Archaeological Resources Protection Act (ARPA) of 1979 (PL-96-95), and the National Historic Preservation Act (NHPA) of 1966, as amended (16 USC 470).

The NHPA is the principal federal law addressing cultural resources. Its implementing regulations at 36 CFR 800 describe the procedures for identifying and evaluating historic properties, for assessing the effects of federal actions on historic properties, and for consulting with appropriate agencies to avoid, reduce, or minimize adverse effects. Historic properties are cultural resources that meet specific criteria for listing on the National Register of Historic Places (NRHP). These regulations are also known as the Section 106 process.

BLM has entered into a national programmatic agreement (PA) on planning and managing historic properties under BLM's jurisdiction or control. BLM in Nevada has also developed a protocol agreement with the State Historic Preservation Office (SHPO). The national PA and the Nevada protocol provide alternative procedures for compliance with the NHPA that allow BLM more flexibility in identifying and determining effects for routine undertakings. The protocol outlines how BLM and SHPO would continue to interact, cooperate, and share information to ensure that the alternate procedures are consistent with the goals of the NHPA.

The Mine area has a long history of use and the discontiguous Rochester Cultural District has been determined to be eligible for listing on the NRHP. In order to comply with the NHPA while continuing ongoing mineral development, BLM Winnemucca District, Nevada Division of Historic Preservation and Archaeology, and the Advisory Council on Historic Preservation entered into a PA in 1991 regarding the treatment of historic properties during mineral development associated with the Mine. The agreement facilitates the evaluation and treatment of historic properties within the boundaries of a large "programmatic area" and was the basis for subsequent work refining the elements and site types that are significant for inclusion in the NRHP–eligible Rochester Cultural District (Busby et al. 1993).

3.3.2 Affected Environment

3.3.2.1 Overview

Prehistoric archaeological evidence of habitation and use of this part of Nevada may date to 10,000 or 12,000 years ago, corresponding to the final high stand of prehistoric Lake Lahontan. The subsistence pattern of these earliest inhabitants is unclear, but there is substantial evidence for use of the grasslands and marshes that developed as the lake receded. In time, the drying became extreme, and those occupants who remained adapted to environmental conditions by using mountain, lake, and desert resources. The marshes and lakes of the valleys were used intensively when environmental conditions became more favorable and with the adoption of bow and arrow technology. At the time Euro-Americans arrived, small family groups continued to seasonally exploit widely scattered resources from upland, lake, river, and desert locations, coming together for communal game drives and cultural activities. For an overview of regional prehistory and history, see *Prehistory and History of the Winnemucca District: A Cultural Resource Literature Overview* (Smith et al. 1983).

3.3.2.2 Rochester Mine History

Mining in the Rochester District began during the 1860s by a group of miners from Rochester, New York. Originally, hard rock shaft gold mining was practiced, but during the latter part of the 19th century the focus shifted to placer mining. Chinese miners arrived later and established small camps working numerous localities and using rockers due to a lack of water. From about 1900 on in the Rochester District, exploratory prospecting occurred, along with the filing of numerous claims. During 1911 to 1912, Joseph Nenzel made a significant discovery of rich silver ore. This discovery led to a 1912 to 1913 "Rochester Rush." Soon 4 mining focal points were established at Nenzel Hill at the eastern head of Rochester Canyon, Lincoln and Independence Hills, on the north and south slopes of the lower end of Rochester Canyon, and at Packard south of Rochester Canyon. From 1913 to 1929, the Rochester District was in its primary production period. Improvements in transportation, machine drilling, power hoists, electrical pumps, explosives, and timbering systems reduced shipping costs and enhanced production. Consolidation of claims and lease holdings also improved efficiency (Simons et al. 2008).

The district produced silver, gold, lead, copper, zinc, antimony, tungsten, dumortierite, and andalusite. The economic viability of large scale mining is sensitive to prices and demand in the world market, weighed against production and transportation costs. By 1929, closure of the mill at Lower Rochester ended the Rochester District's early boom-to-bust cycle. After 1929, limited mining continued in the Rochester District. Placer mining occurred in Limerick Canyon and sporadic activities took place at several small mines and mills. This included reworking tailings. Beginning in the 1980s new mining priorities and technologies led to renewed interest in the mineral resources of the Rochester District and the current mineral development taking place (Simons et al. 2008).

3.3.2.3 Inventory

The entire area within the Rochester Mine permit boundary has been inventoried for cultural resources. Since the Rochester Mine has been in operation since 1986, much of the area has been previously disturbed and many sites are no longer present. Prior to permitting the Mine and subsequent expansions, NHPA Section 106 compliance was completed. Contributing elements of the NRHP–eligible Rochester Cultural District have been affected by past expansions. Data recovery efforts, thorough recordation, archival research, compilation of historic photographs, and a museum exhibit installed at the Marzen House Museum in Lovelock were determined to be sufficient mitigation.

Maps and aerial photographs of the proposed location of expanded operations and ancillary facilities were examined and compared with cultural resource inventories and site records accessed at BLM and through the Nevada Cultural Resource Information System (NVCRIS). Of the areas affected by the proposed new operations and facilities, only the site of the proposed Stage III Heap Leach Facility and the ancillary facility area where ponds would be constructed are in areas not previously permitted for disturbance.

Previous inventories that cover portions of the proposed new disturbance areas are summarized in **Table 3.3.1**. Recorded cultural resources are described in **Table 3.3.2**.

Nine cultural resources have been recorded in the proposed Stage III Heap Leach Facility disturbance area. Prehistoric resources include 2 lithic scatters (CrNV-22-4749 and -22-4750) and 3 isolated flakes (CrNV-22-4751, -22-4753, and 22-4754). Historic resources include 3 prospect pits (CrNV-22-3580, -22-3581, and -22-3582) and one isolated tobacco tin (CrNV-22-4755). These resources have been previously evaluated against the criteria for listing on the NRHP. None of these resources are eligible for listing on the NRHP as individual properties. They are also not located within the boundaries of or contributing elements to the discontiguous NRHP–eligible Rochester Cultural District.

Table 3.3.1: Cultural Resource Inventories within Proposed New Disturbance Area

BLM/NSM Numbers	Reference	Results
CR2-2024a(P)	Burke and Hemphill 1986, *Coeur Explorations, Inc. Rochester Mining Development Project Parcel Inventory.*	This was a block survey of a portion of a 1,550-acre parcel for proposed mining development. A total of 116 prehistoric and historic loci were observed and recorded. Some loci included several historic structures and remains located on federal lands. A total of 101 sites were located on patented land.
CR2-2024b(P) (14-133)	Clay and Burke 1986, *Coeur Explorations Inc. Rochester Mining Development Project Parcel Inventory, Addendum.*	This inventory was the completion of 1,550-acre block survey noted in CR2-2024a. A total of 52 prehistoric and historic loci were observed and recorded.
CR2-2321(P) (14-134)	Lennon et al. 1989, *A Cultural Resource Inventory of the Coeur-Rochester Weaver Saddle Area, Pershing County, Nevada*.	This was a block survey of 240 acres for proposed mining development in Weaver Saddle. A total of 27 historic mining loci and 14 prehistoric and/or historic sites and isolates were observed and recorded.
CR-2367(P) (14-222)	Kautz 1990, *A Class III Cultural Resources Survey of the Packard Ridge, Humboldt Range, Pershing County, Nevada.*	This was a block survey of 334 acres for proposed mining exploration near Weaver Saddle. A total of 8 prehistoric and historic sites, 21 cairns, 13 prospects, and 9 prehistoric isolates were observed and recorded.
NSM: Nevada State Museum		

Table 3.3.2: Cultural Resources within Proposed New Disturbance Area

BLM/NSM Numbers	NRHP Status	Inventory Reference	Description
CrNV-22 -3580 26Pe-1029	Not eligible	CR2-2024a(P), CR2-2024b(P), (14-133)	Historic mining prospect measuring 3.7 meters (m) x 9.1 m.
CrNV-22 -3581 26Pe-1030	Not eligible	CR2-2024a(P), CR2-2024b(P), (14-133)	Historic mining prospect measuring 2.7 m x 4.6 m.
CrNV-22 -3582 26Pe-1031	Not eligible	CR2-2024a(P), CR2-2024b, (14-133)	Historic mining prospect measuring 3 m x 4.6 m.
CrNV-22 -4749 26Pe-2195	Not eligible	CR2-2321(P) (14-134)	Prehistoric site: Small lithic scatter (dimensions not recorded) with 6 flakes of obsidian and cryptocrystalline silicates.
CrNV-22 -4750 26Pe-2196	Not eligible	CR2-2321(P) (14-134)	Prehistoric site: Lithic scatter (70 m x 30 m) containing approximately 60 flakes and 1 biface tip of obsidian and cryptocrystalline silicates. Three probes were negative for subsurface cultural materials
CrNV-22 -4751 26Pe-2197	Not eligible	CR2-2321(P) (14-134)	Prehistoric: Isolated cryptocrystalline silicate flake.
CrNV-22 -4753 26Pe-2199	Not eligible	CR2-2321(P) (14-134)	Prehistoric: Isolated obsidian flake.
CrNV-22 -4754 26Pe-2200	Not eligible	CR2-2321(P) (14-134)	Prehistoric: Isolated obsidian flake.
CrNV-22 -4755 26Pe-2201	Not eligible	CR2-2321(P) (14-134)	Historic: Isolated tin can (tobacco).
NSM: Nevada State Museum			

3.4 Invasive Nonnative Species

3.4.1 Regulatory Framework

The Federal Noxious Weed Act of 1974, as amended (U.S. Fish and Wildlife Service [USFWS] 1990), established a program for federal land management agencies to control the spread of noxious weeds. The U.S. Department of Interior Manual 609 (USFWS 1995) sets forth policy to control undesirable or noxious weeds on the lands, waters, or facilities under its jurisdiction, to the extent economically practicable, and as needed for resource protection and accomplishment of resource management objectives. BLM Manual 9011 (BLM 2007b), BLM Handbook H-9011-1 (BLM 1994), and BLM Manual 9014 (BLM 1990) provide policy for the planning and implementation of biological controls within an integrated pest management program and require that all ground-disturbing projects and any projects that alter plant communities are evaluated to determine the risk of introducing or spreading noxious weeds.

State of Nevada regulations for noxious weeds are included in NRS and NAC Chapter 555 (Nevada Department of Agriculture 2005), which provide for the designation, control, and removal of noxious weeds. Forty-seven species are currently on the Nevada Noxious Weed List (Nevada Department of Agriculture 2008).

Noxious weeds in Nevada are classified by categories which dictate the level of control required by the state (Nevada Department of Agriculture 2008). For Category 'A' weeds, control is required by the state in all infestations. For Category 'B' weeds, control is required by the state in areas where populations are not well established or previously unknown to occur. For Category 'C' weeds, abatement is at the discretion of the state quarantine officer.

3.4.2 Affected Environment

Seven noxious weed species were identified at the Mine (EMA 2000 *in* BLM 2003, AEE 2000). One Category 'A' noxious weed species, squarrose knapweed (*Centaurea squarrosa*), has been documented at the Mine. Three Category 'B' noxious weed species, diffuse knapweed (*Centaurea diffusa*), musk thistle (*Carduus nutans*), and Russian knapweed (*Acroptilon repens*), have been documented at the Mine. Three Category 'C' noxious weed species, salt cedar (*Tamarix ramosissima*), perennial pepperweed (*Lepidium latifolium*), and hoary cress (*Cardaria draba*), have been documented at the Mine (EMA 2000 *in* BLM 2003; AEE 2000).

Nine other non-native, invasive species have been documented at the Mine (EMA 2000, AEE 2000). Although control of these species is not required by law, the non-native, invasive species have potential to adversely impact the ecological integrity of the area within and surrounding the Mine. The following non-native, invasive species were identified: bull thistle (*Cirsium vulgare*), prickly lettuce (*Lactuca serriola*), tanseymustard (*Descurainia sophia*), clasping pepperweed (*Lepidium perfoliatum*), Russian thistle (*Salsola iberica*), tumble mustard (*Sisymbrium altissimum*), spiny cocklebur (*Xanthium spinosum*), halogeton (*Halogeton glomeratus*), and cheatgrass (EMA 2000; AEE 2000).

3.5 Migratory Birds

3.5.1 Regulatory Framework

"Migratory bird" includes all species listed in 50 CFR Parts 10 and 21. All native birds commonly found in the United States, with the exception of native resident game birds, are protected under the MBTA. The MBTA prohibits taking of migratory birds, their parts, nests, eggs, and nestlings without a permit. Executive Order 13186, signed January 10, 2001, directs federal agencies to protect migratory birds by integrating bird conservation principles, measures, and practices. Additional direction comes from the MOU between BLM and USFWS, signed January 17, 2001. The purpose of this MOU is to strengthen migratory bird conservation through enhanced collaboration between BLM and USFWS, in coordination with state, tribal, and local governments. The MOU identifies management practices that impact populations of high priority migratory bird species, including nesting, migration, or over-wintering habitats, on public lands, and develops management objectives or recommendations that avoid or minimize these impacts.

3.5.2 Affected Environment

Raptors

Raptors are protected under the MBTA. Those which are known to or have the potential to occur within the project area are identified below. The raptor species that are also protected under other federal or state law, regulation, or policy are addressed in more detail in Section 3.11–*Special Status Species*.

Raptor foraging habitat exists in and around the Mine, and several species of raptors are likely to occur in the area; however, no raptor nests have thus far been identified (Tetra Tech 2010b). A survey was conducted during the nesting season in 2000 over the Packard Mine to determine the location of active and inactive raptor nests and to assess habitat use by raptors (AEE 2000b). Eight raptor species were observed foraging in the area in early May; however, no nests were located. Species such as red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), and American kestrel (*Falco sparverius*) were noted during the 2000 survey (AEE 2000b). Additionally, great horned owl (*Bubo virginianus*) was identified by the presence of sign (pellets), but the quantity of sign was indicative of casual use of the area (AEE 2000b). Also, a pair of unidentified falcons, assumed to be prairie falcons (*Falco mexicanus*), was observed approximately 1.5 miles south of the Mine, in the vicinity of Willow Creek Canyon (AEE 2000b). The steep rock faces in the Willow Creek Canyon area, approximately 1.5 miles south of the project area, provide potentially suitable habitat for a variety of raptor species (AEE 2000b). One Cooper's hawk (*Accipiter cooperii*) and one sharp-shinned hawk (*Accipiter striatus*), believed to be migrants, were observed during a recent survey of the proposed Stage III Heap Leach Facility site (JBR Environmental Consultants 2010). One pair of burrowing owls (*Athene cunicularia*) has been observed near the Mine (AEE 2000b).

According to NDOW (2010b), the raptors with known range and that are known to reside within a 3-mile buffer of the Mine include Cooper's hawk, golden eagle (*Aquila chrysaetos*), great horned owl, red-tailed hawk, long-eared owl (*Asio otus*), and northern goshawk (*Accipiter gentilis*) (NDOW 2010b). Additional raptor species with known range within a 3-mile buffer of the Mine include the American kestrel, barn owl (*Tyto alba*), northern harrier, northern saw-whet owl (*Aegolius acadicus*), osprey (*Pandion haliaetus*), peregrine falcon (*Falco peregrinus*), prairie falcon, sharp-shinned hawk, short-eared owl (*Asio flammeus*), Swainson's hawk (*Buteo swainsoni*), turkey vulture (*Cathartes aura*), western burrowing owl, and western screech owl (*Megascops kennicottii*) (NDOW 2010b).

Passerines

Non-raptor migratory bird species recorded at the Mine include western kingbird (*Tyrannus verticalis*), gray flycatcher (*Empidonax wrightii*), barn swallow (*Hirundo rustica*), western meadowlark (*Sturnella neglecta*), sage thrasher (*Oreoscoptes montanus*), spotted towhee (*Pipilo *erythrophthalmus*), common raven (*Corvus corvax*), and species of sparrows such as Brewer's sparrow (*Spizella breweri*) and sage sparrow (*Amphispiza belli*) (AEE 2000). According to NDOW (2010b), additional species known to reside within a 3-mile buffer of the Mine include the broad-tailed hummingbird (*Selasphorus platycercus*), calliope hummingbird (*Stellula calliope*), and black-chinned hummingbird (*Archilochus alexandri*). Other bird species including the gray flycatcher, American robin (*Turdus migratorius*), blue-gray gnatcatcher (*Polioptila caerulea*), Brewer's blackbird (*Euphagus cyanocephalus*), and western meadowlark were observed during a recent survey of the proposed Stage III Heap Leach Facility site (JBR Environmental Consultants 2010). Migratory bird nesting and foraging habitat also occurs in the juniper woodland vegetation communities and the sagebrush communities found at the Mine.

Monitoring

Coeur conducts regular monitoring and provides quarterly reports to NDOW for mortalities of wildlife at the Mine. Mortalities associated with the permitted pond solutions or structures from the first quarter of 2007 through the third quarter of 2009 were reviewed for affected wildlife. Over this period of time, migratory bird mortalities associated with the ponds or structures included 2 waterfowl (one egret and one coot). Mortalities documented by NDOW that were not associated with the pond or structures were 4 songbirds (2 starlings, one finch, and one sparrow) (NDOW 2007a, b, c, d; 2008a, b, c, d; 2009a, b, c).

3.6 Native American Religious Concerns

3.6.1 Regulatory Framework

Numerous laws and regulations require consideration of Native American concerns. These include the NHPA of 1966 as amended, the American Indian Religious Freedom Act (AIRFA) of 1978 as amended, Executive Order 13007–Indian Sacred Sites, Executive Order 13175–Consultation and Coordination with Tribal Governments, the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, and the ARPA of 1979, as well as NEPA and FLPMA.

3.6.2 Affected Environment

BLM contacted the Lovelock Paiute Tribe regarding the proposed project by letter on February 3, 2010. In a telephone conversation with BLM archaeologist Peggy McGuckian on April 7, 2010, Lovelock Paiute Tribal Chairman, Victor Mann, stated that the Tribe had no concerns about the proposed project.

3.7 Water Quality (Surface and Ground)

Water within the project area exists as precipitation, surface water, and groundwater resources. The project lies within the south-central Humboldt Range between approximately 5,400–7,300 feet amsl where it straddles a drainage divide separating 3 hydrographic areas (**Figure 3.7.4**).

The hydrology of the site is controlled by basin and range geology. Late Permian and Lower Triassic bedrock is overlain by unconsolidated sediment. Regionally, ground water flows from the mountain range where it is recharged by seepage of surface water, towards adjacent valleys.

Sections 3.7.2 and 3.7.3 describe the affected environment for surface and ground water in the Mine area. They are preceded by Section 3.7.1, which describes the geochemical baseline conditions. Geochemistry is an important component of the affected environment related to water resources because the action of mining causes ore and non-ore minerals associated with a deposit to weather in the presence of water and oxygen resulting in the potential release of constituents to surface and ground water. Describing the geochemical patterns of materials, including predictions of acid-forming and metal leaching potential is a key step in assessing the potential impacts of specific management practices on water quality.

3.7.1 Geochemistry

3.7.1.1 Geology

The Mine area mineralization is hosted in 2 formations, the Weaver and Rochester rhyolites from the Koipato Group. The Weaver Formation is up to 850 feet thick within the Mine area and is the younger of the two rhyolites and includes crystal, rock fragment, and clastic-rich variations. The layering from textural variations results in contrasting properties with respect to groundwater distribution and flow. Approximately 700 feet of Weaver Formation is exposed in the Rochester Pit. The Rochester Formation is up to 2,000 feet thick within the Mine area and is also dominated by rhyolitic tuffs. The tuffs are vertically layered by variation in texture (breccia, ash, clastics). This layering imparts control on the distribution and flow of ground water.

The pit backfill materials include non-ore rock from the Rochester and Weaver formations. Within the Rochester and Weaver formations, high sulfide PAG rocks are exposed in the pit wall.

3.7.1.2 Mine Waste Characterization Program

The geochemistry of the non-ore rock, which includes rock used and proposed to be used for in-pit RDS and backfill, was characterized in 4 studies between 1995 and 2009 (Schafer 1995; Maxim 1998; Maxim 2000; WMC 2009a). The focus of the testing program included acid-base accounting (ABA), net acid generation (NAG) pH testing, meteoric water mobility procedure (MWMP), synthetic precipitation leaching procedure (SPLP) and kinetic testing using humidity cells. A summary of the characterization program is provided in **Table 3.7.1**.

In combination, the results from these studies provided the data used to characterize the backfill material and sulfide zones in the pit wall. The program also provided a basis for estimating amendment requirements for the backfill and pit wall sulfide exposures.

Table 3.7.1: Summary of Geochemical Characterization Program

Geochemical Analysis	Static Testing					Kinetic Testing
	Acid-base Accounting (ABA) with Sulfur Speciation	Net Acid Generation Testing (NAG pH)	Whole Rock Analysis	Meteoric Water Mobility Procedure (MWMP)	Synthetic Precipitation Leaching Procedure (SPLP)	Humidity Cell Testing
Total Samples	156	81	25	38	15	18
Source: Hydrogeo 2010						

Acid-base Accounting

A total of 156 samples were collected from the Rochester and Weaver formations and subjected to ABA with sulfur speciation. ABA is the most commonly used static test method to estimate the capacity of material to produce and neutralize acid.

The AGP of the Mine non-ore rock samples was determined based on the pyrite sulfur content which is all or a portion of the sulfide sulfur. The total sulfur values for all samples range from <0.01 to 4 percent, with average and geometric mean values of 0.12 and 0.04 percent for the Weaver Formation and 0.62 and 0.13 percent for the Rochester Formation. Sulfide sulfur ranges from <0.01 to 3 percent, with average and geometric mean values of 0.07 and 0.02 percent for the Weaver Formation and 0.52 and 0.08 percent for the Rochester Formation.

The net neutralizing potential (NNP) and neutralization potential ratio (ANP:AGP) are used to categorize material into potentially acid-producing or non-acid-producing material. NNP is the difference between the ANP and AGP (i.e., NNP = ANP – AGP). Samples with negative NNP are net-acid generating whereas samples with positive NNP are net-neutralizing. The ANP:AGP ratio is also commonly used to indicate if material is likely to produce acid. Many interpretation schemes have been developed for assessing the potential for acid generation using either NNP or ANP:AGP. In general, samples with NNP greater than +20 tons of $CaCO_3$ per 1,000 tons of material (T $CaCO_3$/kT) and/or ANP:AGP of 3 or greater are considered non-acid-forming. In contrast, material with NNP less than -20 T $CaCO_3$/kT and/or ANP:AGP less than one are considered potentially acid generating. Samples with NNP or ANP:AGP in between these criteria are considered to have uncertain ABA character. BLM in Nevada requires kinetic testing if the NNP does not exceed +20 T $CaCO_3$/kT and/or the ANP:AGP is less than 3 (BLM 1996). **Table 3.7.2** provides a statistical summary of the static test results for non-ore rock samples from the Rochester Pit.

NNP for all tested materials are less than +20 T $CaCO_3$/kT, ranging from -87 T $CaCO_3$/kT to 9 T $CaCO_3$/kT indicating that the material has uncertain acid generating potential. The average NNP for the Weaver Formation is 0.9 T $CaCO_3$/kT and -13 T $CaCO_3$/kT for the Rochester Formation. ANP:AGP values for all tested materials range from 0.01 to 29, with an average of 7.0. The average ANP:AGP is 8.2 for the Weaver Formation and 4.4 for the Rochester Formation. In combination, these criteria indicate that overall the non-ore rocks in the Rochester Pit have uncertain acid generating potential requiring long-term kinetic testing.

Table 3.7.2: Summary of Acid-base Accounting Results

DATA	Total S (%)	Sulfide S (%)	NNP (T $CaCO_3$/kT)	ANP:AGP
WEAVER FORMATION (n = 107)				
Minimum	<0.01	<0.01	-48	<0.01
Maximum	2.0	1.8	9	29
Median	0.02	0.01	1.7	6.4
Average	0.12	0.07	0.9	8.2
Geometric Mean	0.04	0.02	-	4.0
ROCHESTER FORMATION (n = 49)				
Minimum	<0.01	<0.01	-87	<0.01
Maximum	4.0	3.0	8.7	29
Median	0.10	0.03	0.7	3.2
Average	0.62	0.52	-13	4.4
Geometric Mean	0.13	0.08	-	1.0
All DATA (n = 156)				
Minimum	<0.01	<0.01	-87	<0.01
Maximum	4.0	3.0	9	29
Median	0.04	0.01	1.69	6.4
Average	0.27	0.21	-3.4	7.0
Geometric Mean	0.05	0.03	-	2.6
Source: WMC 2009a				

Water Leaching Tests

SPLP and MWMP are designed to determine the potential for release of chemical constituents from a solid that is exposed to meteoric precipitation (rain or snow melt). The primary difference between the tests is the water to rock ratio. The MWMP is close to 1:1, water:rock, while the SPLP is 20:1. The SPLP, therefore, generally yields more dilute concentrations in the leachate.

The concentrations of constituents in the test water leach test extract were compared to applicable water quality standards including the legally enforceable maximum contaminant level (MCL) of specific constituents under the national primary drinking water standards, the state of Nevada Reference Values (NRVs) which are secondary standards for public water systems and the non-enforceable national secondary drinking water standards (secondary MCLs) regulating contaminants that may cause cosmetic or aesthetic effects in drinking water.

A total of 53 non-ore samples have been subjected to water leaching tests to investigate the readily soluble constituents including 15 SPLP and 38 MWMP tests (Schafer 1995; Maxim 2000; WMC 2009a). The extracts ranged in pH from slightly acidic to near neutral. The SPLP extracts contained elevated levels of barium and iron relative to the applicable standards. MWMP results indicated that concentrations of aluminum, cadmium, copper, lead, and zinc for some samples were slightly elevated compared to MCLs. Two samples tested in 2009 from the main ramp and the middle backfill showed levels of antimony and arsenic slightly exceeding the MCLs.

Net Acid Generation Testing

NAG testing is used to determine the net acid remaining after being subjected to a strong oxidizing agent (hydrogen peroxide). The acid that is formed reacts with the neutralizing components in a sample which provides a direct measurement of the net acidity generated after a period of exposure and weathering. The final pH values (NAG pH) can be used to determine a demarcation between PAG and non-PAG materials. Site-specific data are required to confirm the NAG pH to classify material.

The average NAG pH for the Rochester and Weaver Formation samples were 3.7 and 4.5, respectively. Of the 81 samples subject to NAG pH measurements, a minimum pH of 2.3 and maximum pH of 6.6 were obtained. The NAG pH varied widely (pH 2.7–6.6) for samples with total sulfur content below the 0.4 percent total sulfur PAG criterion, as described below in the Operational Geochemical Testing section, whereas samples with higher sulfur content (greater than 0.4 percent) resulted in NAG pH values between 2.3 and 2.6. These results further suggest that both acid generating and acid neutralizing material are present at the Mine.

Kinetic Testing

Kinetic, humidity cell testing is an accelerated weathering test. During the procedure, material is exposed to moist, oxygenated air which accelerates the weathering of sulfide minerals. The purpose is to gauge the extent that mine materials with uncertain acid generation potential (per ABA) can produce acidic drainage. On a weekly basis, the weathering solids are rinsed with water and the leachate is analyzed for its chemical constituents.

Kinetic testing was conducted over a 50-week period. A total of 18 non-ore samples, sufficient to characterize non-ore rock, were subjected to kinetic testing using humidity cell tests (HCTs) to further assess acid generating potential and weathering characteristics. The samples included 13 HCTs from the Rochester Formation, 4 HCTs from the Weaver Formation and one HCT using material that was not designated (Hydrogeo 2010). Samples selected for kinetic testing were conservatively selected to be representative of the materials with ABA values suggesting acid generating potential or uncertain reactivity.

As shown in **Table 3.7.3**, the final HCT pH values ranged from 3.3–8.7 with the majority of the pH values at test completion between 4.0 and 5.5 (Hydrogeo 2010). This is consistent with the negligible amount of neutralization potential of Mine materials and total sulfur values of the HCT samples which ranged from 0.13–2.54 percent. In contrast, the backfill has lower total sulfur content (0.05 percent) than the HCTs, and therefore is anticipated to have low potential for long-term acid generation (WMC 2009b).

Table 3.7.3: Summary of Humidity Test Results

Cell ID	Formation	Test duration	Total S (%)	Sulfide S (%)	NNP (T $CaCO_3$/KT)	ANP:AGP	Final pH (su)	Total S	NNP	ANP:AGP	Final HCT pH
6550 P2-29	Not designated	34 weeks	0.8	0.72	-1.4	1	4	PAG	Uncertain	Uncertain	PAG
95KC-1007	Rochester	52 weeks	1.59	0.75	-14.4	0.39	4.5	PAG	PAG	Uncertain	PAG
95KC-1008	Rochester	52 weeks	2.45	2.45	-73.5	0.04	4.5	PAG	PAG	PAG	PAG
95KC-1009	Rochester	24 weeks	0.53	0.26	9.8	2.2	6.6	PAG	Non-PAG	Non-PAG	Non-PAG
97-09-01	Rochester	23 weeks	1.03	0.8	-24.8	0.01	3.8	PAG	PAG	PAG	PAG
97-09-02	Rochester	23 weeks	0.85	0.44	-13.3	0.03	4.2	PAG	PAG	PAG	PAG
97-10-02	Rochester	23 weeks	2.54	1.63	-50.8	0	3.6	PAG	PAG	PAG	PAG
91-10-03	Rochester	23 weeks	1.75	1.14	-35.1	0.01	3.3	PAG	PAG	PAG	PAG
98GCM06	Rochester	37 weeks	0.23	0.2	-5.3	0.2	5.4	Non-PAG	Uncertain	Uncertain	Non-PAG
98GCM11	Rochester	23 weeks	0.39	0.34	-1.6	0.8	6.4	Non-PAG	Uncertain	Uncertain	Non-PAG
98GCM19	Rochester	37 weeks	0.2	0.01	1.7	6.4	5.1	Non-PAG	Non-PAG	Non-PAG	Non-PAG
98GCM52	Rochester	23 weeks	0.67	0.62	-16.4	0.2	3.5	PAG	PAG	Uncertain	PAG
98MM1002RT	Rochester	22 weeks	0.44	0.35	-10	0.1	4.1	PAG	Uncertain	Uncertain	PAG
RT-Waste (Q3)	Rochester	25 weeks	0.13	0.1	-1.4	0.6	8.7	Non-PAG	Uncertain	Uncertain	Non-PAG
96-2QTRW	Weaver	24 weeks	0.46	0.06	5.9	4.2	7.1	PAG	Non-PAG	Non-PAG	Non-PAG
98GCM14	Weaver	37 weeks	0.37	0.04	7.8	7.2	5.1	Non-PAG	Non-PAG	Non-PAG	Non-PAG
98GCM34	Weaver	37 weeks	0.72	0.1	-2.1	0.3	4	PAG	Uncertain	Uncertain	PAG
98GCM71	Weaver	23 weeks	0.15	0.15	1.3	1.3	6.9	Non-PAG	Non-PAG	Non-PAG	Non-PAG

Source: Hydrogeo 2010

Site-Specific Acid Generating Thresholds

The static test results were compared to HCT results in order to define site-specific criteria for identifying PAG versus non-PAG material during operations (Coeur 2009a). The resulting criteria were obtained by correlating final pH values from the HCTs with the corresponding NNP, ANP:AGP, and total sulfur concentrations as illustrated in **Figure 3.7.1**, **Figure 3.7.2**, and **Figure 3.7.3**, respectively. The correlation analysis demonstrated that HCTs with final pH values less than 5.0 were classified as PAG material, and cells with final pH values greater than 5.0 were considered non-PAG material (Coeur 2009a). In addition, samples with NNP greater than 0 T $CaCO_3$/kT were non-PAG, samples with NNP less than -10 T $CaCO_3$/kT were consistently PAG and samples with NNP between these values varied widely in acid generation/neutralization. Similarly, material with ANP:AGP above 1.0 were non-PAG based on humidity cell testing and material with ANP:AGP below 0.1 were PAG. The analysis also demonstrated that non-ore rock identified as PAG (pH < 5.0) contained at least 0.4 percent total sulfur. The site-specific criteria used to distinguish PAG from non-PAG material are summarized in **Table 3.7.4**.

Operational Geochemical Testing

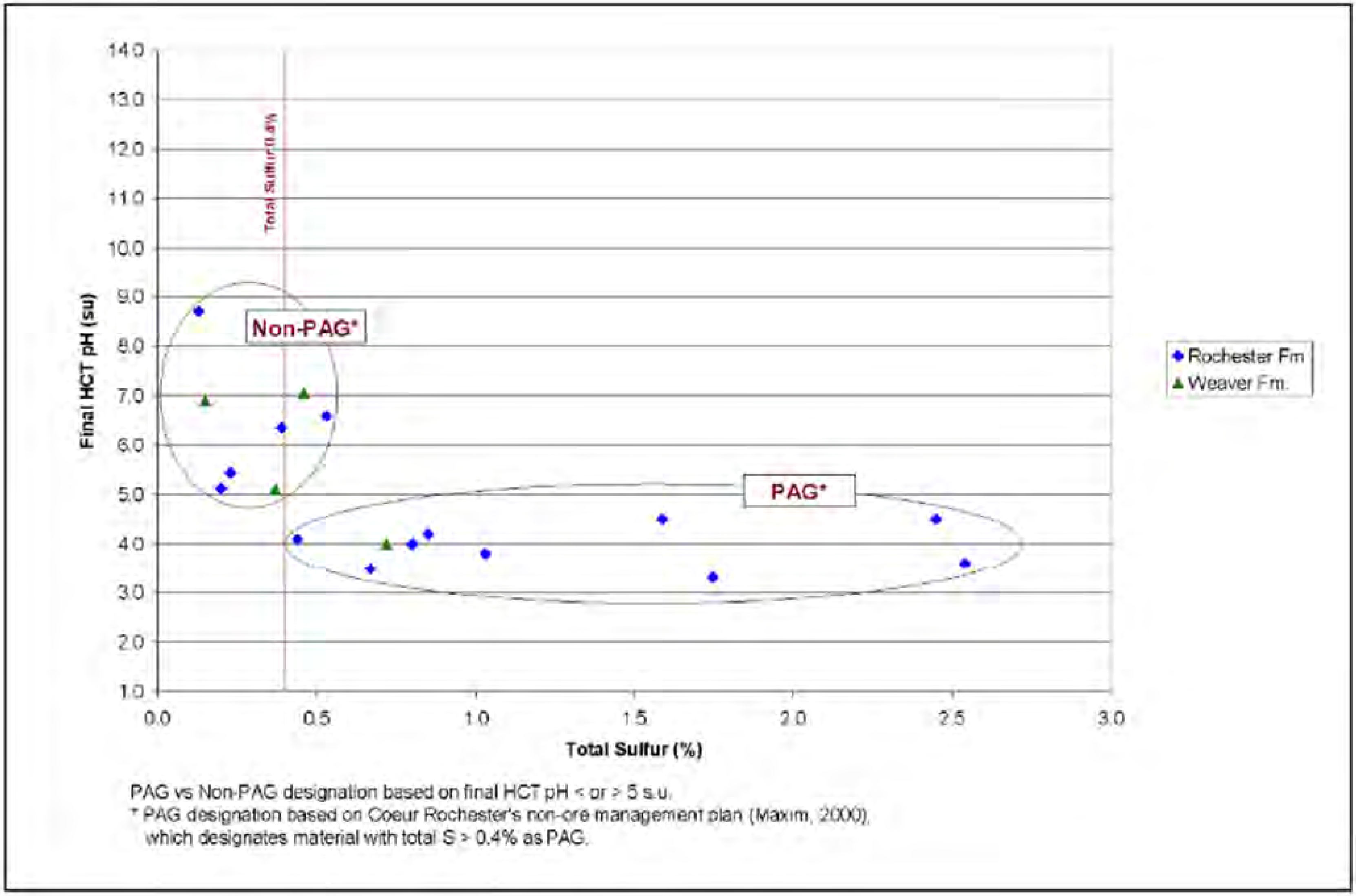
Between 2000 and 2007, Coeur collected ore and non-ore rock from one of every 10 blast holes (10 percent) in the Rochester Pit, and analyzed the material for total sulfur. If a sample analysis reported more than 0.4 percent total sulfur, the PAG criterion used during operations, then a visual inspection of the blast hole area to obtain a preliminary assessment of the extent of the PAG material was conducted and additional samples from adjacent blast holes were also analyzed. Visual inspection and testing was conducted on 8 percent of the blast hole samples. If the average total sulfur concentration in an area was greater than 0.4 percent, the material was selectively handled as PAG and encapsulated with non-PAG rock. A majority of the samples (71 percent) had low total sulfur (≤0.01 percent) and 92 percent of the samples were below the PAG criterion of 0.4 percent total sulfur. Operational geochemical testing indicated that approximately 3.7 percent of all samples tested were classified as PAG. In terms of the entirety of mined material, less than one percent of the ore, waste rock and run-of-mine low grade ore from the Rochester Pit were classified as PAG material (**Table 3.7.5**).

Backfill Geochemical Characterization

Under alternatives B–D, approximately 5.25 million tons of non-PAG development rock would be placed in the pit as backfill below the ultimate water level (WMC 2009b). An additional 4 million tons of non-PAG rock would be placed in the pit as material for the buttress, which would be above the water table. Total sulfur of the backfill would be less than 0.4 percent based on the same selective handling criterion used during mining.

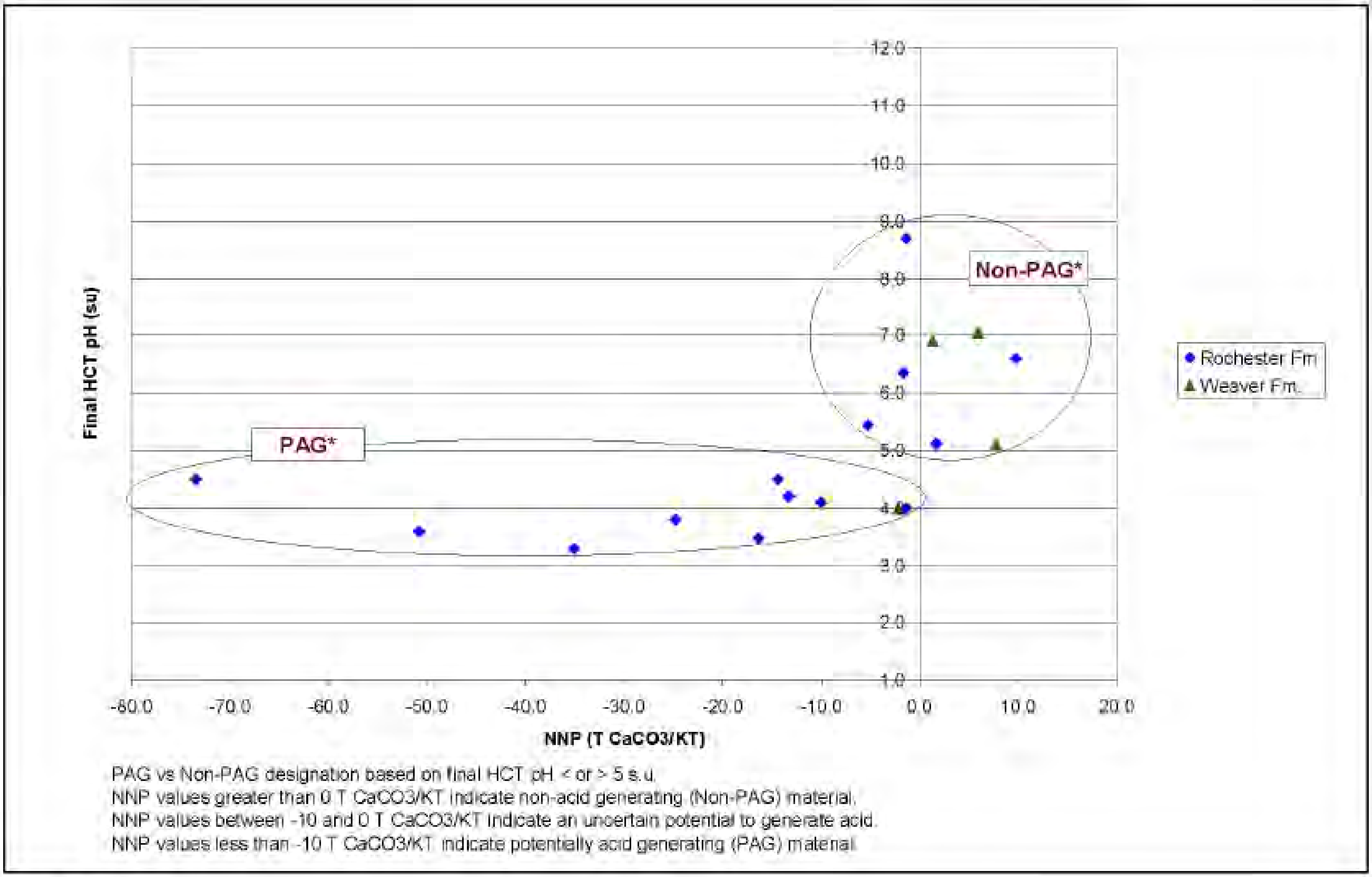
The acid generating capacity of a 132-sample subset from **Table 3.7.2** that was considered non-PAG based on the 0.4 percent total sulfur cutoff is summarized in **Table 3.7.3**. Of these backfill samples, 17 percent had an ANP:AGP < 3 and would require amendment to achieve this ratio. Six of the 18 non-ore HCTs were conducted on non-PAG rock including 4 samples of Rochester Formation and 2 samples of Weaver Formation with ANP:AGP ratios lower than the average of 8.2 determined by ABA. Despite low ANP:AGP values none of these samples went acid and all HCT results corroborate the criterion used to identify non-PAG material.

Figure 3.7.1: Comparison of Final Humidity Cell Test pH and Total Sulfur Content



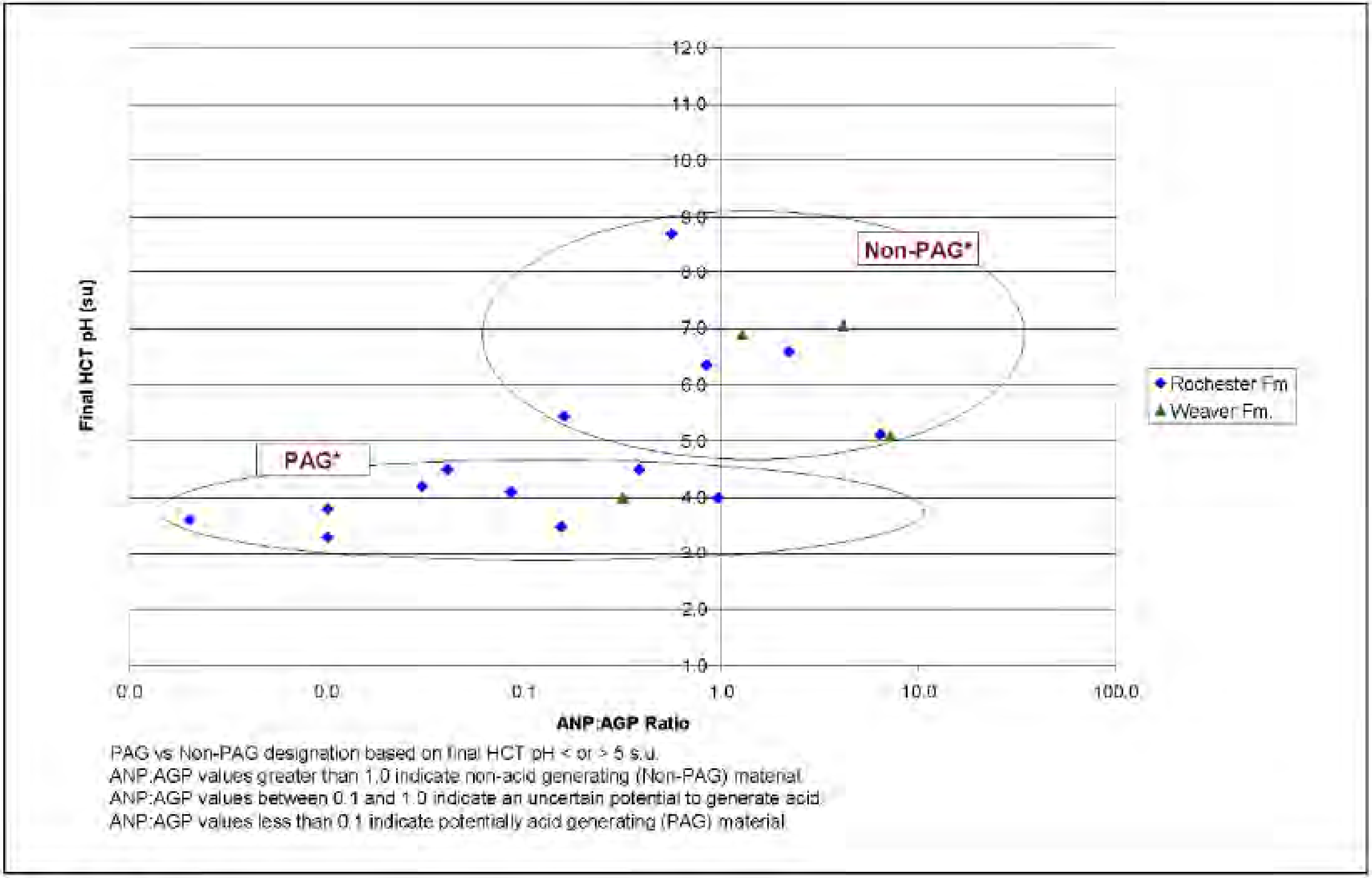
Source: Hydrogeo 2010

Figure 3.7.2: Comparison of Final Humidity Cell Test pH and Net Neutralizing Potential



Source: Hydrogeo 2010

Figure 3.7.3: Comparison of Final Humidity Cell Test pH and Neutralizing Potential to Acid Generating Potential Ratio



Source: Hydrogeo 2010

Table 3.7.4: Site-Specific Criteria Summary for Identifying PAG Material

Parameter	PAG	Non-PAG
HCT pH	< 5	≥5
Total Sulfur	≥ 0.4%	<0.4%
NNP [(1)]	< -10 T $CaCO_3$/kT	> 0 T $CaCO_3$/kT
(1) Samples with NNP values between the PAG and non-PAG criteria are considered to have uncertain acid generating character.		

Table 3.7.5: Distribution Summary of PAG and Non-PAG Material from the Rochester Pit

Criteria	Rochester Formation		Weaver Formation		Total	
	kT	%	kT	%	kT	%
PAG (ST ≥ 0.4%)	2,191	0.61	116	0.03	2,307	0.64
Non-PAG (ST < 0.4%)	201,040	55.9	156,396	43.5	357,436	99.4
Total	**203.231**	**56.5**	**156,512**	**43.5**	**359,743**	**100.0**
ST = Total Sulfur; kT = 1000 tons Source: Hydrogeo 2010 after Coeur 2009a						

Table 3.7.6: Summary of Backfill Acid-base Accounting Results

DATA	Total S (%)	Sulfide S (%)	NNP (T $CaCO_3$/kT)	ANP:AGP (T $CaCO_3$/kT)
Minimum	0.01	0.01	-5.75	0.03
Maximum	0.39	0.34	8.69	28.80
Average	0.06	0.03	2.26	8.26
Source: WMC 2009b				

Table 3.7.7: Pit Wall Surface Areas by Lithology for Current Pit

Lithology	Surface Area (ft^2)	Relative Proportion of Area (%)
Rochester Formation	94,587,835	65.93
Weaver Formation	48,814,140	34.03
Sulfides	57,719	0.04
Total	**143,459,694**	**100.00**
Source: WMC 2009b		

Pit Wall Geochemistry

Table 3.7.7 summarizes the exposed surface areas of the 3 lithologies and the relative percentage of each area based on the current geologic block model and in-pit mapping (WMC 2009b). The pit wall rock is comprised of approximately 66 percent Rochester Formation and 34 percent Weaver Formation. Discrete zones of exposed PAG sulfide rock account for approximately 58,000 ft^2 or about 0.04 percent of the pit wall area. The existing pit lake located adjacent to exposed sulfide in the lower bench of the pit contains acidic water with high metal and sulfate concentrations as explained in the Rochester Pit Lake Water Quality discussion in Section 3.7.2.6.

3.7.2 Surface Water

Description of the surface water environment of the project area is based primarily on Hydro-Geo Consultants, Inc. (Hydrogeo), who compiled hydrologic data from baseline and previous studies in February 2010.

3.7.2.1 Surface Water Hydrology

Precipitation and snow melt generate surface water within the project area. Such surface water is seasonal and found only in isolated springs, wetlands, and in ephemeral drainages (**Figure 3.7.5**).

3.7.2.2 Meteorology

Most precipitation in the area falls during the spring and winter (December through May). Annual precipitation is estimated to be 13.41 inches for the project area based on data from the Mine. The temperature for the project area is estimated to average 50.2°F. Open-air evaporation at the Mine is approximately 37.5 inches per year (SWS 2010a).

3.7.2.3 Surface Water Drainages, Diversions, and Springs

The surface water flow is seasonal with most occurring between December and May. The flow originates from springs, seeps, or from sustained periods of heavy precipitation and spring season runoff. Runoff collects and flows downward in channels off the mountain ranges. The surface flow and natural sediments rarely reach perennial drainages (e.g., Humboldt River and Carson Sink) in adjacent graben basins, as it typically infiltrates into unconsolidated sediment near the range front. Such infiltration recharges ground water beneath the Lovelock Valley/Oreana Sub-Area of the Humboldt River basin, Buena Vista Valley, and the Carson Desert/Packard Valley hydrographic areas.

The Mine is located near the divide between the three state of Nevada hydrographic areas (**Figure 3.7.4**). The Mine occurs in the very upper reaches of, and is relatively minor in size compared to the basins. Seven prominent ephemeral drainage channels occur within the very upper reaches of these basins. The American and South American Canyons drain eastward within the Buena Vista Valley basin from elevations between 7,786 feet amsl and 4,025 feet amsl. Drainage collects in the Lovelock Valley basin through Limerick and Rochester Canyons from between 7,284 feet amsl and 4,180 feet amsl and flows towards the Humboldt River. Weaver Canyon, Packard Wash, and Woody Canyon drain southwest from within the Carson Desert/Packard Valley basin between 7,284 and 4,960 feet amsl.

Diversion channels and associated stormwater management ponds have been constructed to control surface water flows that would result from a 100-year, 24-hour precipitation event. The Rochester Pit is separated from the Stage I and Stage II heap leach facilities by such a channel. Another channel extends from east of the office facility complex (north of Stage I) northward to the Stage IV area where it runs northeasterly to the head of American Canyon. These channels divert clean surface water runoff from contact with Mine facilities and re-route the water to downstream discharge points within the same drainage basins. Water management ponds provide storage capacity during emergency and storm conditions. Two pregnant solution ponds and a barren solution pond are also present that currently provide emergency water storage.

Two small year-round springs flow in the project area (**Figure 3.7.5**). American Canyon Spring and South American Canyon Spring each flow an estimated 1 to 2 gpm from alluvial sediments. The springs are thought to be associated with perched aquifers (Hydrogeo 2010). The flow quickly evaporates or infiltrates into shallow sediments. Historically, several other springs occurred in the project area, all of which no longer flow as surface water diversions have reduced recharge of ground water to the alluvium in the Mine area.

Surface Water at Heap Leach Pads

Historically, a wetland area of approximately 4.98 acres occurred beneath the north dike area of the Stage I pad (Hydrogeo 2010). Other small springs also existed at the site, but have been covered by the Stage IV Heap Leach Facility. Flow from these historic springs is captured by pad underdrain systems.

Two additional seep areas are located on the west side of the Sage Hen Flat above the Stage IV Heap Leach Facility (**Figure 3.7.5**). Flows from these seeps are very low (<1 gpm) and seasonal.

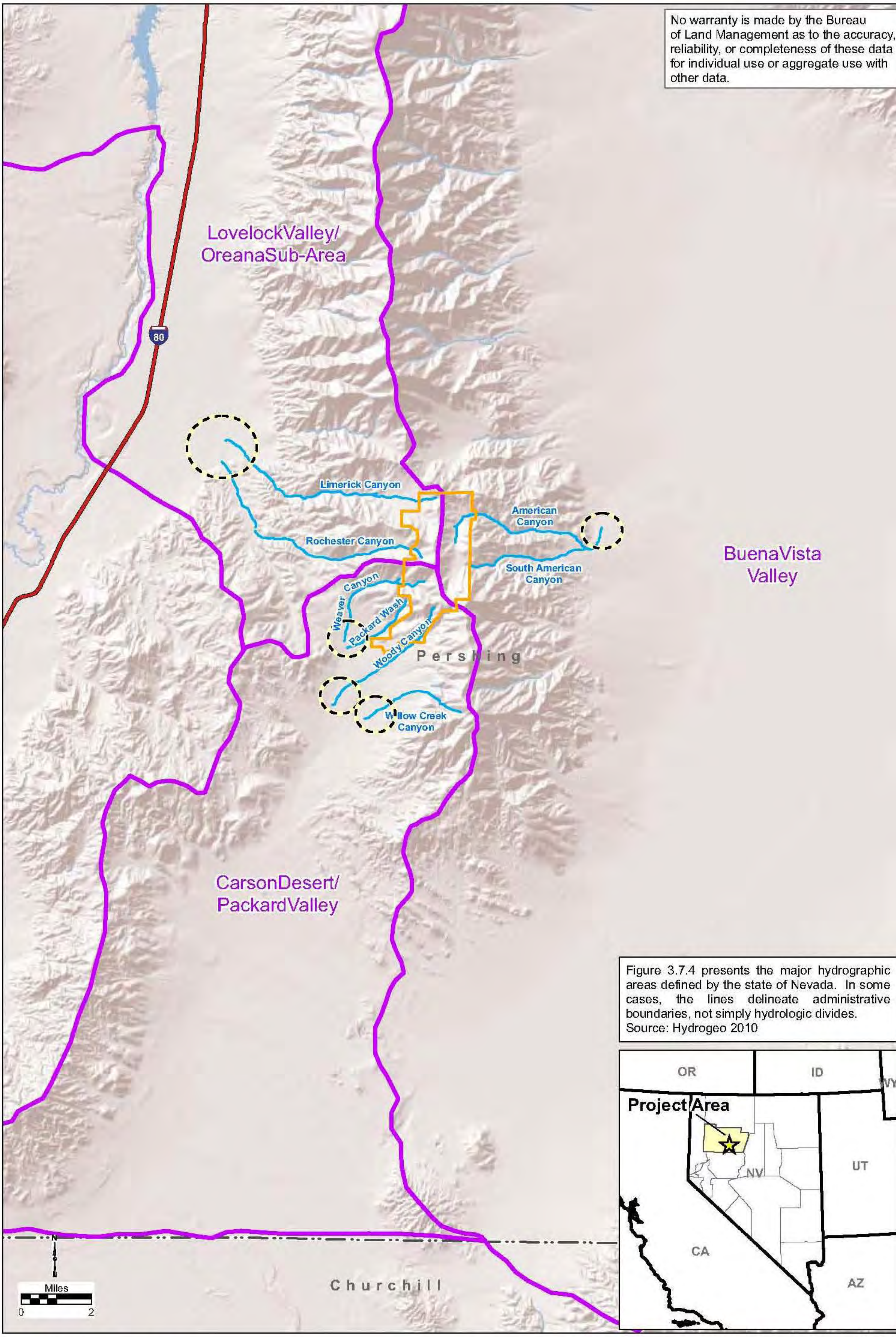
Rochester Pit Lake

A lake has developed in the Rochester Pit since the cessation of mining in 2007 (Hydrogeo 2010). The pit lake has formed through inflow of ground water and collection of surface water runoff and precipitation. As of February 2010, the pit lake water level was at 5,997 feet amsl. It currently is about 25 feet deep and covers an area of approximately 2 to 3 acres.

3.7.2.4 Surface Water Quality

Surface water samples have been collected historically from springs and the pit lake. No samples have been collected from surface drainages due to their ephemeral nature both on-site and in the surrounding catchment areas. Pre-mining surface water quality data are not available for the project area.

Water quality was compared to applicable water quality standards including the national primary and secondary MCLs and the NRVs which are secondary standards for public water systems.



NATIONAL SYSTEM OF PUBLIC LANDS

WINNEMUCCA DISTRICT OFFICE

Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, Nevada 89445

Legend

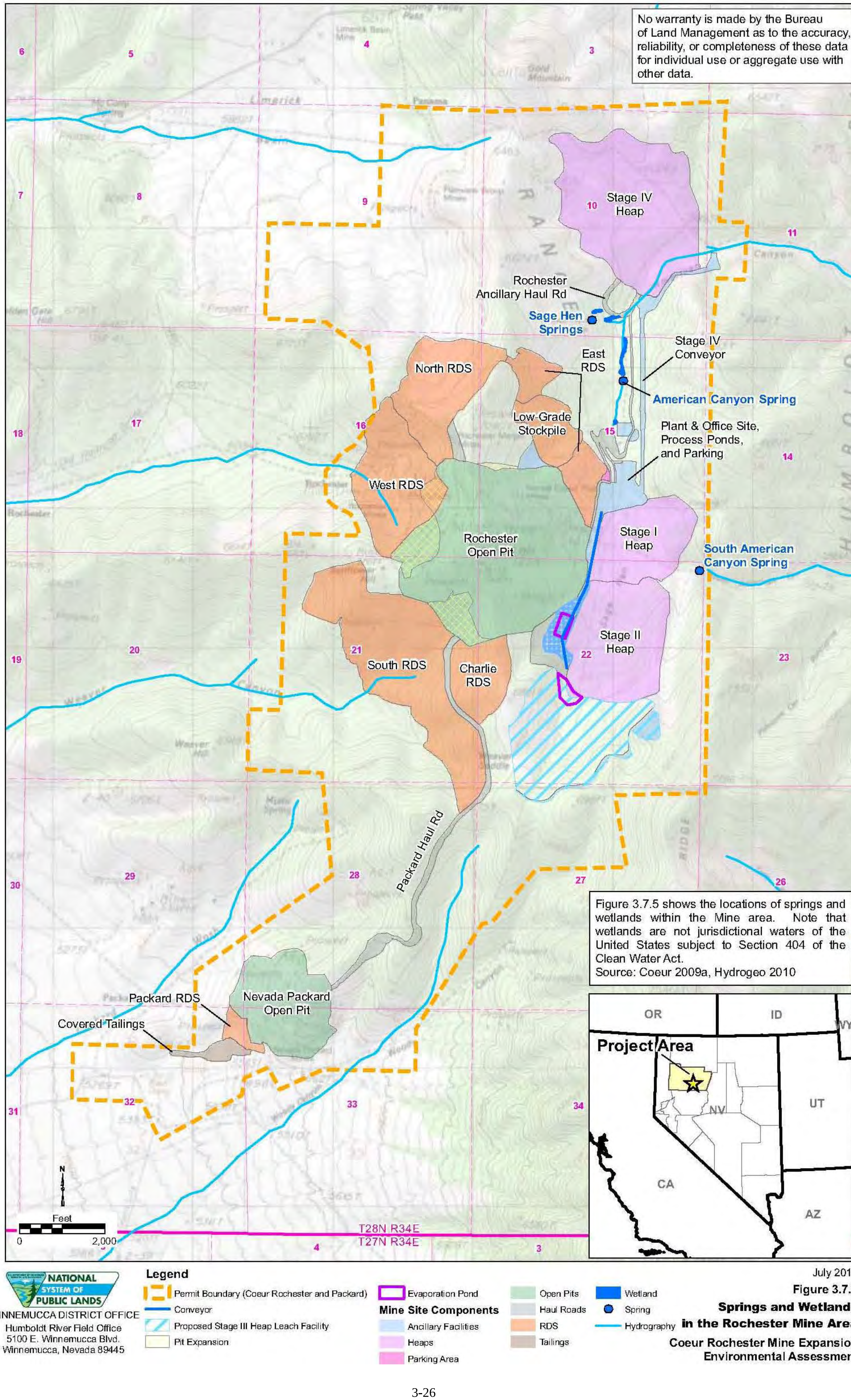
- Permit Boundary (Coeur Rochester and Packard)
- Hydrography
- Nevada Hydrographic Basins
- Infiltration Zones
- Interstate Highway
- County Boundary

July 2010

Figure 3.7.4

Hydrographic Areas

Coeur Rochester Mine Expansion Environmental Assessment



NATIONAL SYSTEM OF PUBLIC LANDS
WINNEMUCCA DISTRICT OFFICE
Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, Nevada 89445

July 2010

Figure 3.7.5
Springs and Wetlands in the Rochester Mine Area
Coeur Rochester Mine Expansion Environmental Assessment

3.7.2.5 Spring Water Quality

Spring water quality is monitored at American Canyon Spring and South American Canyon Spring. The period of record for water quality data collection at American Canyon Spring is November 1993 through November 2009 and May 2003 through November 2009 for South American Canyon Spring.

South American Canyon Spring water is generally suitable for human consumption with moderate levels of TDS (220–400 mg/L), near neutral pH (6.52–8.25), and low levels of most trace constituents. Aluminum, arsenic, and mercury were slightly elevated above the MCLs and NRVs during separate solitary sampling events, and manganese was elevated on 2 occasions.

In contrast to South American Canyon Spring, water at American Canyon Spring is of poor quality and is generally not safe for human consumption but considered acceptable for livestock and wildlife. The water contains moderate to high TDS (150–1,030 mg/L), slightly alkaline pH (6.8–8.53), and moderate to high levels of trace constituents.

The American Canyon Spring water quality data suggests slight rising trends in the concentrations of chloride, nitrate, TDS, and selenium over the period of record. Of these constituents, the average nitrate concentration of 22.3 mg/L was elevated above the regulatory standard (10 mg/L) whereas TDS was greater than the 1000 mg/L standard during one sampling event. Arsenic was elevated above the NRV of 0.01 mg/L in 88 percent of the American Canyon Spring samples collected over the period of record. Other constituents exceeded the respective water quality standards during one or more sampling events including cadmium, lead, manganese, mercury, and pH but increasing concentration trends have not been identified.

Coeur recently completed a Corrective Action Plan (CAP) (Hydrogeo 2010a) required by NDEP for elevated constituent concentrations, particularly chloride, nitrate, and TDS in the groundwater north and downgradient of the process facilities area at ground water monitoring well MW-30. Well MW-30 is directly upgradient of America Canyon Spring. The CAP assessed whether the source(s) of the elevated constituents concentrations was related to the current mining operations or from impacted soils resultant from historic releases. The CAP study (Hydrogeo 2010a and 2010b) concluded, and NDEP agreed (NDEP 2010a and 2010b), that the elevated constituent concentrations in the area of MW-30 are from historic releases from the mine’s process facilities and that the primary contaminant sources have been eliminated. The CAP study also concluded that elevated nitrates in the area below the process facilities including American Canyon Spring are likely the result of the mine’s septic system leach fields and not from the process facilities. The nitrate concentrations at American Canyon Spring are within the standard operating levels of a septic system leach field that typically range from 20 to 60 mg/l (EnviroData Solutions 1998). NDEP comments on the CAP Phase I Report did not specify any corrective actions needed for the Rochester septic system/leach field. (NDEP 2010a)

NDEP recommended collection of additional monitoring data in MW-30 to determine if any remedial action is warranted. Coeur will submit an additional CAP report to NDEP in January, 2011.

3.7.2.6 Rochester Pit Lake Water Quality

The Rochester Pit lake water is of poor quality and is not suitable for human consumption based on MCL and NRV exceedances observed for numerous parameters in the 2 years of monitoring data collected from April 2007 to April 2009 (**Table 3.7.8**). The water quality in the pit lake is characterized by low pH and high trace metals and sulfate resulting from acid rock drainage derived from the direct contact of water reporting to the sump at the bottom of the lake with a small sulfide exposure (primarily pyrite, FeS_2) near the pit bottom. Although net acid-generating rocks in the Rochester Pit are sparse occurrence of sulfides immediately adjacent to the pit sump appears to have resulted in immediate and efficient transfer of chemical mass to accumulating water. These sulfide minerals have now been covered with water due to the rising pit lake elevation. Monitoring of groundwater quality in pit area wells TH 1-3 (**Table 3.7.15**) indicates variable water quality. The water quality in TH-1 and TH-2 is generally better than the pit lake water quality, while TH-3 generally shows poorer water quality than the pit lake.

3.7.3 Ground Water

Numerous groundwater studies have historically been conducted at the Mine site as documented by Hydrogeo (2010c). These studies include geotechnical investigations, groundwater characterizations and monitoring, heap leach pad development, water supply, and development of corrective action plans. Hydrogeo (2010c) recently developed a comprehensive hydrogeologic and geochemical technical report summarizing background information and up-dated data to support POA No. 8.

In addition to the recent work of Hydrogeo (2010c), Schlumberger Water Services (SWS) (2010a), prepared a groundwater quantity and quality analysis of the project area. The SWS study includes a description of the site conceptual hydrogeology as the basis for a numerical groundwater model. The numerical model predicts hydrogeologic and groundwater quality impacts from proposed Mine activities under the various alternatives. The Hydrogeo (2010c) and SWS (2010a) studies form the primary basis for description of the ground water affected environment for the project area.

The conceptual model area selected for the current study includes the Rochester Pit, Sage Hen Flat, South American Canyon, and American Canyon. The conceptual model area is located completely in the Buena Vista Valley hydrographic basin. This includes the western part of the open pit, under pre-mine conditions, which was part of the Humboldt River Valley hydrographic basin. The western portion of the Rochester Pit is assumed to report to the pit lake through the near-surface increased hydraulic conductivity zone in the pit shell created by mining activities.

The conceptual model area is bounded by the Humboldt River Valley hydrographic basin to the west and the Carson Sink to the south. Key locations in the conceptual model area include the Rochester Pit and the BRF.

Table 3.7.8: Summary of Existing Groundwater Quality Data for the Pit Lake

Analyte	Units	EPA MCL or NRV (1,2)	% BDL (6)	MAX (5)	MIN (5)	AVG (3,5)
Alkalinity	mg/L		28%	70	BDL	20.2
Aluminum	mg/L	0.2	21%	8.6	BDL	1.63
Antimony	mg/L	0.006	76%	0.0108	BDL	0.0027
Arsenic	mg/L	0.01	59%	0.029	BDL	0.006
Barium	mg/L	2	0%	0.159	0.01	0.04
Beryllium	mg/L	0.004	74%	0.0033	BDL	0.0011
Bicarbonate	mg/L		28%	86	BDL	21.8
Boron	mg/L		3%	0.24	BDL	0.16
Cadmium	mg/L	0.005	3%	1.6	BDL	0.67
Calcium	mg/L		0%	209	0.927	101
Chloride	mg/L	400	0%	340	1.24	54
Chromium	mg/L		71%	0.007	BDL	0.0037
Copper	mg/L	1.0	3%	6.1	BDL	1.44
Fluoride	mg/L	4.0 (2.0)	4%	5.9	BDL	0.89
Iron	mg/L	0.6	18%	16	BDL	1.37
Lead	mg/L	0.015	32%	0.34	BDL	0.08
Magnesium	mg/L	150	0%	21.7	0.347	14.8
Manganese	mg/L	0.1	0%	0.65	0.0246	0.29
Mercury	mg/L	0.002	62%	0.0097	BDL	0.0007
Nickel	mg/L		26%	0.071	BDL	0.029
Nitrate (4)	mg/L	10	4%	35.5	BDL	10.4
pH	su	6.5-8.5	0%	8.28	3.39	5.57
Potassium	mg/L		0%	24	3.58	17.2
Selenium	mg/L	0.05	6%	0.0882	BDL	0.0304
Silver	mg/L	0.1	91%	0.024	BDL	0.003
Sodium	mg/L		0%	72	1.14	54.6
Sulfate	mg/L	500	0%	660	3.01	319
Thallium	mg/L	0.002	6%	0.073	BDL	0.008
TDS	mg/L	1000	0%	1110	200	599
Zinc	mg/L	5	0%	17	0.022	6.0

Source: April 2007 to April 2009 data adapted from Coeur Rochester Hydrologic Monitoring Database (Coeur 2009b)
(1) National primary drinking water standards are legally enforceable standards that apply to public water systems. The MCL is the highest level of a contaminant allowed in drinking water.
(2) National secondary drinking water standards. These are non-enforceable guidelines regulating contaminants that my cause cosmetic or aesthetic effects in drinking water (EPA 2009). Secondary standards listed are for Nevada per NAC 445A.455 for public water systems http://www.leg.state.nv.us/NAC/NAC-445A.html#NAC445ASec455.
(3) Average values were calculated using actual value or ½ of detection limit for non-detect values unless all values are below detection limit.
(4) Nitrate value is NO_3 as N, NO_3, or NO_3+NO_2.
(5) Shaded cells indicate exceedance of EPA primary or Nevada secondary drinking water standard.
(6) BDL: Below lab detection limits
(Hydrogeo 2010)

3.7.3.1 Geologic Controls

Unconsolidated sediments overlie bedrock which locally out-crops to the surface. The sediments fill a south-plunging trough beneath the Stage I Heap Leach Facility. Locally, they reach 150 feet in depth within ephemeral drainage channels. Silt and clay are abundant with less sand and gravel occurring in discontinuous lenses (Telesto 2007).

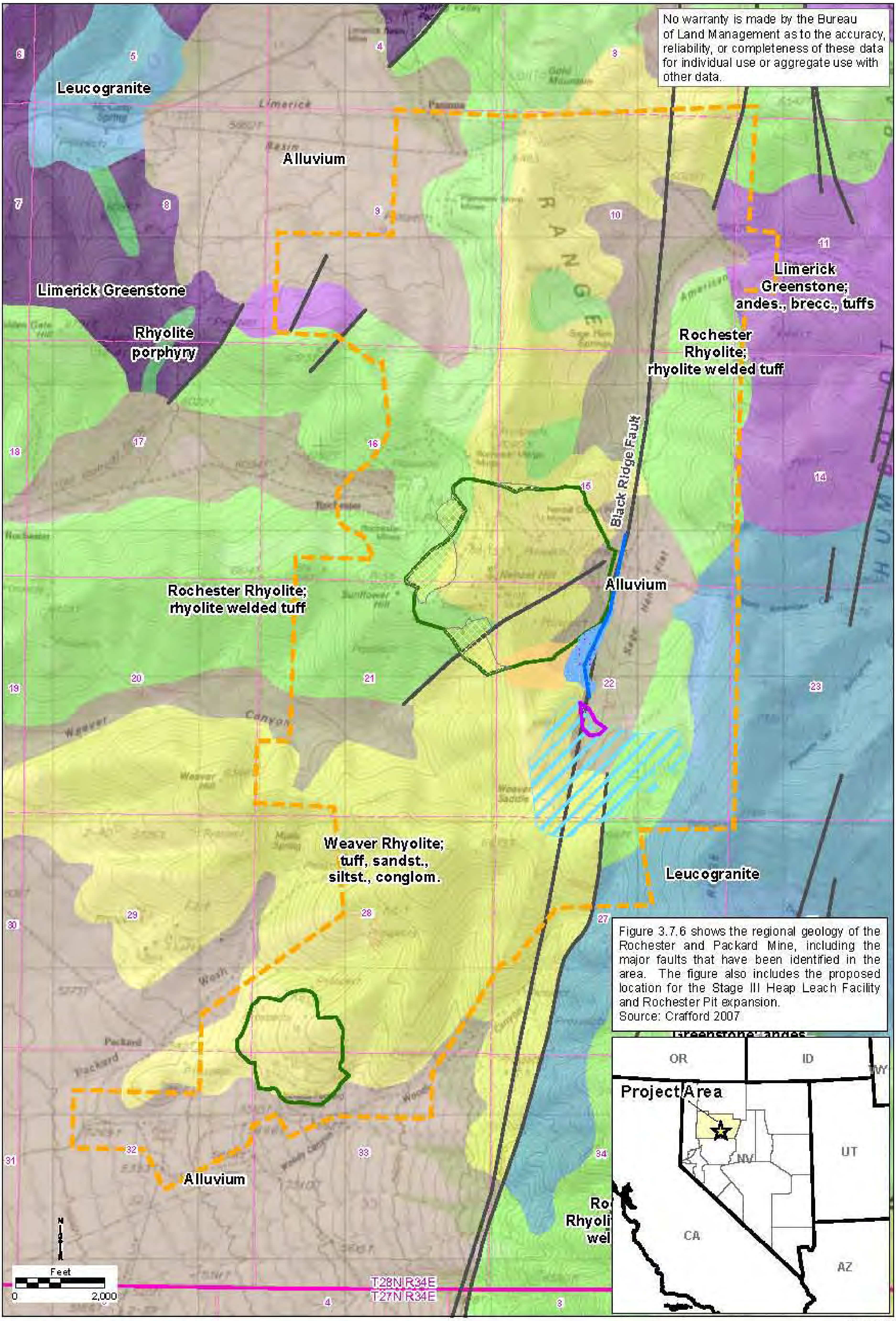
Bedrock is primarily volcanic in origin and consists of the Rochester and Weaver formations (**Figure 3.7.6**). The Rochester Formation is up to 2,000 feet thick within the Mine area and is dominated by rhyolitic tuffs. The tuffs are vertically layered by variation in texture (breccia, ash, clastics). This layering imparts control on the distribution and flow of ground water.

The Weaver Formation overlies the Rochester and is up to 850 feet thick in the Mine area. The Weaver is also dominated by rhyolite and includes crystal, rock fragment, and clastic-rich variations. As with the Rochester, layering from textural variations results in contrasting properties with respect to groundwater distribution and flow.

At least 2 episodes of compression and one of major extension in the Great Basin have deformed the bedrock at Rochester. Deformation of the rocks has impacted the site hydrogeology through formation of zones of brittle fracture and development of discrete faults. The most prominent rock deformation occurs as north-south trending faults. The BRF is the most distinct and occurs as a steep zone up to 200 feet wide (**Figure 3.7.6**). Other less distinct, steeply dipping north-south and east-west trending faults are also present.

The density of fractures varies generally by rock type within the project area. Fractures are poorly developed in the upper part of the Weaver Formation, but are well developed in the lower part and in the underlying Rochester Formation (**Figure 3.7.7** and **Figure 3.7.8**). The fractures form a complex intersecting array of broken rock. In addition, fractures are prominent within 50–100 feet of the Rochester Pit floor (Hydrogeo 2010) caused by blasting and geostatic rebound.

The geologic development at Rochester resulted in rocks with variation in permeability to ground water. Fractures are of major importance as they are features with potential to store water or within which ground water may move from bedrock ranges towards the adjacent valleys.



NATIONAL SYSTEM OF PUBLIC LANDS

WINNEMUCCA DISTRICT OFFICE
Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, Nevada 89445

Legend

- Proposed Stage III Heap Leach Facility
- Pit Expansion
- Evaporation Pond
- Conveyor
- Conveyor Corridor
- Permit Boundary (Coeur Rochester and Packard)
- Pit Boundary
- Faults

Nevada Geology

- Alluvium
- Leucogranite
- Limerick Greenstone
- Limerick Greenstone; andes., brecc., tuffs
- Rhyolite porphyry
- Rochester Rhyolite; rhyolite welded tuff
- Weaver Rhyolite; tuff, sandst., siltst., conglom.
- Weaver Ash

July 2010

Figure 3.7.6

Geologic Map of the Rochester Mine Area

Coeur Rochester Mine Expansion Environmental Assessment

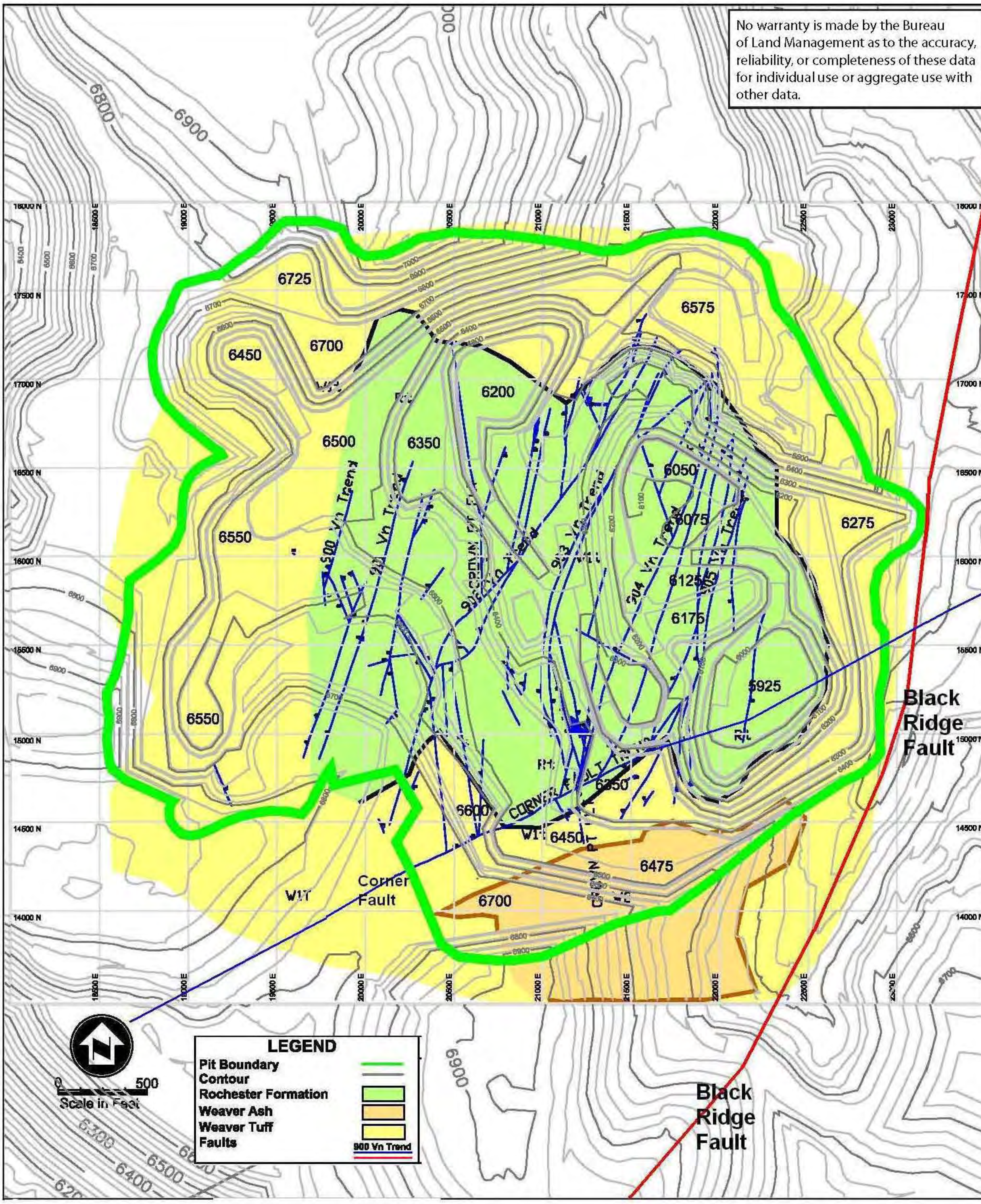


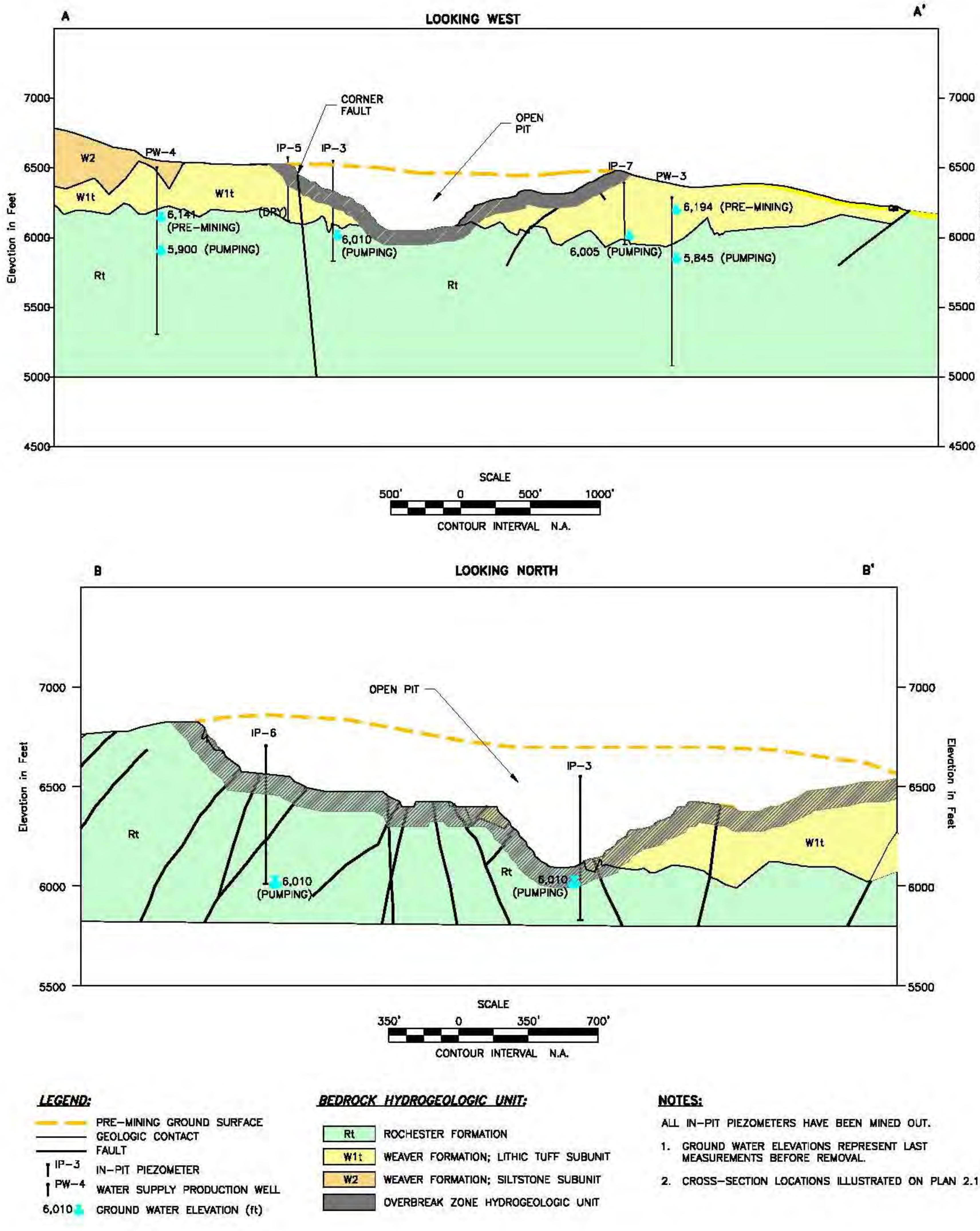
Figure 3.7.7 depicts the topography and geology of the Rochester Pit, including the Black Ridge Fault and the numerous small faults within the bottom of the pit.
Source: Hydrogeo 2010

NATIONAL SYSTEM OF PUBLIC LANDS
WINNEMUCCA DISTRICT OFFICE
Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, Nevada 89445

July 2010

Figure 3.7.7

Geology of the Rochester Pit
Coeur Rochester Mine Expansion Environmental Assessment



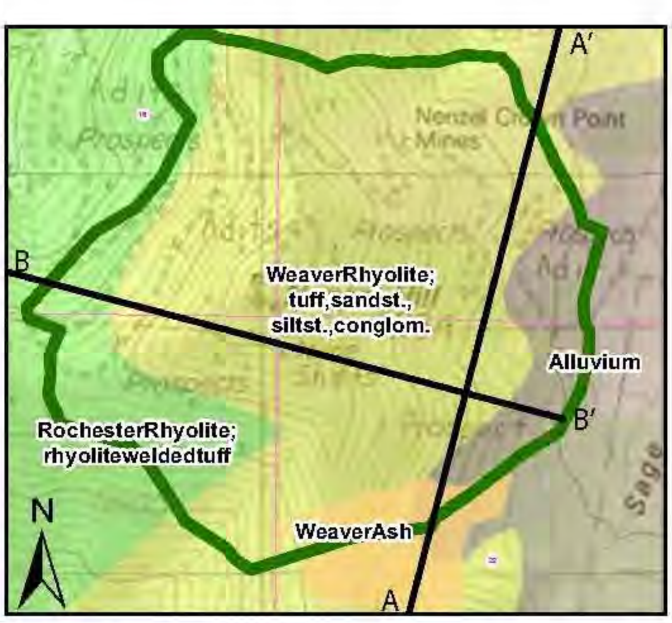
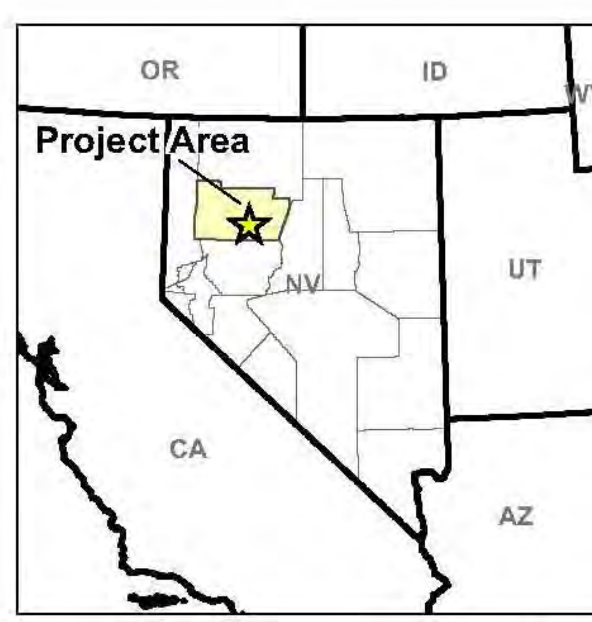


Figure 3.7.8 shows the hydrogeologic cross sections through the Rochester Pit including the small faults in the pit bottom. Source: SWS 2010a

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



NATIONAL SYSTEM OF PUBLIC LANDS

WINNEMUCCA DISTRICT OFFICE
Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, Nevada 89445

July 2010

Figure 3.7.8

Geologic Cross Sections Through the Rochester Pit

Coeur Rochester Mine Expansion
Environmental Assessment

Left Blank Intentionally

3.7.3.2 Ground Water Distribution

Hydrogeo (2010c) and SWS (2010a) describe ground water occurrence in 4 hydrogeologic units. These units reflect permeability variation within sediments and underlying bedrock, and include the following.

<u>Shallow Alluvium</u>
This comprises laterally discontinuous unconsolidated sediments. Depth to ground water varies in the shallow alluvium due to local aquifers that are isolated (i.e., perched) within unsaturated sediment. The ability of the sediments to permit groundwater flow (hydraulic conductivity) has been estimated from pumping tests in 10 monitoring wells (**Table 3.7.9**) and is characterized as low.

Beneath the Stage I Heap Leach Facility, discontinuous perched ground water occurs within sandy silt and interbedded gravel and cobble lenses. The water bodies are not necessarily connected (Telesto 2007). Most of the perched water flows horizontally, but a minor component of flow is downward into the unsaturated portion of the underlying bedrock unit.

Leakage from the Stage I Heap Leach Facility and from a barren solution pipeline in 2005 associated with Stage II seeped downward and mixed with perched and bedrock ground water (Telesto 2007). The seepage is collected in a pump-back collection system which has locally lowered the ground water level near the Mine process facilities. The pumping draws in shallow ground water allowing it to be captured for management.

<u>Bedrock Unit</u>
The bedrock hydrogeologic unit extends within the Rochester and Weaver formations (**Figure 3.7.6**) across the entire project area except for the BRF zone and the immediate vicinity of the Rochester Pit. Ground water occurs primarily within interconnected fractures in the rock. The overall hydraulic conductivity is considered relatively low and is estimated based on pump testing of 10 wells (**Table 3.7.9**).

<u>Fault Zone Flow Conduits</u>
SWS (2010a) defines a third hydrostratigraphic unit based on ground water occurrence within the BRF and other structures. The BRF is relatively fractured, and ground water occurs within perched and semi-perched zones. Based on historic pumping and aquifer testing (from 6 production wells) and on records of 3 monitoring wells, the BRF is considered the main groundwater drainage artery through the project area. Fault zones in American and South American Canyons also act as flow conduits. Hydraulic conductivity is relatively high (0.5–43 feet/day) within this unit compared to the bedrock unit (**Table 3.7.9**).

The BRF is particularly important as it compartmentalizes and separates ground water in the vicinity of the Rochester Pit to the west, from that beneath the heap leach facilities to the east and southeast. Ground water flows from the bedrock aquifer beneath the pads into the BRF where it is transmitted away from the pit. The BRF is also important as the source of ground water supply produced in wells supporting the operation.

Table 3.7.9: Rochester Area Permeability Test Results

Hydraulic Conductivity				
Unit	**No. Wells**	**Minimum**	**Maximum**	**Geometric Mean**
Shallow Alluvium	13	3.4 x 10^{-7} cm/sec 9.6 x 10^{-4} feet/day	1.3x10^{-2} cm/sec 37 feet/day	2.2x10^{-5} cm/sec 8.0x10^{-2} feet/day
Bedrock	10	1.2x10^{-7} cm/sec 3.4x10^{-4} feet/day	2.6x10^{-3} cm/sec 7.4 feet/day	1.8x10-5 cm/sec 5.2x10^{-2} ft/day
BRF	5	1.9x10^{-4} cm/sec 5.4x10^{-1} feet/day	1.5x10^{-2} cm/sec 43 feet/day	1.7x10^{-3} cm/sec 4.8 feet/day
Pit Overbreak Zone	1	3.7x10^{-4} cm/sec (measured in a single monitoring well TH-3)		

Rochester Pit Overbreak Zone

The Rochester Pit area is intersected by numerous natural fractures and faults (Hydrogeo 2010) which generally parallel the BRF (**Figure 3.7.7**). In addition, blasting during pit development has created a zone of highly fractured rock (**Figure 3.7.8**) within the Rochester and Weaver formations extending approximately 50 to over 100 feet below the pit floor and peripheral to the pit walls (Hydrogeo 2010).

Rochester Pit Lake

Groundwater flow towards the Rochester Pit has, in part, been responsible for slow development of the pit lake since cessation of mining in 2007. It is probable that local infiltration also contributes to the pit lake, as evidenced by the seasonal rise (mostly occurring from March to July). The pit penetrated the groundwater table by approximately 225 feet through mining. Specific dewatering wells were not required for mining operations; drawdown may have been driven by water supply pumping in the adjacent sections of the BRF.

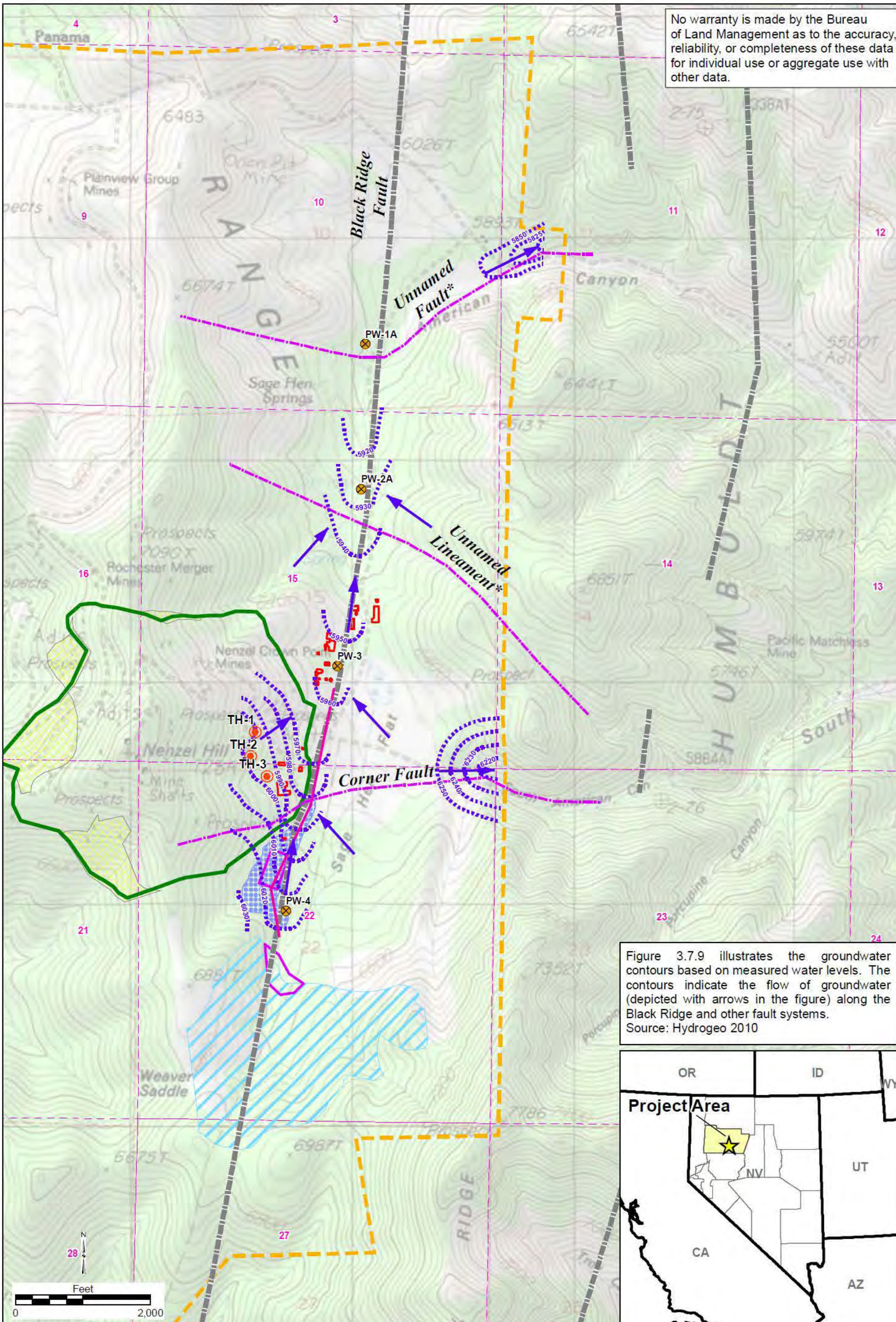
3.7.3.3 Potentiometric Surface Location and Groundwater Flow Directions

Groundwater elevation data from 2009 (year-end) are primarily from the BRF zone. Less data exist from the American Canyon and South American Canyon shallow alluvium.

Contours of the water table elevation data indicate that present groundwater flow is generally northward and focused within the BRF zone (**Figure 3.7.9**). The ground water generally mirrors topography and flows towards the BRF or towards American or South American Canyon. Ground water then flows within the conduits outward from the project area.

Ground water levels within the vicinity of the Rochester Pit Overbreak Zone are currently relatively flat; within 3 wells (TH-1, TH-2, and TH-3) in the pit (**Figure 3.7.9**), levels are within 0.4 feet elevation over 800 feet of map separation. This suggests that the water bearing fractures are hydraulically well connected. The Overbreak Zone appears to drain ground water from the surrounding Bedrock Zone hydrogeologic unit (SWS 2010a).

Ground water levels are currently recovering slowly within the Rochester Pit (Hydrogeo 2010). Ground water flow directions immediately peripheral to the pit are currently towards the pit lake.



Legend

- Permit Boundary (Couer Rochester and Packard)
- Open Pit Limits
- Conveyor
- Conveyor Corridor
- Proposed Stage III Heap Leach Facility
- Evaporation Pond
- Pit Expansion
- Facilities
- Faults
- TH Wells
- Lineament
- Potentiometric Surface
- Pumping_Wells
- Ground Water Flow Direction

NATIONAL SYSTEM OF PUBLIC LANDS

WINNEMUCCA DISTRICT OFFICE
Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, Nevada 89445

July 2010

Figure 3.7.9

Potentiometric Surface and Ground Water Flow Directions

Coeur Rochester Mine Expansion Environmental Assessment

Left Blank Intentionally

3.7.3.4 Site Water Balance

SWS (2010a) evaluated the recharge of ground water at the site. Recharge is from precipitation and occurs approximately uniformly across the site, with higher values at higher elevations. A portion of the precipitation infiltrates into fractured bedrock and unconsolidated alluvial aquifers. The Hardman precipitation map (Huntington 2007) and the Maxey-Eakin method were used to estimate overall groundwater recharge to be 345 acre-feet/year within the project area.

The Maxey-Eakin method was developed during a series of reconnaissance studies of across Nevada. The method provides an estimate for total basin groundwater recharge as a function of precipitation zones. The original Maxey-Eakin method provides a conservative estimate of groundwater recharge compared to more recent methods such as Flint et al (2004) and Nichols (2000). Given the documented uncertainty in groundwater recharge estimates (Epstein 2004) the original Maxey Eakin method was chosen as the most conservative available estimation method for the model area.

Ground water discharges by evapo-transpiration (ET), and pumping. Based on depth, ground water is considered lost to ET primarily at the upper end of canyons along the BRF (**Figure 3.7.9**).

Ground water has been withdrawn from the BRF zone since 1987 to provide water supply for the Mine. Four pumping wells operated (PW-1, PW-2, PW-3, and PW-4) (**Figure 3.7.9)** originally with 2 later replaced. Pumping rates vary seasonally and average 277 gpm (**Table 3.7.10**). Groundwater withdrawal has resulted in aquifer drawdown within the BRF and also the pit area (Hydrogeo 2010).

Table 3.7.10: Water Supply Pumping Wells

Well	Easting (feet)	Northing (feet)	Average Pumping Rate (gpm)	Average Summer Pumping Rate (gpm)
PW-1a	23,752	21,717	60	98
PW-2a	23,690	19,571	103	147
PW-3	23,343	16,954	72	90
PW-4	22,579	13,338	42	68
Total			**277**	**403**

3.7.3.5 Ground Water Quality

Pre-mining baseline ground water quality data are not available for the project area as no monitoring wells were installed prior to mining activities.

<u>Historic Impacts to Ground Water Quality and Corrective Actions</u>
Construction of the Stage I Heap Leach Facility occurred prior to installation of any monitoring wells in the vicinity. However, historic impacts to ground water quality from Stage I have been observed since 1990 and addressed through the WPCP process. These impacts and Coeur's remediation activities are documented and detailed below. More specific discussion of current ground water quality is provided in the next subsection.

Historically, the shallow alluvial water-bearing zone (the shallow sediments) near the toe of the north dike of the Stage I Heap Leach Facility and sediments and bedrock in and north of the process facilities area have been impacted by seepage from various sources including the leach pad, process ponds, and pipelines. The use of calcium hypochlorite to detoxify cyanide resulting from accidental releases has also impacted the shallow sediments. Decommissioning of the Stage I Heap Leach Facility in April 1998 and on-going remediation activities have resulted in improved ground water quality.

Coeur carried out numerous studies to characterize the hydrogeology of the Stage I area and seepage in order to mitigate impacts to ground water (e.g., Hydrogeo 1991a, 1991b, 1992, 1994, and 2004; Telesto 2005, 2006; TRC 1998).

A CAP for the Stage I Heap Leach Facility area was developed in partial fulfillment of the Administrative Order (Finding of Alleged Violation and Order) issued to Coeur by NDEP in 2003 (NDEP 2003). The CAP was based on a 5-phase approach designed to delineate the lateral and vertical extent of the contaminant plume and determine the best remedial action to contain and curtail the contamination (Hydrogeo 2003a, 2003b, 2003c, 2003d, 2003e). The Phase V CAP report provides a complete summary of the CAP progression, conclusions, and recommendations (Hydrogeo 2003e).

In 2004, NDEP issued the renewal of WPCP NEV0050037 and an associated Schedule of Compliance (SOC) for the Stage I Heap Leach Facility. In response to the SOC, a hydraulic and geochemical evaluation of the Stage I Heap Leach Facility area was conducted including water sampling and geochemical signature analysis, analytical chemical transport modeling, a tracer dye test of potential seepage from the Stage I Leach Facility, installation of additional monitoring wells, rising-head slug tests and soil sampling adjacent to the Pregnant Solution Ponds (Telesto 2005, 2006).

As required by the SOC, a fate and transport report based on the information collected during the hydraulic and geochemical evaluation was submitted to NDEP in January 2007 (Telesto 2007). The study focused on delineating the groundwater contamination plume associated with the Stage I Heap Leach Facility and an evaluation of the potential for the plume to degrade the aquifer in the BRF.

The study concluded that most of the perched water flows horizontally and is captured by the catch basin central (CBC) drain system thereby removing most of the chemical mass from impacted sediment ground water. Some ground water within the sediments is not captured by the CBC and enters the underlying fractured bedrock system. This downward leakage is a minor component of the total flow due to the low vertical permeability in the sediments. The rate of downward leakage was calculated to evaluate the maximum-possible chemical impacts to the BRF aquifer which is the only hydrogeologic unit in the Stage I area that could be developed for water supply. Results suggest that should impacted shallow alluvial-hosted ground water migrate to the fault zone, the water would not exceed regulatory standards for any constituents due to dilution. Therefore, the likelihood of health risks associated with impacted water within the sediments is low. The new monitoring wells in the BRF now allow direct monitoring of BRF water quality to verify this prediction (Hydrogeo 2010).

In April 2005, a leak was identified in the Stage II Barren Solution Pipeline (BSP) located in the Process Area between the process ponds and the barren pond (NDEP 2005). The leak was repaired and the contaminated sediments around the pipeline were excavated and removed by mid-April 2005. Coeur and NDEP agreed on a 4-phase CAP to address the resulting contamination in the shallow ground water including several rounds of delineation drilling, sampling, installation of 5 new monitoring wells in the BSP area and recommendations for remedial actions.

Baseline Ground Water Quality

Groundwater monitoring was first initiated at the Mine in 1987. The monitoring program now includes data collection from 42 monitoring wells and 2 production wells (Hydrogeo 2010). Twelve of the monitoring wells were installed since 2006 (Hydrogeo 2010).

The ground water quality discussion is based on data from 14 wells (**Table 3.7.12**) in the 3 principle hydrogeologic units, including:

- Four monitoring wells in the shallow water-bearing sediment unit (WI-15, WI-17/17R, WI-19, MW-26)
- Five monitoring wells in the water-bearing bedrock unit outside the BRF (WI-14, MW-30, WI-24, MW-25, WI-27)
- Five wells completed in the water-bearing bedrock unit in the BRF including 2 production wells (PW-1a, PW-2a) and 3 monitoring wells (MW-46, MW-47, PW-4)

Ground water in the bedrock unit in the Rochester Pit area was characterized using data from 3 monitoring wells installed in October 2009 (TH-1, TH-2, TH-3) and the pit lake. Summary information for key wells, including the period of record, is provided in **Table 3.7.11**. Detailed information for each well is included in **Tables 3.7.12 - 3.7.15** and includes the period of record for each well.

The shallow sediment ground water quality is variable, ranging from sodium-bicarbonate (WI-15, WI-19, MW-26) to sodium-sulfate type (WI-17) with generally high levels of TDS, near neutral pH, and high levels of trace constituents, particularly arsenic, cadmium, fluoride, iron, manganese, and nitrate (**Table 3.7.12**). Ground water in these sediments is of poor quality, is not suitable for human consumption, and in some cases not suitable for livestock watering. The quality of the ground water in the shallow sediment wells is better in the South American Canyon (WI-15) and American Canyon (MW-26) areas than in Sage Hen Flat (WI-17 and WI-19). Historically, the shallow sediments near the toe of the Stage I north dike have been impacted by accidental releases from various process fluid sources including the leach pad, process ponds, and pipelines, as well as by the historic use of calcium hypochlorite to detoxify cyanide (Hydrogeo 2010). The shallow ground water quality has improved since decommissioning of the Stage I Heap Leach Facility in April 1998 and on-going remediation activities, as demonstrated by dramatic reductions in WAD cyanide, mercury, silver, and zinc concentrations in WI-17 from 1993 through approximately 1999. Recent trends towards elevated levels of chloride, nitrate and TDS above the MCL and NRV values may be explained in part by calcium hypochlorite detoxification of historic cyanide spills and storm events causing infiltration through shallow contaminated sediments.

In the BSP area, water quality continues to improve since maximum concentrations recorded to date at this location (Well WI-19) were observed for WAD cyanide (16 mg/L), mercury (0.011 mg/L), selenium (0.047 mg/L), and silver (0.20 mg/L). By July 2005 the concentrations of these parameters decreased to well below the MCLs for selenium, silver, nitrate and WAD cyanide while mercury showed trends towards lower concentrations but remained elevated above the MCL.

Ground water in the bedrock unit outside the BRF zone is of moderate to poor quality and generally is not suitable from human consumption. The ground water quality is better in the South American Canyon and American Canyon areas than in the Sage Hen Flat area. Ground water ranges from sodium-bicarbonate type in the South American Canyon and Sage Hen Flat areas to calcium-bicarbonate\sulfate type in American Canyon with generally moderate to high levels of TDS, near neutral pH, and levels of trace constituents, particularly arsenic, iron, and manganese, that are elevated above the MCL and NRV values (**Table 3.7.13**). Accidental release events and cleanup efforts (using calcium hypochlorite) in Sage Hen Flats, particularly at the toe of the north dike of the Stage I Heap Leach Facility and Process Pond areas, have affected the bedrock ground water quality with elevated levels of nitrate, chloride, and other Mine-related constituents (Hydrogeo 2010). Nitrate levels above the regulatory standard of 10 mg/L are present in MW-30 (see previous discussion under Surface Water). The CBC drain system captures most of this ground water, but a minor component of the flow is downward into unsaturated portions of the bedrock.

Ground water from wells in the bedrock in the BRF zone is calcium\sodium-bicarbonate type with generally moderate levels of TDS, near neutral pH, and low levels of most trace constituents (**Table 3.7.14**). Calcium is the dominant cation in the ground water from the deep production wells PW-1a and PW-2a and sodium is more dominant in the shallower wells. Ground water in the bedrock is good quality and is generally suitable from human consumption; however, arsenic levels in wells PW-1a and MW-47 typically have elevated levels that are above the regulatory standard of 0.01 mg/L. The ground water quality data in the BRF zone do not indicate that the wells have been impacted by Mine-related activities.

Ground water from wells in the Rochester Pit is calcium-sulfate type with generally moderate levels of TDS, slightly to very acidic pH, and moderate levels of trace constituents (**Table 3.7.15**). Ground water in the pit is poor quality and is not suitable for human consumption. Pit area ground water typically has levels that are elevated above the MCLs for antimony and cadmium, and elevated levels of copper, fluoride, iron, manganese, sulfate, zinc, and TDS in TH-3. The Rochester Pit has discrete zones of exposed sulfide-rich rock that represent approximately 0.03 percent of the total exposed area, with oxide rocks accounting for about 99.97 percent of the exposed area in the Rochester Pit. Monitoring well TH-3 and the pit lake are completed in a sulfide rich zone and the water chemistry in these wells reflects the high sulfide rock with low pH and high trace metals and sulfate. The pit area water quality shows that the ground water in the pit area is not well mixed and isolated zones of high sulfate exist.

Table 3.7.11: Monitoring and Production Wells used in Water Quality Analysis for Rochester Mine

Well ID	Date Installed	Well Depth (ft)	Casing Diameter (inches)	Casing Material	Screened Interval (ft)	Screened Formation	Mine Area	Water Quality Data Period of Record	
WI-14	Oct-91	38	4	PVC	18-38	Bedrock	SAC	Mar-93	Oct-09
WI-15	Oct-91	36	4	PVC	16-36	Sediments	SAC	Mar-93	Oct-09
WI-17/WI-17R	Oct-91	29	4	PVC	19-29	Sediments	SHF	Mar-93	Oct-09
WI-19	Oct-91	24	4	PVC	14-24	Sediments	SHF	May-93	Jul-09
WI-24	Oct-91	195	4	PVC	175-195	Bedrock	SHF	Mar-93	Nov-09
MW-25	May-94	60	4	PVC	40-60	Bedrock	AC	Mar-93	Nov-09
MW-26	Jun-94	24	4	PVC	14-24	Sediments	AC	Feb-95	Apr-09
WI-27	Jun-94	45	4	PVC	35-45	Bedrock	AC	Sep-94	Nov-09
MW-30	Apr-03	148	4	PVC	128-148	Bedrock	SHF	Apr-03	Jul-09
PW-1A	Mar-96	1,460	10	Steel	760-1,440	BRF	SHF	May-96	Nov-09
PW-2A	May-01	1,050	14	Steel	160-1,043	BRF	SHF	Nov-01	Nov-09
PW-4	Jul-86	1196	10	Steel	449-1,196	BRF	St. III	Jun-93	Oct-09
MW-46	Jun-07	504	4	PVC	454-504	BRF	Pit	Jun-07	Nov-09
MW-47	Jul-07	474	4	PVC	434-474	BRF	SHF	Jul-07	Nov-09
TH-1	Oct-09	82	2	PVC	62-82	Bedrock	Pit	Nov-09	Dec-09
TH-2	Oct-09	113	2	PVC	93-113	Bedrock	Pit	Nov-09	Dec-09
TH-3	Oct-09	62	2	PVC	42-62	Bedrock	Pit	Nov-09	Dec-09

SAC: South American Canyon; SHF: Sage Hen Flats; Pit: Rochester Pit area
St. III: Stage III Heap Leach Facility area; AC: American Canyon; BRF: Black Ridge Fault
A complete listing and summary of well data is provided in Hydrogeo 2010.

Table 3.7.12: Summary of Ground Water Quality Data for Select Wells in the Shallow Sediments

Location			Well WI-15				Well WI-17 (WI-17R)				Well WI-19				Well MW-26			
Analyte	**Units**	**EPA MCL or NRV [1,2]**	**% BDL [6]**	**MAX [5]**	**MIN [5]**	**AVG [3,5]**	**% BDL [6]**	**MAX [5]**	**MIN [5]**	**AVG [3,5]**	**% BDL [6]**	**MAX [5]**	**MIN [5]**	**AVG [3,5]**	**% BDL [6]**	**MAX [5]**	**MIN [5]**	**AVG [3,5]**
Dates			**March 1993 - October 2009**				**March 1993 - October 2009**				**March 1993 – October 2009**				**February 1995 – October 2009**			
Alkalinity	mg/L		0%	262	132	193	0%	784	68.5	390	0%	653	126	358	0%	2530	393	863
Aluminum	mg/L	0.2	92%	0.156	BDL	0.025	84%	0.14	BDL	0.03	74%	0.146	BDL	0.057	84%	0.06	BDL	0.04
Antimony	mg/L	0.006	97%	0.002	BDL	0.001	84%	0.003	BDL	0.002	53%	0.013	BDL	0.005	74%	.0091	BDL	.0029
Arsenic	mg/L	0.01	85%	0.014	BDL	0.006	23%	0.189	BDL	0.053	9%	0.33	BDL	0.08	0%	0.23	0.009	0.08
Barium	mg/L	2	40%	0.082	BDL	0.07	21%	0.28	BDL	0.09	5%	0.6	BDL	0.2	48%	0.136	BDL	0.125
Beryllium	mg/L	0.004	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL	97%	0.002	BDL	0.0007	95%	0.01	BDL	0.001
Bicarbonate	mg/L		0%	290	158	220	0%	660	83.6	385	0%	760	149	500	0%	2600	480	1191
Boron	mg/L		0%	0.34	0.18	0.26	0%	2.7	0.6	1.1	0%	5.6	0.29	1.4	0%	3.1	0.59	1.28
Cadmium	mg/L	0.005	99%	0.01	BDL	0.001	53%	0.053	BDL	0.008	96%	0.026	BDL	0.002	97%	0.0098	BDL	0.001
Calcium	mg/L		0%	78.9	40	55.8	0%	1040	64	311	0%	200	68.3	125	0%	396	18.2	117.1
Chloride	mg/L	400	0%	98	41.7	83.6	0%	5060	150	1559	0%	860	159	415	0%	650	108	193
Chromium	mg/L		98%	0.01	BDL	0.004	75%	0.034	BDL	0.007	95%	0.01	BDL	0.004	82%	0.06	BDL	0.008
Copper	mg/L	1.0	93%	0.02	BDL	0.01	34%	73.3	BDL	13.9	71%	7.64	BDL	0.25	65%	0.12	BDL	0.02
Fluoride	mg/L	4.0 (2.0)	1%	6	BDL	1.4	18%	9	BDL	0.98	15%	5.4	BDL	0.5	26%	1.6	BDL	0.3
Iron	mg/L	0.6	7%	3.45	BDL	1.58	37%	6.66	BDL	0.68	48%	2.5	BDL	0.4	59%	11.2	BDL	0.7
Lead	mg/L	0.015	90%	0.02	BDL	0.007	87%	0.222	BDL	0.013	85%	0.014	BDL	0.008	76%	0.016	BDL	0.007
Magnesium	mg/L	150	0%	46.2	20	28.4	0%	238	17.58	65.5	0%	57	4.9	32.2	0%	831	23.6	186
Manganese	mg/L	0.1	0%	0.47	0.167	0.292	0%	15.8	0.29	2.47	10%	7.39	BDL	1.41	26%	2.35	BDL	0.35
Mercury	mg/L	0.002	91%	0.0006	BDL	.0002	17%	0.654	BDL	0.047	67%	0.011	BDL	0.0005	85%	0.001	BDL	0.0003
Nickel	mg/L		96%	0.004	BDL	0.010	50%	0.56	BDL	0.054	80%	1.43	BDL	0.09	70%	0.1	BDL	0.02
Nitrate [4]	mg/L	10	66%	36.8	BDL	0.93	4%	210	BDL	58	35%	24	BDL	3.0	26%	1.76	BDL	0.42
pH	su	6.5-8.5	0%	8.18	6.52	7.04	0%	8.50	7.00	7.85	0%	9.83	6.61	7.63	0%	8.2	7.31	7.72
Potassium	mg/L		7%	4.7	BDL	2.2	6%	24	BDL	5.5	6%	68	BDL	7	0%	35	1.2	8.2
Selenium	mg/L	0.05	100%	BDL	BDL	BDL	29%	0.146	BDL	0.030	75%	0.047	BDL	0.010	91%	.0063	BDL	0.003
Silver	mg/L	0.1	96%	0.07	BDL	0.005	61%	5.4	BDL	0.4	90%	0.2	BDL	0.011	100%	BDL	BDL	BDL
Sodium	mg/L		0%	115	66	92	0%	2210	340.3	1217	0%	900	80.32	288	0%	1100	183	418
Sulfate	mg/L	500	0%	180	69.8	148	0%	1900	300	867	2%	380	BDL	144	0%	4000	154	899
Thallium	mg/L	0.002	100%	BDL	BDL	BDL	92%	0.003	BDL	0.0006	86%	0.0023	BDL	0.0007	100%	BDL	BDL	BDL
TDS	mg/L	1000	0%	690	114	533	0%	12000	1700	4470	0%	2200	480	1233	0%	7700	290	2256
WAD Cyanide	mg/L	0.2	99%	0.016	BDL	0.005	1%	179	BDL	33.5	69%	16	BDL	0.44	97%	0.02	BDL	0.005
Zinc	mg/L	5	39%	1.18	BDL	0.05	5%	93.57	BDL	13.0	34%	0.52	BDL	0.05	26%	0.11	BDL	0.03

Adapted from Coeur Rochester Hydrologic Monitoring Database (Coeur 2009b). (1) National primary drinking water standards are legally enforceable standards that apply to public water systems. The MCL is the highest level of a contaminant allowed in drinking water. (2) National secondary drinking water standards. These are non-enforceable guidelines regulating contaminants that my cause cosmetic or aesthetic effects in drinking water (EPA 2009). Secondary standards listed are for Nevada per NAC 445A.455 for public water systems http://www.leg.state.nv.us/NAC/NAC-445A.html#NAC445ASec455. (3) Average values were calculated using actual value or ½ of detection limit for non-detect values unless all values are below detection limit. (4) Nitrate value is NO_3 as N, NO_3, or $N0_3$+NO_2. (5) Shaded cells indicate exceedance of EPA primary or Nevada secondary drinking water standard. (6) BDL: Below lab detection limits

Table 3.7.13: Summary of Ground Water Quality Data for Select Wells outside the Black Ridge Fault

Location			Well WI-14				Well MW-30				Well WI-24				Well MW-25				Well WI-27			
Analyte	**Units**	**EPA MCL or NRV [1,2]**	**% BDL [6]**	**MAX [5]**	**MIN [5]**	**AVG [3,5]**	**% BDL [6]**	**MAX [5]**	**MIN [5]**	**AVG [3,5]**	**% BDL [6]**	**MAX [5]**	**MIN [5]**	**AVG [3,5]**	**% BDL [6]**	**MAX [5]**	**MIN [5]**	**AVG [3,5]**	**% BDL [6]**	**MAX [5]**	**MIN [5]**	**AVG [3,5]**
Dates			**March 1993 - October 2009**				**April 2003 – July 2009**				**March 1993 – November 2009**				**March 1993 - November 2009**				**September 1994 – November 2009**			
Alkalinity	mg/L		0%	314	98	200	0%	160	65	97	0%	208	36	48	0%	381	127	265	0%	258	130	177
Aluminum	mg/L	0.2	90%	0.033	BDL	0.023	60%	0.34	BDL	0.07	100%	BDL	BDL	BDL	92%	0.04	BDL	0.02	92%	0.087	BDL	0.02
Antimony	mg/L	0.006	97%	0.001	BDL	0.001	96%	0.0032	BDL	0.001	100%	BDL	BDL	BDL	55%	0.006	BDL	0.002	92%	0.002	BDL	0.001
Arsenic	mg/L	0.01	24%	0.022	BDL	0.01	42%	0.03	BDL	0.014	49%	0.03	BDL	0.010	43%	0.036	BDL	0.012	44%	0.053	BDL	0.011
Barium	mg/L	2	27%	0.11	BDL	0.09	0%	0.4	0.027	0.18	25%	0.137	BDL	0.088	29%	0.141	BDL	0.088	32%	0.05	BDL	0.08
Beryllium	mg/L	0.004	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL	97%	0.002	BDL	0.001
Bicarbonate	mg/L		0%	383	121	215	0%	190	79	117	0%	208	37	56	0%	390	140	298	0%	261	143	196
Boron	mg/L		2%	0.56	BDL	0.27	50%	0.19	BDL	0.09	6%	0.2	BDL	0.1	0%	0.38	0.13	0.25	0%	0.37	0.1	0.17
Cadmium	mg/L	0.005	99%	0.011	BDL	0.001	96%	0.0083	BDL	0.001	93%	0.002	BDL	0.001	98%	0.024	BDL	0.001	97%	0.008	BDL	0.001
Calcium	mg/L		0%	94.6	26.9	56.7	0%	160	7.6	43.1	0%	29.08	12.8	24.1	0%	165	52.76	104	0%	267	85	116
Chloride	mg/L	400	0%	199	27	67	0%	380	24	201	0%	84.4	35.5	56.0	0%	188	78	131	0%	166	82.8	101
Chromium	mg/L		98%	0.011	BDL	0.004	96%	0.018	BDL	0.003	95%	0.0059	BDL	0.004	98%	0.012	BDL	0.004	96%	0.256	BDL	0.008
Copper	mg/L	1.0	90%	0.028	BDL	0.01	85%	0.061	BDL	0.023	86%	0.03	BDL	0.01	97%	0.02	BDL	0.011	90%	0.02	BDL	0.015
Fluoride	mg/L	4.0 (2.0)	1%	2.1	BDL	0.6	48%	0.24	BDL	0.13	31%	1.25	BDL	0.17	12%	1	BDL	0.29	14%	1.42	BDL	0.23
Iron	mg/L	0.6	67%	1.369	BDL	0.061	12%	2.7	BDL	0.31	30%	3.63	BDL	0.72	46%	1.8	BDL	0.17	62%	0.78	BDL	0.07
Lead	mg/L	0.015	91%	0.01	BDL	0.006	92%	0.018	BDL	0.005	94%	0.02	BDL	0.006	91%	0.033	BDL	0.006	97%	0.015	BDL	0.006
Magnesium	mg/L	150	0%	47.2	8.8	23.2	0%	29	2.1	11.9	0%	11.2	4.66	9.01	0%	87	13	56	0%	67	26	50
Manganese	mg/L	0.1	19%	0.26	BDL	0.03	0%	0.21	0.031	0.088	0%	0.61	0.217	0.44	8%	0.148	BDL	0.028	3%	0.274	BDL	0.068
Mercury	mg/L	0.002	93%	0.00048	BDL	0.0002	0%	0.49	0.00047	0.132	97%	0.00037	BDL	0.0002	88%	0.0026	BDL	0.0003	92%	0.00031	BDL	0.0002
Nickel	mg/L		69%	0.028	BDL	0.013	85%	0.053	BDL	0.007	75%	0.033	BDL	0.014	73%	0.035	BDL	0.013	96%	0.003	BDL	0.010
Nitrate [4]	mg/L	10	20%	29.3	BDL	3.8	0%	20	3.6	12.4	76%	3.44	BDL	0.308	54%	5.84	BDL	0.42	62%	37.3	BDL	2.0
pH	su	6.5-8.5	0%	8.33	6.99	7.48	0%	7.71	6.27	6.98	0%	8.24	5.91	6.59	0%	8.56	7.14	7.64	0%	8.46	6.99	7.58
Potassium	mg/L		7%	4.7	BDL	2.4	0%	13	3.9	8	0%	15	5.9	10.9	6%	6.3	BDL	3.9	5%	10.3	BDL	4.7
Selenium	mg/L	0.05	91%	0.006	BDL	0.004	96%	0.01	BDL	0.006	97%	0.021	BDL	0.003	94%	0.013	BDL	0.005	90%	0.079	BDL	0.007
Silver	mg/L	0.1	97%	0.05	BDL	0.004	100%	BDL	BDL	BDL	99%	0.01	BDL	0.004	98%	0.005	BDL	0.004	98%	0.01	BDL	0.004
Sodium	mg/L		0%	132	32	73	0%	240	52	137	0%	39	14.18	28.4	0%	147	33.59	92	0%	146	36	62
Sulfate	mg/L	500	0%	160	50	98	0%	180	34	62	0%	130	42	55	0%	454	129	257	0%	721	196	310
Thallium	mg/L	0.002	100%	BDL	BDL	BDL	83%	0.0015	BDL	0.0008	15%	0.011	BDL	0.004	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL
TDS	mg/L	1000	0%	939	230	475	0%	1000	350	630	0%	570	184	242	0%	1284	538	821	0%	1490	409	770
WAD Cyanide	mg/L	0.2	69%	0.08	BDL	0.01	20%	0.1	BDL	0.047	97%	0.031	BDL	0.005	94%	0.086	BDL	0.007	100%	BDL	BDL	BDL
Zinc	mg/L	5	47%	0.13	BDL	0.03	8%	0.81	BDL	0.18	1%	5.2	BDL	1.5	51%	0.12	BDL	0.02	49%	0.12	BDL	0.02

Adapted from Coeur Rochester Hydrologic Monitoring Database (Coeur 2009b). (1) National primary drinking water standards are legally enforceable standards that apply to public water systems. The MCL is the highest level of a contaminant allowed in drinking water. (2) National secondary drinking water standards. These are non-enforceable guidelines regulating contaminants that my cause cosmetic or aesthetic effects in drinking water (EPA 2009). Secondary standards listed are for Nevada per NAC 445A.455 for public water systems http://www.leg.state.nv.us/NAC/NAC-445A.html#NAC445ASec455. (3) Average values were calculated using actual value or ½ of detection limit for non-detect values unless all values are below detection limit. (4) Nitrate value is NO_3 as N, NO_3, or NO_3+NO_2. (5) Shaded cells indicate exceedance of EPA primary or Nevada secondary drinking water standard. (6) BDL: Below lab detection limits

Table 3.7.14: Summary of Ground Water Quality Data for Select Wells in the Black Ridge Fault

Location			Well PW-1A (Production Well)				Well PW-2A (Production Well)				Well PW-4				Well MW-46				Well MW-47			
Analyte	Units	EPA MCL or NRV (1,2,5)	% BDL (6)	MAX	MIN	AVG (3)	% BDL (6)	MAX	MIN	AVG (3)	% BDL (6)	MAX	MIN	AVG (3)	% BDL (6)	MAX	MIN	AVG (3)	% BDL (6)	MAX	MIN	AVG (3)
Dates			May 1996 – November 2009				November 2001 – November 2009				June 1993 - October 2009				June 2007 – November 2009				July 2007 – November 2009			
Alkalinity	mg/L		0%	220	84	130	0%	132	83	107	0%	101	23.1	72	0%	130	42.1	68	0%	201	112	161
Aluminum (2)	mg/L	0.2	90%	0.04	BDL	0.02	88%	0.134	BDL	0.030	100%	BDL	BDL	BDL	83%	0.25	BDL	0.06	82%	0.419	BDL	0.08
Antimony	mg/L	0.006	97%	0.001	BDL	0.001	96%	0.001	BDL	0.001	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL	91%	0.0076	BDL	0.002
Arsenic	mg/L	0.01	*23%*	0.049	BDL	0.013	54%	0.015	BDL	0.005	84%	0.017	BDL	0.004	75%	0.012	BDL	0.004	64%	0.0436	BDL	0.011
Barium	mg/L	2	24%	0.51	BDL	0.113	0%	0.069	0.032	0.044	24%	0.036	BDL	0.051	0%	0.085	0.0472	0.062	9%	0.0488	BDL	0.018
Beryllium	mg/L	0.004	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL
Bicarbonate	mg/L		0%	270	100	149	0%	150	83.8	122	0%	120	23.1	79	0%	160	42.1	77	0%	230	112	177
Boron	mg/L		0%	2	0.13	0.25	0%	0.21	0.1	0.15	0%	0.2	0.11	0.12	17%	0.189	BDL	0.11	0%	0.269	0.16	0.20
Cadmium	mg/L	0.005	100%	BDL	BDL	BDL	96%	0.019	BDL	0.001	96%	0.01	BDL	0.002	92%	0.0086	BDL	0.001	100%	BDL	BDL	BDL
Calcium	mg/L		0%	260	30	48.0	0%	62	36	48	0%	45.2	14.4	23.7	0%	38.4	16	20.8	0%	56	35.8	48
Chloride (2)	mg/L	400	0%	1700	61	111	0%	103	57.4	71	0%	90.4	8.58	44.7	0%	303	28	55	0%	339	79	110
Chromium	mg/L		100%	BDL	BDL	BDL	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL
Copper (2)	mg/L	1.0	95%	0.057	BDL	0.013	100%	BDL	BDL	BDL	88%	0.41	BDL	0.03	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL
Fluoride (2)	mg/L	4.0 (2.0)	0%	1	0.19	0.34	0%	0.55	0.2	0.3	4%	0.9	BDL	0.34	42%	0.78	BDL	0.18	9%	1.2	BDL	0.41
Iron (2)	mg/L	0.6	56%	260	BDL	6.74	15%	9.47	BDL	1.32	20%	16.4	BDL	2.82	8%	19.7	BDL	3.5	0%	5	0.047	1.18
Lead	mg/L	0.015	92%	0.38	BDL	0.015	92%	0.006	BDL	0.004	84%	0.02	BDL	0.009	92%	0.011	BDL	0.004	100%	BDL	BDL	BDL
Magnesium (2)	mg/L	150	0%	110	14	20.6	0%	21.3	15	18	0%	13.9	4.3	6.7	0%	16	4.1	5.5	0%	22.6	12	15
Manganese (2)	mg/L	0.1	0%	5.4	0.02	0.226	0%	0.628	0.06	0.198	0%	0.606	0.0439	0.263	0%	0.899	0.207	0.522	0%	1.4	0.219	0.41
Mercury	mg/L	0.002	92%	0.0035	BDL	0.0004	92%	0.00037	BDL	0.0001	92%	0.00136	BDL	0.0002	100%	BDL	BDL	BDL	73%	0.00112	BDL	0.0003
Nickel	mg/L		91%	0.028	BDL	0.009	96%	0.002	BDL	0.005	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL
Nitrate (4)	mg/L	10	77%	3.62	BDL	0.32	88%	0.23	BDL	0.25	36%	2.44	BDL	0.34	33%	0.4	BDL	0.15	73%	1.5	BDL	0.2
pH (2)	su	6.5-8.5	0%	8.43	6.05	7.83	0%	8.11	6.81	7.43	0%	7.7	6.35	6.96	0%	7.62	6.09	6.90	0%	7.97	7.16	7.58
Potassium	mg/L		0%	10	4	6	0%	13	6.4	9	4%	8.1	BDL	4.5	0%	41.1	6.2	10.4	0%	23.8	4.3	8.1
Selenium	mg/L	0.05	97%	0.002	BDL	0.003	100%	BDL	BDL	BDL	961%	0.011	BDL	0.002	92%	0.0043	BDL	0.003	82%	0.0034	BDL	0.003
Silver (2)	mg/L	0.1	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL	96%	0.008	BDL	0.005	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL
Sodium	mg/L		0%	74.2	34	47	0%	50	30	35	0%	50.5	28.2	39.0	0%	165	27.9	41	0%	207	55	83
Sulfate (2)	mg/L	500	0%	154	48.8	69	0%	87	58	76	0%	75.4	10.5	42.0	0%	90.8	15	40	0%	127	35.1	66
Thallium	mg/L	0.002	100%	BDL	BDL	BDL	79%	0.0015	BDL	0.0007	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL	91%	0.00263	BDL	0.0007
TDS (2)	mg/L	1000	0%	2400	284	386	0%	428	270	341	0%	450	40	212	0%	736	150	221	0%	886	360	426
WAD Cyanide	mg/L	0.2	97%	0.54	BDL	0.012	100%	BDL	BDL	BDL	96%	0.078	BDL	0.008	100%	BDL	BDL	BDL	100%	BDL	BDL	BDL
Zinc (2)	mg/L	5	62%	0.17	BDL	0.03	23%	0.602	BDL	0.070	28%	0.22	BDL	0.05	33%	0.099	BDL	0.022	91%	0.011	BDL	0.006

Adapted from Coeur Rochester Hydrologic Monitoring Database (Coeur 2009b). (1) National primary drinking water standards are legally enforceable standards that apply to public water systems. The MCL is the highest level of a contaminant allowed in drinking water. (2) National secondary drinking water standards. These are non-enforceable guidelines regulating contaminants that my cause cosmetic or aesthetic effects in drinking water (EPA 2009). Secondary standards listed are for Nevada per NAC 445A.455 for public water systems http://www.leg.state.nv.us/NAC/NAC-445A.html#NAC445ASec455 . (3) Average values were calculated using actual value or ½ of detection limit for non-detect values unless all values are below detection limit. (4) Nitrate value is NO_3 as N, NO_3, or $N0_3$+NO_2. (5) Shaded cells indicate exceedance of EPA primary or Nevada secondary drinking water standard. (6) BDL – Below lab detection limits

Table 3.7.15: Summary of Ground Water Quality Data for the In Pit Wells and the Pit Lake

Location			Well TH-1				Well TH-2				Well TH-3 [6]				Pit Lake			
Analyte	Units	NRV [1]	% BDL [5]	MAX [4]	MIN [4]	AVG [2,4]	% BDL [5]	MAX [4]	MIN [4]	AVG [2,4]	% BDL [5]	MAX [4]	MIN [4]	AVG [2,4]	% BDL [5]	MAX [4]	MIN [4]	AVG [2,4]
Dates			November 2009 – May 2010				November 2009 – May 2010				November 2009 – March 2010				April 2007 – June 2010			
Alkalinity	mg/L		0%	63	33	48	0%	39	31	35	0%	22	22	22	25%	70	<1	17
Aluminum	mg/L	0.2	67%	0.1	<0.045	0.04	83%	0.34	<0.045	0.08	0%	20	0.093	13.2	16%	8.6	<0.045	1.4
Antimony	mg/L	0.006	17%	0.0095	<0.0025	0.0058	0%	0.018	0.0053	0.010	100%	<0.0025	<0.0025	0.001	81%	0.0108	<0.0025	0.0024
Arsenic	mg/L	0.010	100%	<0.005	<0.005	0.003	100%	<0.005	<0.005	0.003	100%	<0.005	<0.005	0.003	67%	0.029	<0.003	0.005
Barium	mg/L	2.0	0%	0.061	0.021	0.037	0%	0.11	0.047	0.08	0%	0.048	0.024	0.036	0%	0.159	0.01	0.04
Beryllium	mg/L	0.004	83%	0.0023	<0.001	0.0008	100%	<0.001	<0.001	0.0005	20%	0.0067	<0.001	0.005	79%	0.0033	<0.001	0.001
Bicarbonate	mg/L		0%	77	40	58	0%	48	38	43	0%	26	26	26	29%	86	<1	18
Boron	mg/L		0%	0.25	0.19	0.21	50%	0.12	<0.1	0.08	0%	0.28	0.14	0.19	7%	0.24	<0.04	0.15
Cadmium	mg/L	0.005	17%	0.05	<0.001	0.02	0%	0.58	0.0074	0.21	0%	0.34	0.075	0.25	2%	1.6	<0.001	0.7
Calcium	mg/L		0%	51	43	45	0%	26	21	23	0%	240	95	199	0%	300	0.927	129
Carbonate	mg/L		100%	<1	<1	0.5	100%	<1	<1	0.5	100%	<1	<1	0.5	96%	9.6	<1	0.9
Chloride	mg/L	400	0%	38	36	37	0%	40	38	39	0%	51	31	37	0%	340	1.24	52
Chromium	mg/L	0.1	100%	<0.005	<0.005	0.003	100%	<0.005	<0.005	0.003	60%	0.0098	<0.005	0.005	72%	0.0073	<0.005	0.004
Copper	mg/L	1.0	83%	0.25	<0.05	0.06	100%	<0.05	<0.05	0.03	0%	20	2.4	15	5%	6.1	<0.05	1.3
Fluoride	mg/L	4.0	17%	0.32	<0.2	0.24	50%	0.19	<0.1	0.1	0%	3.7	0.54	2.2	3%	5.9	<0.1	0.9
Iron	mg/L	0.6	0%	0.68	0.029	0.32	17%	0.47	<0.01	0.13	0%	51	0.031	23.9	16%	16	<0.01	1.2
Lead	mg/L	0.015	100%	<0.01	<0.0025	0.003	100%	<0.01	<0.0025	0.003	20%	0.15	<0.01	0.09	35%	0.34	<0.0025	0.07
Magnesium	mg/L	150	0%	12	11	11	0%	8	6	7	0%	48	25	41	0%	21.7	0.347	15.6
Manganese	mg/L	0.10	0%	0.091	0.05	0.07	0%	0.21	0.05	0.15	0%	2.1	0.77	1.5	0%	0.65	0.0246	0.30
Mercury	mg/L	0.002	83%	0.00012	<0.0001	0.00006	83%	0.00017	<0.0001	0.00008	20%	0.0022	<0.0001	0.0010	70%	0.0097	<0.0001	0.0005
Nickel	mg/L	0.1	40%	0.017	<0.01	0.01	0%	0.022	0.012	0.018	0%	0.16	0.053	0.12	23%	0.071	<0.01	0.030
Nitrate + Nitrite [3]	mg/L	10	50%	0.15	<0.1	0.09	50%	0.44	<0.1	0.14	0%	12	4.3	7.84	4%	35.5	0.313	10.6
Nitrogen, Total	mg/L	10	100%	<1.1	<1.1	0.5	100%	<1.1	<1.1	0.5	--	--	--	--	0%	12	9.8	11
pH (field)	su	6.5-8.5	0%	6.29	5.76	6.04	0%	6.64	5.7	6.10	0%	5.94	3.28	3.90	0%	9.78	3.03	5.69
pH (lab)	su	6.5-8.5	0%	7.29	6.29	6.61	0%	6.44	6.19	6.30	0%	5.98	2.9	3.66	0%	9.33	3.4	5.9
Potassium	mg/L		0%	16	9.5	11	0%	10	6.2	8.9	0%	15	7.6	9.7	0%	24	3.58	18
Selenium	mg/L	0.05	100%	<0.005	<0.005	0.003	83%	0.0074	<0.005	0.003	0%	0.047	0.017	0.039	7%	0.0882	<0.003	0.032
Silver	mg/L	0.1	100%	<0.005	<0.005	0.003	100%	<0.005	<0.005	0.003	100%	<0.005	<0.005	0.003	93%	0.024	<0.005	0.003
Sodium	mg/L		0%	110	73	83	0%	43	40	42	0%	130	56	94	0%	72	1.14	57
Sulfate	mg/L	500	0%	240	210	228	0%	110	86	97	0%	1500	440	1142	0%	890	3.01	410
Thallium	mg/L	0.002	50%	0.0023	<0.001	0.001	100%	<0.001	<0.001	0.0005	60%	0.002	<0.001	0.001	5%	0.073	<0.001	0.007
TDS	mg/L	1000	0%	480	440	462	0%	300	230	260	0%	2000	760	1652	0%	1400	200	722
WAD CN	mg/L	0.2	100%	<0.01	<0.01	0.005	100%	<0.01	<0.01	0.005	100%	<0.01	<0.01	0.005	89%	0.373	<0.01	0.02
Zinc	mg/L	5.0	0%	1.2	0.094	0.7	0%	1.1	0.2	0.5	0%	82	16	60	0%	17	0.011	6

Adapted from Coeur Rochester Hydrologic Monitoring Database (Telesto 2010). (1) Nevada Reference Value (NRV) http://ndep.nv.gov/bmrr/file/200909-profilei.pdf (NDEP BMRR 2009) (2) Average values were calculated using actual value or ½ of detection limit for non-detect values. (3) Nitrate value is NO_3 as N, NO_3, or $N0_3$+NO_2. (4) Shaded cells indicate levels above the NRV (5) BDL: Below lab detection limits; variable detection limits (6) Well TH-3 was abandoned March 2, 2010 (Telesto 2010).

Left Blank Intentionally

3.8 <u>Economics and Social Values</u>

3.8.1 Regulatory Framework

NEPA recognizes that project effects may include economic or social, among others; therefore, social and economic values need to be considered in the NEPA process. NEPA regulations (40 CFR Section 1508.14) also state that "economic or social effects are not intended by themselves to require preparation of an environmental impact statement."

3.8.2 Affected Environment

Pershing and Humboldt counties represent the primary study area (or impact region) for socioeconomic resources associated with the Mine. The Mine is located in Pershing County, but workers also commute from Humboldt County. Mine operations generate economic activity in Humboldt County, which has a larger economic base relative to Pershing County, through the purchase of goods and services that support mining operations and the expenditures of Mine employees. As a result, the following discussion of socioeconomic conditions focuses on Pershing and Humboldt counties, and the cities of Lovelock and Winnemucca, where appropriate. Socioeconomic effects could also be realized in surrounding counties and/or other regions of the state or country; these out-of-area effects are difficult to evaluate, and therefore, are qualitatively analyzed to the extent feasible.

The closest communities to the Mine are Lovelock, approximately 28 miles to the southwest, and Winnemucca, approximately 60 miles to the northeast. Lovelock is the county seat for Pershing County, and Winnemucca is the county seat for Humboldt County. These cities each contain a wide range of community resources including housing, post offices, courthouses, cafes, motels, gas stations, grocery stores, automobile repair garages, restaurants, etc. They also independently provide important community services including law enforcement, fire protection, medical aid, and schools. Major industries that contribute to the economic base for Pershing and Humboldt counties include government services, private employment, mining, retail trade, accommodation and food services, and farming (Bureau of Economic Analysis [BEA] 2009a).

Prior to 2007, Coeur was a major employer in Pershing County (and to a lesser extent Humboldt County), employing between 200 and 300 (at peak mining activity) full-time employees and summer student employees. Approximately two-thirds of the employees lived in Lovelock and one-third in Winnemucca. Current employment levels are the lowest they have been since the Mine began operating in 1986. Coeur currently provides 33 full-time jobs and one part-time job, as well as 4 full-time contractors and 2 part-time contractors. Of the 34 Coeur employees, 23 (approximately 68 percent) currently reside in Lovelock (Pershing County), 10 (approximately 29 percent) in Winnemucca (Humboldt County), and one (approximately 3 percent) in Fallon (Churchill County) (Coeur 2010a).

The following sections provide more detailed information on the existing socioeconomic conditions in the study area.

3.8.2.1 Population

Table 3.8.1 presents the historic and current population levels in the study area. Pershing and Humboldt counties are rural and sparsely populated. According to the Nevada State Demographer's Office, the total population in Pershing and Humboldt counties in 2009 was 7,149 and 17,690 persons, respectively. Based on these figures, Pershing County is ranked as the

11th most populous county in the state (out of the state's 17 counties), and Humboldt County ranks ninth. The combined population in the study area accounts for about one percent of the state's total population of just over 2.7 million people in 2009. The population in Pershing County steadily increased from 1990 to 2009, with the exception of a decline between 2003 and 2005 (Nevada State Demographer's Office 2010). The population in Humboldt County steadily increased since 1990, except for a slight decrease in 2009.

Table 3.8.1: Historic and Current Population Levels in the Study Area

Area	1990	2000 (1)	2003 (1)	2005 (1)	2007 (1)	2009 (1)
Pershing County	4,550	6,693 (47%)	6,967 (4.1%)	6,736 (-3.3%)	7,075 (5%)	7,149 (1%)
Humboldt County	13,020	16,106 (23.7%)	16,457 (2.2%)	17,293 (5%)	18,052 (4.4%)	17,690 (-2%)

Source: Nevada State Demographer's Office 2010
(1) Total percentage change from previous period is shown in parentheses.

Based on the current number of Coeur employees at the Mine (34), their county of residence (23 Pershing, 10 Humboldt, 1 Churchill) (Coeur 2010a), and the average number of people per household in each of these counties (2.69 Pershing, 2.7 Humboldt, 2.82 Churchill) (U.S. Census Bureau 2000a), it is estimated that the existing operations at the Mine support a population of approximately 92 persons, with approximately 62 of those persons residing in Pershing County, 27 in Humboldt County, and 3 in Churchill County.

3.8.2.2 Employment and Job Base

Table 3.8.2 shows employment by industry, in conjunction with percentages of total employment, in Pershing and Humboldt counties in 2007. According to the U.S. Department of Commerce BEA, total full- and part-time employment in Pershing and Humboldt counties was 2,490 and 10,309 jobs, respectively (BEA 2009a). Non-farm employment was the predominant source of the counties' combined job base, accounting for roughly 94 percent of all jobs, with prominent sectors including private, mining, retail trade, and accommodation and food services (BEA 2009a). The government employed 2,235 people in the 2 counties and accounted for over 17 percent of the regional job base. Both counties also support farm employment, that sector being relatively more common in Pershing County.

Table 3.8.2: Employment by Industry in the Study Area (2007)

Industry/Sector [1]	Pershing County		Humboldt County	
	Jobs	% of Total	Jobs	% of Total
Farm employment	**264**	**10.6%**	**499**	**4.8%**
Non-farm employment	**2,226**	**89.4%**	**9,810**	**95.2%**
Private	1,448	58.2%	8,353	81%
Forestry, fishing, related activities, and other	(2)	--	(2)	--
Mining	437	17.6%	1,458	14.1%
Utilities	(2)	--	(2)	--
Construction	57	2.3%	584	5.7%
Manufacturing	55	2.2%	364	3.5%
Wholesale trade	(2)	--	230	2.2%
Retail trade	215	8.6%	1,418	13.8%
Transportation and warehousing	(2)	--	(2)	--
Information	16	0.6%	95	0.9%
Finance and insurance	28	1.1%	137	1.3%
Real estate and rental and leasing	84	3.4%	326	3.2%
Professional and technical services	41	1.6%	249	2.4%
Management and companies and enterprises	(2)	--	10	0.1%
Administrative and waste services	(2)	--	501	4.9%
Educational services	(2)	--	33	0.3%
Health care and social assistance	(2)	--	420	4.1%
Arts, entertainment, and recreation	(2)	--	186	1.8%
Accommodation and food services	(2)	--	1,159	11.2%
Other services, except public administration	102	4.1%	453	4.4%
Government and government enterprises	**778**	**31.2%**	**1,457**	**14.1%**
Federal, civilian	14	0.6%	164	1.6%
Military	14	0.6%	37	0.4%
State and local	750	30.1%	1,256	12.2%
State government	(2)	--	253	2.5%
Local government	(2)	--	1,003	9.7%
Total employment	**2,490**	**100%**	**10,309**	**100%**

Source: BEA 2009a
(1) Based on North American Industry Classification System (NAICS)
(2) Line item estimate not presented to avoid disclosure of confidential information; estimate included in the totals.

Table 3.8.3 shows the 2009 labor force and unemployment rate in Pershing and Humboldt counties and the state of Nevada. The average annual size of the labor force was 2,624 in Pershing County and 8,646 in Humboldt County. The unemployment rate was 10.4 percent in Pershing County and 7.7 percent in Humboldt County, both lower than the statewide rate of 11.8 percent (Nevada Workforce Informer 2009).

Table 3.8.3: Labor Force and Unemployment in the Study Area and State of Nevada (2009)

Area	Labor Force	Unemployment Rate
Pershing County	2,624	10.4%
Humboldt County	8,646	7.7%
State of Nevada	1,369,891	11.8%
Source: Nevada Workforce Informer 2009		

3.8.2.3 Earnings and Income

Wage-related data also help characterize the workforce in the study area. The median annual wages in Pershing and Humboldt counties in 2009 were $22,800 and $31,200, respectively. The median annual wage for the state of Nevada in 2009 was $31,200, higher than in Pershing County and the same as in Humboldt County (Nevada Department of Employment, Training & Rehabilitation 2009).

As shown in **Table 3.8.4**, total personal income in Pershing and Humboldt counties in 2007 was $139.6 million (MM) and $536.5 MM, respectively (BEA 2009b). Of the combined total income of $676.1 MM for the 2 counties, approximately $482.2 MM (71 percent) was attributed to wage earnings and the remaining $193.8 MM (29 percent) represented non-labor income. Personal income in the 2 counties accounted for 6.6 percent of the total income generated in the state of Nevada in 2007. Pershing County had a per-capita income level of $21,998, which was about 45 percent less than per-capita income at the state level ($39,853). Per-capita income in Humboldt County, at $30,687, was substantially higher than Pershing County but still well below the average for the state (BEA 2009b).

Table 3.8.4: Personal Income in the Study Area and State of Nevada (2007)

Area	Net Earnings [1,2]	Non-Labor Income [1,3]	Total Income [1]	Per-Capita Income
Pershing County	$91,377	$48,244	$139,621	$21,988
Humboldt County	$390,904	$145,621	$536,525	$30,687
State of Nevada	$67,895,332	$33,903,647	$101,798,979	$39,853

Source: Bureau of Economic Analysis (2009b)
(1) Values in thousands ($1,000s) of dollars
(2) Net earnings: earnings by place of work less contributions for government social insurance plus adjustment for residence
(3) Non-labor income: dividends, interest, and rents plus transfer payments

3.8.2.4 Tax Receipts and Fiscal Resources

Portions of operating costs for the Mine represent expenditures in the regional economic area, which stimulates regional economic activity. Activity at the Mine also affects other economic sectors including sales, mineral production values, property values, and land tenure, all of which affect tax revenues received by local governments (mainly Pershing County). Pershing County relies on tax revenues to fund essential public services and programs. Tax receipts represent a large source of the county's budgeted expenditures, which totaled $11.8 MM in fiscal year (FY) 2008-09 (Nevada Department of Taxation 2009). The following discussion compares annual capital, operating and tax information for the Mine from 2009 (current reporting) to 2006, the last full year of operations.

The total annual operating cost (including capital costs and payroll) in 2009 was $21,223,000; $22,018,000 in 2008; $53,359,000 in 2007; $74,240,000 in 2006 (Coeur 2010a). The difference in total annual operating costs between 2006 and 2009 represents an approximate reduction of 71 percent.

In 2006 Coeur paid $1,051,711 in annual payroll taxes, which included Federal Insurance Contributions Act (FICA), FICA-11 Medicare, federal unemployment, and state unemployment. In addition, but not quantified, is the amount of federal income taxes paid directly by Mine employees. In 2009, payroll taxes totaled $201,573, an approximate reduction of 81 percent from 2006 (Coeur 2010a).

The Mine generated approximately $1.2 MM in annual sales and use tax revenues in 2006, which benefits the state of Nevada, Pershing and surrounding counties, local cities (including Lovelock and Winnemucca), and local districts. For 2009, the annual sales and use tax revenues were approximately $415,000, an approximate reduction of 65.5 percent from 2006 (Coeur 2010a).

NRS 362.170 provides for the levy of a tax on the net production of minerals within the state in lieu of a property tax for the extraction of minerals (ores, oil, gas, and other hydrocarbons). Mining companies are allowed to deduct from the gross proceeds expenses directly tied to the production of a product. The tax rate on net proceeds of each operation depends on the ratio of the net proceeds to the gross proceeds, and is based on a sliding scale between 2 and 5 percent (NRS 362.140). In 2006, the total amount of taxes that Coeur paid on the net proceeds of mineral production at the Mine was approximately $1.98 MM. This value increased to $2.5 MM in 2007 illustrating the mineral production based on the last year of full mining and ore processing. The tax value decreased to $2.4 MM in 2008; and significantly decreased to $1.4 MM in 2009. From 2009 through final closure of the current operations in 2014, Coeur estimates the value of the net proceeds mineral tax would drop significantly on a yearly basis. Under current operations, Coeur estimates the 2014 net proceeds mineral tax value at $117,000, an approximate reduction of 94 percent from 2006, and an approximate 95 percent reduction from the 2007 maximum tax payment (Coeur 2010a).

In 2006 Coeur paid $405,000 in property taxes to Pershing County. In 2009 the property tax payment was $368,000, an approximate reduction of 10 percent (Coeur 2010a). In FY 2008-09, the assessed value of mining properties in Pershing County was $33.9 MM (Nevada Department of Taxation 2009). Coeur’s 2009 property tax accounted for approximately one percent of the assessed mining property values in the County.

Table 3.8.5 summarizes the annual operating costs and taxes for the Mine from 2006, which was the last full year of operations, through 2009. The values indicate a substantial drop in the local and regional economic activity due to the reduction in Mine activities.

Table 3.8.5: Summary of Annual Operating Costs and Taxes for the Mine (2006-2009)

Year	Operating Costs	Sales & Use Tax Revenues	Property Tax Revenues	Net Proceeds of Minerals Taxes (1)	Payroll Taxes (2)
2006	$ 74,240,000	$1,200,000	$405,000	$1,980,000	$1,051,711
2007	$ 53,359,000	$838,000	$413,000	$2,500,000	$1,035,278
2008	$ 22,018,000	$375,000	$384,000	$2,400,000	$249,856
2009	$ 21,223,000	$415,000	$368,000	$1,400,000	$201,573

(1) Illustrates current operations through 2009 only. Table 4.14.1 presents annual operating costs and tax information for the No Action Alternative (Alternative A) and the Proposed Action (Alternative B) from 2006 through 2020.
(2) Includes Federal Insurance Contributions Act (FICA), FICA-11 Medicare, federal unemployment, and state unemployment.

3.9 Paleontology

3.9.1 Regulatory Framework

BLM manages paleontological resources under a number of federal laws, including FLPMA Sections 310 and 302(b), which direct BLM to manage public lands to protect the quality of scientific and other values; 43 CFR 8365.1-5, which prohibits the willful disturbance, removal, and destruction of scientific resources or natural objects; 43 CFR 3622, which regulates the amount of petrified wood that can be collected for personal, noncommercial purposes without a permit; and 43 CFR 3809.420(b)(8), which stipulates that a mining operator "shall not knowingly disturb, alter, injure, or destroy any scientifically important paleontological remains … on Federal lands."

In the Omnibus Public Lands Act (OPLA) passed in 2009, the Paleontological Resources Preservation subtitle clarifies requirements that paleontological resources collected under permit on public lands remain federal property and must be preserved in an approved repository where they can be available for scientific research and public education. It also affirms the need for maintaining confidentiality of localities and defines penalties for theft and vandalism. BLM is currently developing regulations to implement the subtitle.

Instruction Memorandum (IM) No. 2008-009 (BLM 2007c) defines BLM classification system for paleontological resources on public lands. The descriptions for the classes used in the Potential Fossil Yield Classification (PFYC) system serve as guidelines rather than strict definitions. Knowledge of the geology and the paleontological potential for individual units or preservational conditions should be considered when determining the appropriate class assignment. In addition, IM No. 2009-011 (BLM 2008), effective October 10, 2008, provides guidelines for assessing potential impacts to paleontological resources in order to determine mitigation steps for federal actions on public lands under the FLPMA and NEPA. Together, these 2 IMs, with the PFYC system, provide guidance for the assessment of potential impacts to paleontological resources, field survey and monitoring procedures, and recommended mitigation measures that protect paleontological resources impacted by federal actions.

3.9.2 Affected Environment

Information detailing the geologic formations in the vicinity of the Mine was obtained from the USGS preliminary integrated geologic map database (Crafford 2007).

The Humboldt Range is known as a rich locality for Middle Triassic paleontology. Although the fossil record is discontinuous across the range, it has one of the most complete records of

Triassic marine fauna known to exist. The main geologic units exposed within and adjacent to the Mine boundary include the Limerick Formation, Rochester Formation, and Weaver Formation of the Permian to Lower Triassic Koipato Group, and to a lesser extent Quaternary alluvium. The Koipato Group is generally volcanic in origin, and the potential for fossil occurrence at the Mine is limited to tuffaceous sedimentary units of the Weaver and Rochester formations. The Weaver Formation contains a greater amount of tuffaceous sedimentary rocks than the underlying Rochester Formation, and fossil occurrence is limited to ammonite impressions in the upper fine-grained portion of this formation. Following deposition, both the Rochester and Weaver formations have undergone hydrothermal alteration and mineralization. Due to the limited fossil occurrence and hydrothermal alteration of these units in the Mine area, these formations are considered to have a low potential for yielding major fossil deposits. The Limerick Formation is unfossiliferous and as a result does not have any paleontological significance.

Within and adjacent to the Mine, alluvial deposits are located within drainages and alluvial fans along the western flank of the Humboldt Range. The thickness of the alluvium varies considerably across the Mine site and is generally limited in the vicinity of the pit, with bedrock at or close to the surface. The erosional and depositional nature of the alluvial deposits makes it difficult to predict the potential for fossil occurrences. Any fossils that may be located within the alluvium could have been transported long distances from their original depositional area (Crafford 2007).

Fossil Hill is a widely recognized fossil locality approximately 3 miles east of the Mine that has been the site of extensive paleontological study in the past. Fossiliferous strata in this location are assigned to the Fossil Hill member of the Prida Formation, which forms the oldest part of the Star Peak Group. It is one of the most fossiliferous Triassic localities in North America. Besides having an abundance of individuals and different species, this area is unique in that nearly a dozen successive faunas are represented within a relatively small thickness of strata (Silberling 1962).

BLM has classified and mapped formations in the Winnemucca District Office using the PFYC system (BLM 2010a). The PFYC system assigns a designation (classes 1 through 5) to geologic units to denote their paleontological sensitivity for planning purposes. Class 1 geologic units have the lowest paleontological sensitivity and are not likely to contain recognizable fossil remains. Class 5 geologic units have a very high paleontological sensitivity and consistently and predictably produce scientifically significant fossils. Formations within the Mine Plan of Operations boundary area range up to Class 4, but no important fossils have been identified in the formations within the Mine boundary to date. No fossils have been found in the alluvium deposits within the Mine area. The formations that are within the footprint of the proposed new disturbance are all PFYC Class 1.

3.10 <u>Soils</u>

3.10.1 Regulatory Framework

BLM regulations for surface management of public lands mined under the General Mining Law of 1872 (30 U.S. Code [USC] Section 22 *et seq.*) are provided in 43 CFR 3809. Specifically, 43 CFR 3809.420 requires mining-related activities to minimize impacts to soil resources. Guidance for reclamation is provided in BLM (1992) Handbook H-29 3042-1.

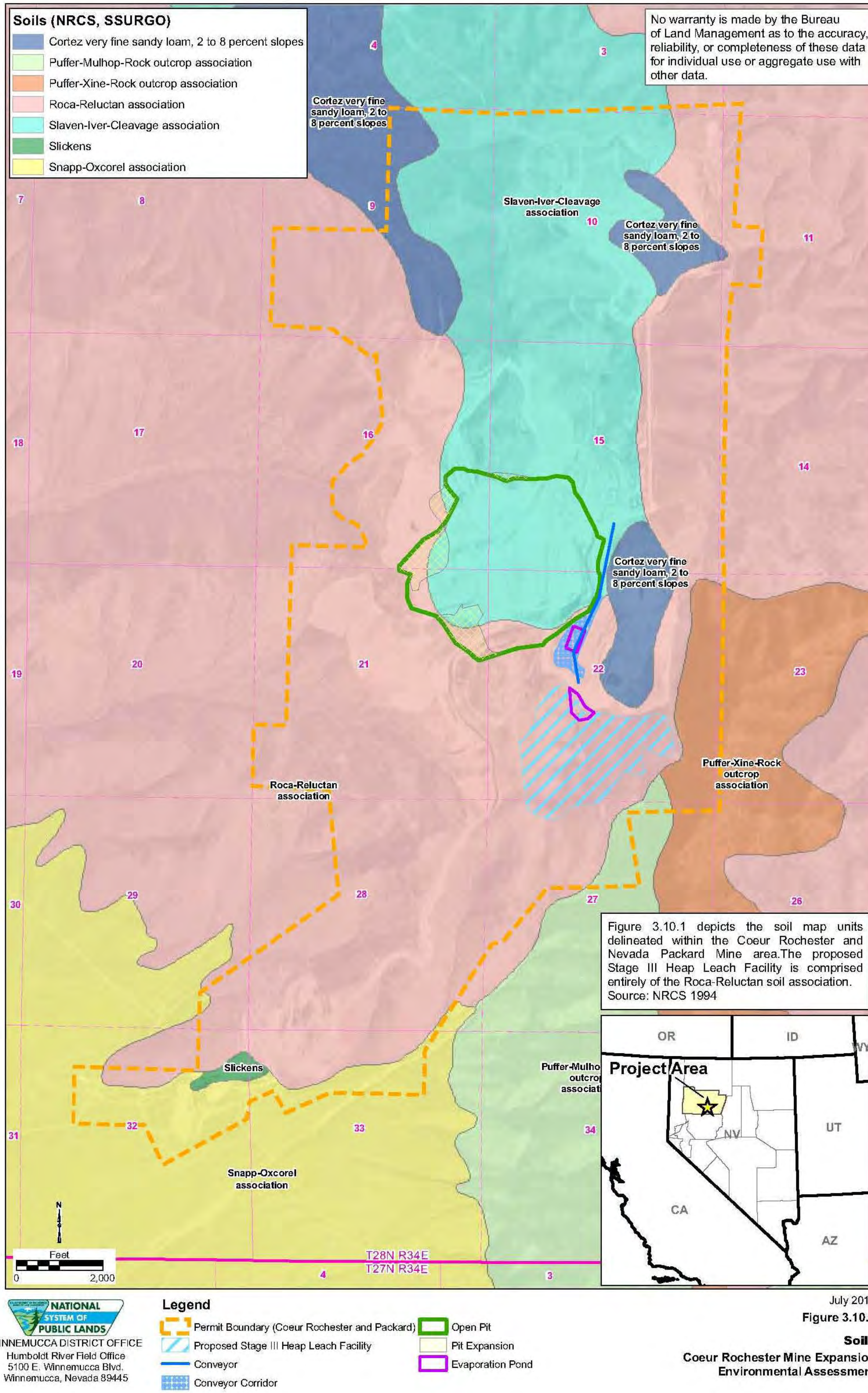
NAC 445A.350-.447 (Mining Facilities) and NAC 519A.010-.415 (Regulation of Mining Operations) were developed to implement the requirements of the NRS 445A.300-.730 (Water Pollution Control) and NRS 519A.010-.290 (Reclamation of Land Subject to Mining Operations). The purpose of these statutes is in part to ensure that the lands disturbed by mining operations are reclaimed to safe and stable conditions, which includes soil conservation through erosion control.

Soil erosion is governed by EPA stormwater management regulations, derived as part of the Clean Water Act (CWA). Under the CWA, the National Pollution Discharge Elimination System (NPDES) stormwater program requires authorization to discharge stormwater under a NPDES permit and the development and implementation of a SWPPP with appropriate erosion control features designed to meet BMP and Natural Resources Conservation Service performance standards. In the state of Nevada, the NPDES program is implemented by NDEP. A current SWPPP is in effect at the Mine (Coeur 2008).

3.10.2 Affected Environment

The Mine is located in a mountainous area with soils that are primarily shallow and provide limited quantities for stockpiling and subsequent use as a growth media. Within the proposed Stage III Heap Leach Facility area, soils are moderately and very deep. Soils within the proposed Stage III Heap Leach Facility area consist of colluvial, alluvial, and aeolian deposits. These soils are suitable for use as growth media on Stage III and other features. Soils within the proposed Stage III Heap Leach Facility area could yield 400,000 to 600,000 cubic yards of growth media.

Based on the NRCS (1994) Soil Survey of Pershing County, Nevada, soil map units delineated within and adjacent to the Mine include Roca-Reluctan, Slaven-Iver-Cleavage, Cortez, Snapp-Oxcorel, Puffer-Xine-Rock outcrop, Puffer-Mulhop-Rock, and Slickens soil associations (NRCS 1994;). These soils are typical of the steep mountain slopes and gently sloping alluvial valleys of the north-central Great Basin. Slopes vary from gently sloping piedmonts and fan skirts with moderate runoff to steep foothills and side slopes with moderate to rapid runoff. The Roca-Reluctan soil association underlies the proposed Stage III Heap Leach Facility area. Virtually all 162.0 acres of the proposed new disturbance would occur within the Roca-Reluctan soil association. The Roca-Reluctan soil association consists of very cobbly loam and gravelly loam, and it has a moderate to severe water erosion potential and slight wind erosion potential. The Roca-Reluctan soil association shows very slow to moderately slow permeability and rapid runoff potential (NRCS 1994).



Soils (NRCS, SSURGO)
Cortez very fine sandy loam, 2 to 8 percent slopes
Puffer-Mulhop-Rock outcrop association
Puffer-Xine-Rock outcrop association
Roca-Reluctan association
Slaven-Iver-Cleavage association
Slickens
Snapp-Oxcorel association
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.
Cortez very fine sandy loam, 2 to 8 percent slopes
Slaven-Iver-Cleavage association
Cortez very fine sandy loam, 2 to 8 percent slopes
Cortez very fine sandy loam, 2 to 8 percent slopes
Puffer-Xine-Rock outcrop association
Roca-Reluctan association
Slickens
Snapp-Oxcorel association
Figure 3.10.1 depicts the soil map units delineated within the Coeur Rochester and Nevada Packard Mine area.The proposed Stage III Heap Leach Facility is comprised entirely of the Roca-Reluctan soil association. Source: NRCS 1994
Project Area
OR
ID
WY
NV
UT
CA
AZ
Feet
0
2,000
T28N R34E
T27N R34E
4
3
7
8
9
10
11
18
17
16
15
14
19
20
21
22
23
30
29
28
27
26
31
32
33
34
4
3
Legend
Permit Boundary (Coeur Rochester and Packard)
Proposed Stage III Heap Leach Facility
Conveyor
Conveyor Corridor
Open Pit
Pit Expansion
Evaporation Pond
NATIONAL SYSTEM OF PUBLIC LANDS
WINNEMUCCA DISTRICT OFFICE
Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, Nevada 89445
July 2010
Figure 3.10.1
Soils
Coeur Rochester Mine Expansion
Environmental Assessment

Left Blank Intentionally

3.11 Special Status Species

3.11.1 Regulatory Framework

Special status species are those species for which state or federal agencies afford protection by law, regulation, or policy. Included in this category are federally threatened and endangered species which are protected by Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended; species identified as federally proposed or candidate for listing by USFWS; plant species protected by NRS 527.270-.300; wildlife on the Nevada State Protected Animal List (NAC 501.100-503.104); species protected under the Bald and Golden Eagle Protection Act (BGEPA) of 1940, as amended (16 USC 668-668d); and species designated as sensitive species by BLM, which are species that require special management consideration to avoid potential future listing under the ESA and that have been identified in accordance with procedures set forth in BLM Manual 6840.

In addition, species petitioned for federal listing and for which protection may be warranted are not required to be protected but are typically considered high priority species by state and federal agencies. An additional category included in this special status species discussion is rare plants that are tracked by the Nevada Natural Heritage Program (NNHP), which is not a statutory category but is considered during agency planning.

Avian species that are protected under the MBTA but that are otherwise not special status species are discussed in Section 3.5–*Migratory Birds*.

3.11.1.1 Bureau of Land Management

BLM maintains a list of plant and animal species that are designated as sensitive for which population viability is a concern, as indicated by a downward trend in population numbers, density, or habitat conditions that would reduce existing distribution of a species. BLM policy requires that actions authorized, funded, or carried out by the agency do not contribute to the listing of any sensitive species as threatened or endangered under the ESA. BLM Manual 6840 defines sensitive species as "…those species not already included as BLM Special Status Species under (1) federal listed, proposed, or candidate species, or (2) State of Nevada listed species."

3.11.1.2 Nevada Natural Heritage Program

The general location and status of Nevada's sensitive plants and natural biological communities are compiled in an inventory maintained by the NNHP. In addition to federal and state protected species, the NNHP tracks species for which the scientific community in Nevada has concern. Designations of rare plants are based on global, national, and sub-national status ranking with respect to the species abundance and distribution globally and within Nevada. The designations do not afford legal status or protection for the species, but agencies do consider the listings in their planning and decision-making processes.

3.11.1.3 State of Nevada

Twenty-four plant taxa have been declared to be threatened with extinction pursuant to NRS 527.270-.300 and are on the state list of fully protected species of native flora (NAC 527.010), also known as the Critically Endangered Species List (Nevada Legislature 2010a). For each of these species, no member of its kind may be removed or destroyed at any time by any means except under special permit issued by the State Forester Firewarden (NRS 527.270).

NAC 503.030-.080 includes lists of species of mammals, birds, fish, amphibians, and reptiles that are classified by the state of Nevada as protected and those protected species that are further classified as threatened or sensitive (Nevada Legislature 2010b).

3.11.1.4 U.S. Fish and Wildlife Service

The ESA is administered by USFWS, in consultation with other federal and state agencies. The ESA affords protection to species classified as threatened or endangered, as well as to habitats which are designated by the Secretary of the Interior to be critical to such species. The ESA prohibits the "taking" (i.e., killing, harming, or harassment) of listed species without special exemptions. As defined by the ESA, an endangered species is any species that is in danger of extinction throughout all or a significant portion of its range. A threatened species is any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Proposed, candidate, and petitioned species receive no statutory protection under the ESA; however, USFWS encourages conservation efforts for these species, and federal agencies afford them consideration in their planning and decision making processes.

In addition, the BGEPA provides federal protection to the bald eagle (*Haliaeetus leucocephalus*) and the golden eagle (*Aquila chrysaetos*), prohibiting the direct or indirect taking of an eagle, eagle part or product, or eagle nest.

3.11.2 Affected Environment

The following discussion of special status species is based on the following sources of information:

- Baseline data collection efforts and assessments conducted for the Mine, identified and summarized in this section as well as in sections 3.10–*Soils*, 3.12–*Vegetation*, and 3.14–*Wildlife*.
- Special status species field survey conducted for the proposed Stage III Heap Leach Facility (JBR Environmental Consultants 2010).
- Consultation with NDOW, including database search results for the known or potential occurrence of special status species within a 3-mile buffer of the permitted Plan of Operations boundary for the Mine (NDOW 2010a) and telephone conversations with NDOW wildlife specialists (Tetra Tech 2010a, b).
- NNHP (2010) database search results for endangered, threatened, candidate, and/or at risk plant and animal taxa recorded within a 2-kilometer radius of the permitted Plan of Operations boundary for the Mine.
- Informal consultation with USFWS (2010a, b).

3.11.2.1 Special Status Plants

The 2010 USFWS list of protected species by county identifies no plant species for Pershing County (USFWS 2010b), and informal consultation with USFWS (2010a) identified no listed, proposed, or candidate plant species occurring in the subject project area. The 2010 NNHP data indicate that there are no endangered, threatened, candidate, and/or at risk taxa recorded within 2 kilometers of the Mine, but that habitat may be available for the Lahontan milkvetch (*Astragalus porrectus*), which is determined by the NNHP to be vulnerable (NNHP 2010).

Lahontan milkvetch habitat is described as open, calcareous or alkaline soils, sandy to gravelly washes, alluvium, or gullies on clay badlands, knolls, or playa edges in the shadscale (*Atriplex confertifolia*) zone (NNHP 2001). This species has been recorded at elevations ranging from 4,020 to 5,200 feet amsl (NNHP 2001). Field surveys conducted at the Rochester Mine (IME 1992 *in* BLM 2003) and the Packard Mine (AEE 2000a) did not identify this species. The proposed Stage III Heap Leach Facility site is comprised entirely of the Roca-Reluctan soil association (Section 3.10–*Soils*). The soil properties of the Roca-Reluctan association are non-saline and have a 10 percent maximum content of calcium carbonate, making this soil association only mildly alkaline (NRCS 1994). Furthermore, the site, at 5,400 to 7,300 feet amsl, is above occurrences of shadscale. Therefore, it is unlikely that occupied Lahontan milkvetch habitat exists at the proposed Stage III Heap Leach Facility site. In 2010, the site and an approximately 250-foot buffer were surveyed for the presence of potential Lahontan milkvetch habitat, and the conclusion was that the survey area does not represent habitat that would support this species (JBR Environmental Consultants 2010).

3.11.2.2 Special Status Wildlife

A comprehensive list of the species identified by various consultation efforts, and thus, determined to be warranted for detailed analysis in this EA, is provided in **Table 3.11.1**, along with the state and federal listing status for each of these species based on the NNHP (2009) Plant and Animal At-Risk Tracking List. The rationale for including each of these species for detailed analysis in the EA is presented below.

Informal consultation with USFWS (2010a, b) identified no listed or proposed species occurring in the Mine area; however, one candidate species, the greater sage-grouse (*Centrocercus urophasianus*), may occur in the area. The 2010 NNHP data indicate that there are no endangered, threatened, candidate, and/or at risk taxa recorded within 2 kilometers of the Mine, but NNHP recommended contacting NDOW for more information regarding sage-grouse and raptors (NNHP 2010). NDOW (2010a, b) identified mapped sage-grouse distribution and core breeding habitat within 3 miles of the Mine. NDOW (2010a) also identified 3 special status raptor species (golden eagle, northern goshawk, and peregrine falcon) and one special status bat species (Townsend's big-eared bat) within 3 miles of the Mine. In addition, the pygmy rabbit (*Brachylagus idahoensis*) has recently been under review for federal listing (USFWS 2010c), and BLM determined that an inventory for the presence of pygmy rabbit would be required for the area to be disturbed by the proposed project; however, survey results were negative (JBR Environmental Consultants 2010). Migratory birds that are known to reside in the area (NDOW 2010a) and are protected under the MBTA, but that are otherwise not special status species, are discussed in Section 3.5–*Migratory Birds*.

Table 3.11.1: Special Status Wildlife Species Warranting Detailed Analysis

Common Name	Scientific Name	Status
Birds		
Greater sage-grouse	*Centrocercus urophasianus*	USFWS Candidate, Nevada State Protected Animal
Golden eagle	*Aquila chrysaetos*	MBTA, BGEPA, BLM Nevada Sensitive
Northern goshawk	*Accipiter gentilis*	MBTA, BLM Nevada Sensitive, Nevada State Protected Animal, NDOW Species of Special Concern
Burrowing owl	*Athene cunicularia*	BLM Nevada Sensitive
Long-eared owl	*Asio otus*	BLM Nevada Sensitive
Short-eared owl	*Asio flammeus*	BLM Nevada Sensitive
Swainson's hawk	*Buteo swainsoni*	BLM Nevada Sensitive
Prairie falcon	*Falco mexicanus*	BLM Nevada Sensitive
Peregrine falcon	*Falco peregrinus*	MBTA, BLM Nevada Sensitive, Nevada State Protected Animal
Mammals		
Pygmy rabbit	*Brachylagus idahoensis*	Under review for federal listing, BLM Nevada Sensitive
Small-footed myotis	*Myotis ciliolabrum*	BLM Nevada Sensitive
California myotis	*Myotis californicus*	BLM Nevada Sensitive
Western pipistrelle	*Parastrellus Hesperus*	BLM Nevada Sensitive
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM Nevada Sensitive, Nevada State Protected Animal

<u>Greater Sage-Grouse</u>

The USFWS announced on March 23, 2010, that the best scientific information, including new genetic analysis, does not support recognition of a western subspecies of the greater sage-grouse (USFWS 2010d). This announcement is included in USFWS's decision that the listing of greater sage-grouse is warranted for ESA protection but is precluded by higher listing priorities (USFWS 2010d). The greater sage-grouse will be placed on the candidate list for future action (USFWS 2010a, d).

Because greater sage-grouse are known to occur within and/or near the project area, USFWS recommended analysis of the potential impacts from the proposed project on the greater sage-grouse (USFWS 2010a). NDOW (2010a, b) data indicate that sage-grouse distribution, including nesting, summer, and winter habitats are mapped within and around the Mine (**Figure 3.11.1**) and that sage-grouse core breeding habitat is mapped at the northern periphery of the 3-mile buffer of the Mine. The Mine is located within the Humboldt Sage Grouse Population Management Unit (PMU), which generally consists of the entire Humboldt Mountain Range area. According to NDOW wildlife specialists, this PMU has low sage-grouse activity with likely 50–100 sage grouse individuals in the 6–7 mile radius of the Mine (Tetra Tech 2010a).

The nearest lek to the proposed project is located in the Indian Creek drainage approximately 6–7 miles north of the Mine. Although potential habitat for sage-grouse exists, exploration of mineral deposits and wildland fires are the likely reasons for low numbers of sage-grouse in the area (Tetra Tech 2010a).

During a helicopter survey conducted in 1999, no sage-grouse use was observed at the closest known lek locations, nor were any sage-grouse leks or individuals observed within the Mine area; however, sage-grouse were heard vocalizing approximately 2 miles from the Mine (AEE 2000b). In 2002, a monitoring/survey plan for sage-grouse for the Nevada Packard Mine area was developed (BLM 2003). No sage-grouse were seen or heard during the 2002 survey. In addition to the survey, several members of BLM and NDOW visited the site during 2002. The 2 lek surveys and 3 daylight visits were consistent in their results: no leks, birds, or bird signs were observed (BLM 2003).

Golden Eagle

Golden eagles are known to reside within 3 miles of the Mine (NDOW 2010a), and USFWS (2010a) recommended analyzing project impacts to affected individuals, their habitats, and regional populations. Suitable golden eagle foraging habitat exists in and around the Mine, consisting of juniper woodlands, shadscale shrublands, and sagebrush shrublands intermixed with open areas, where rabbits and small rodents are available (Tesky 1994; NDOW 2010a). Golden eagles generally nest on cliff ledges and in tall trees when cliffs are not available (Tesky 1994), which are not available in the vicinity of the Mine.

Northern Goshawk

Northern goshawks are known to reside within 3 miles of the Mine (NDOW 2010a). Potential northern goshawk foraging habitat exists in and around the Mine, consisting of juniper shrublands intermixed with open areas (Griffith 1993, NDOW 2010a). This species uses stands of old-growth forests for nesting (Griffith 1993), which are not available in the vicinity of the Mine.

Burrowing Owl

One pair of burrowing owls has been encountered occupying an abandoned kit fox burrow located on a rock pile immediately west of and adjacent to the Nevada Packard Old Heap Leach Pad 1 (AEE 2000b). Although no young owls were observed, the birds were presumed to be nesting. No colony-forming ground squirrels (e.g., Richardson's ground squirrel [*Spermophilus richardsonii*]) have been observed in or near the Mine (AEE 2000b). When this species is present, conspicuous colonization by burrowing owls often occurs. However, additional abandoned kit fox burrows were observed in the area and represent potential additional nesting sites for burrowing owls.

Long-eared Owl

Long-eared owl range is known to occur within 3 miles of the mine area (NDOW 2010a). This species nests in trees with dense vegetation and forages in open areas (NatureServe 2009). The prey of the long-eared owl consists of small mammals such as voles and mice (NatureServe 2009).

Short-eared Owl

Short-eared owl range is known to occur within 3 miles of the mine area (NDOW 2010a). This species is ground nesting and will construct nests in small holes scraped in the ground (NatureServe 2009). Areas with high density rodent populations are preferred for short-eared owl breeding and foraging habitat (NatureServe 2009). Vegetation characteristics of short-eared owl nesting and foraging habitat include marshes, bogs, dunes, grasslands, open woodlands, and old fields (NatureServe 2009).

Swainson's Hawk

Swainson's hawk range is known to occur within 3 miles of the mine area (NDOW 2010a). Breeding habitat for this species includes sagebrush and pinyon-juniper woodlands (Tesky 1994b). Foraging habitat includes open areas such as grasslands and other areas with short vegetation supporting populations of small mammals, reptiles, birds, and insects (Tesky 1994b).

Prairie Falcon

Prairie falcon range is known to occur within 3 miles of the mine area (NDOW 2010a). Breeding habitat for this species consists of foothills and mountains that provide cliffs and escarpments suitable for nest sites (Tesky 1994c). Foraging habitat for prairie falcon includes open areas such as shrublands and grasslands with ground squirrel populations (Tesky 1994c).

Peregrine Falcon

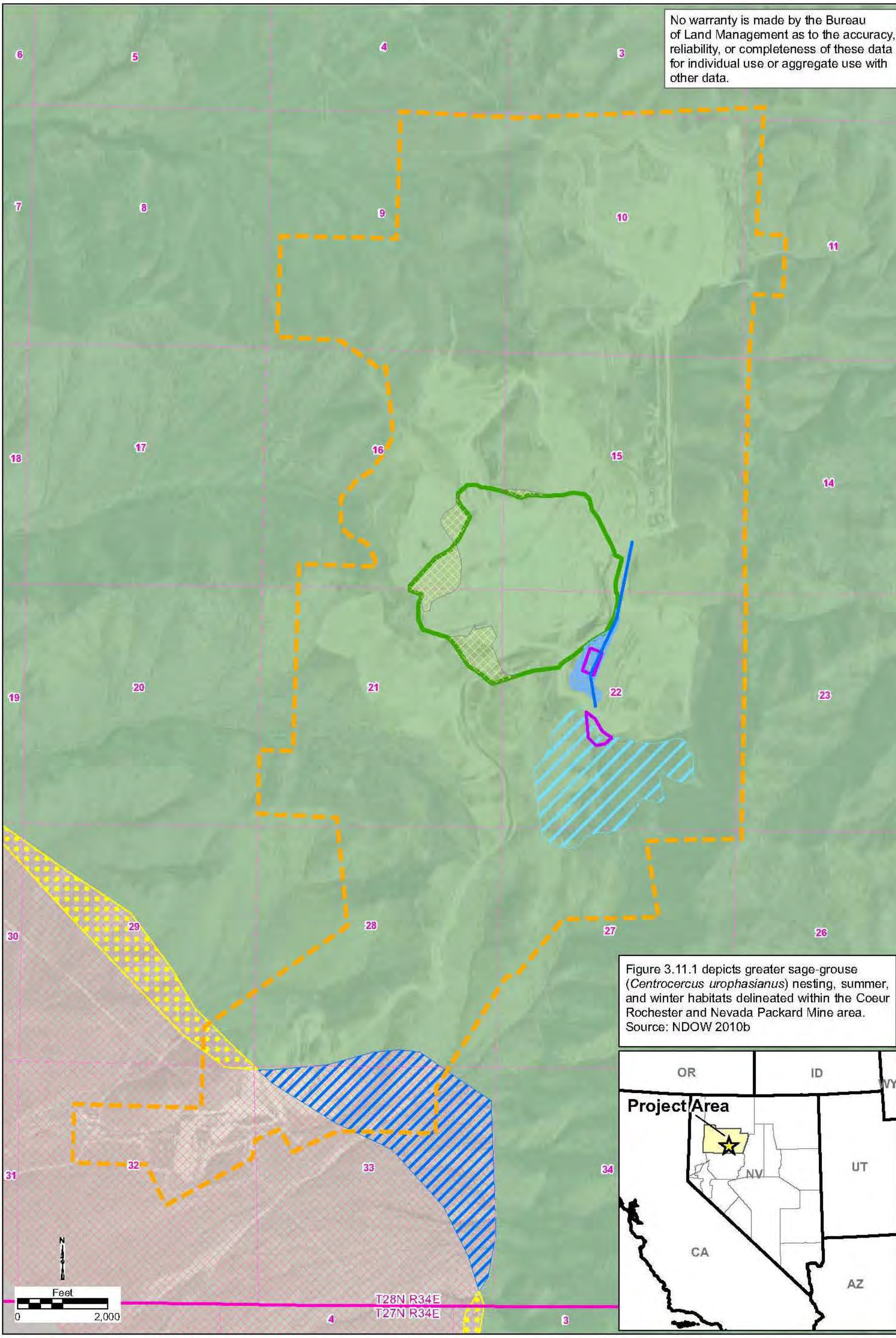
The peregrine falcon is known to have range within 3 miles of the Mine (NDOW 2010a). Peregrine falcon foraging habitat in the southwest includes savannahs and shrubland steppes (Snyder 1991). Potential foraging habitat for this species exists in and around the Mine, consisting of sagebrush shrubland and juniper woodland. Peregrine falcon nesting habitat consists of ledges on high cliffs, usually overhanging and within 2 miles of water (Snyder 1991), which are not available in the vicinity of the Mine.

Pygmy Rabbit

On January 8, 2008, USFWS issued a 90-day finding that a petition to list the pygmy rabbit presented substantial scientific information that listing the species may be warranted, and therefore, USFWS would initiate a status review regarding listing the species (USFWS 2008). On September 29, 2010, the USFWS issued a finding stating pygmy rabbits do not warrant protection under the ESA in California, Nevada, Oregon, Idaho, Utah, Wyoming, and Montana. The pygmy rabbit is not protected under NRS 501 but is protected as a BLM Sensitive species (NNHP 2009). Currently, the pygmy rabbit is also listed as a game species in Nevada (NDOW 2009).

The pygmy rabbit is a sagebrush-obligate species, closely associated with large, dense, clumped stands of basin big sagebrush growing in deep, loose, friable soils. Burrows are generally on flatter ground, sometimes on moderate slopes, and not on steep ground (Roberts 2003).

Currently, BLM considers big sagebrush (*Artemisia* (*A.) tridentata* ssp.) to be an indicator of potential pygmy rabbit habitat, and any areas proposed for disturbance that have a cover of big sagebrush must be inventoried for the presence of pygmy rabbits.



NATIONAL SYSTEM OF PUBLIC LANDS

WINNEMUCCA DISTRICT OFFICE
Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, Nevada 89445

Legend

- Permit Boundary (Coeur Rochester and Packard)
- Conveyor
- Conveyor Corridor
- Proposed Stage III Heap Leach Facility
- Open Pit
- Pit Expansion
- Evaporation Pond

Sage Grouse Habitat (NDOW)

- Nesting
- Summer
- Winter
- Nesting, Summer, and Winter Habitat

July 2010

Figure 3.11.1

Sage Grouse Habitat
Coeur Rochester Mine Expansion
Environmental Assessment

Left Blank Intentionally

The Stage III Heap Leach Facility contains areas of suitable habitat, including occasional patches of mountain big sagebrush (*A. tridentata vaseyana*) in the western part of the site, and areas of taller, denser mountain and big sagebrush (*A. tridentata tridentata*) in the eastern part of the site (JBR Environmental Consultants 2010). In addition, while most of the Mine has very thin soil development, the Stage III Heap Leach Facility site is in a north-facing topographical bowl with good vegetative cover, and therefore, has the potential to have a deeper soil profile. In 2010, the proposed Stage III Heap Leach Facility and an approximately 250-foot buffer in areas of suitable habitat were surveyed for pygmy rabbits (JBR Environmental Consultants 2010). No pygmy rabbits were observed, no evidence of their presence in the area was found, and it was concluded that the area is not occupied by pygmy rabbits. Further, since the area is bordered by existing disturbance on the north and by juniper habitat with low-stature black sagebrush (*A. nova*) on the east, west, and south, colonization of the area by pygmy rabbits in the future seems unlikely (JBR Environmental Consultants 2010). NDOW wildlife specialists indicate that they are unaware of any pygmy rabbits in the area (Tetra Tech 2010a).

<u>Townsend’s Big-Eared Bat</u>
Townsend's big-eared bats are known by NDOW (2010a) to currently reside within a 3-mile buffer of the Mine. The bat surveys conducted by Sherwin and Gannon (2000a) identified an abundance of wintering/hibernating individuals of Townsend’s big-eared bats in the Mine area. Suitable mitigation roosts to replace those lost to mining activities were identified, and bats were relocated, as described in the Nevada Packard Mine Bat Habitat Mitigation Plan (Sherwin and Gannon 2000b). Townsend’s big-eared bats in Nevada tend to forage in forested areas, including juniper, mountain mahogany, mixed-fir, and riparian deciduous habitats, but appear to avoid foraging in open sagebrush/grassland steppe (Gruver and Keinath 2006).

<u>Other Bats</u>
Most bat species are designated as BLM Sensitive. Winter and warm season bat surveys have been conducted at the Mine and at abandoned mines in the vicinity. The purpose of the surveys was to determine bat usage and whether any of these workings included hibernation roosts, and to find mitigation sites for Rochester Mine expansion projects (Sherwin and Gannon 2000a, b; Sherwin et al. 2000). Several portions of mine workings within the Mine were used by relatively large concentrations of wintering Townsend’s big-eared bats (*Corynorhinus townsendii*). Other bat species identified using the Mine area for winter roosts (hibernacula) were small-footed myotis (*Myotis ciliolabrum*), California myotis (*Myotis californicus*), and western pipistrelle (*Parastrellus hesperus*). These bats were relocated per the Bat Habitat Mitigation Plan for the Coeur Rochester Mine (Sherwin et al. 2002). NDOW (2010a) also reports these bat species occurring in the Mine area.

Most bats in Nevada are year-round residents. In general, bats eat insects and arthropods during the warmer seasons and hibernate in underground structures during the cooler seasons. Bats commonly roost in caves, mines, outcrops, buildings, trees and under bridges (WYGF 2005, USFS 2000, NatureServe 2009). Potential roosting habitats at the Mine consists of operations buildings and other permanent or semi-permanent, as well as rock crevices. Bats may eat flies, moths, beetles, ants, scorpions, centipedes, grasshoppers, and crickets. Bats thrive where the plant communities are healthy enough to support a large population of prey (Bradley et al. 2006). Lights and water within the project area may attract individuals that are foraging.

3.12 <u>Vegetation</u>

3.12.1 Regulatory Framework

3.12.1.1 General Vegetation

Public lands under BLM administration at the Mine are managed for multiple uses under the guidance of the Sonoma-Gerlach MFP (BLM 1982). In addition, BLM developed Standards for Rangeland Health and Guidelines for Grazing Management (Standards and Guidelines) for BLM-administered lands in Nevada (BLM 2007a). These Standards and Guidelines set specific conditions to be achieved on BLM lands and the practices that would be applied in order to achieve the Standards and Guidelines. In addition, FLMPA directs the Secretary of the Interior to "take any action necessary to prevent unnecessary and undue degradation of the lands."

3.12.1.2 Reclamation

BLM Surface Management Regulation (43 CFR 3809, as amended; BLM 2000), NRS 519A Mining Reclamation (NDEP 1989), and NAC 519A Regulation of Mining Operations and Exploration Projects (NDEP 1989) require the Plan of Operations to include a Reclamation Plan that facilitates reclamation during operations and at closure.

Specific criteria for successful stabilization and revegetation are discussed in the Nevada Guidelines for Successful Revegetation for NDEP, BLM, and the U.S. Forest Service (USFS) (1988). Success criteria include cover, diversity, maturity of vegetation, effectiveness at intercepting meteoric water, slope stabilization, and erosion control. Control measures must also be implemented to limit the spread and growth of noxious weeds and invasive species.

Vegetation as a component of heap leach closure influences the amount of infiltration through its ability to evapo-transpirate meteoric water from the heap. Evaluation of revegetation in these areas may be subjected to additional success criteria at the discretion of the regulatory agencies to safeguard against potential violations of the Water Pollution Control Act and the related federal and state regulations and statutes.

3.12.2 Affected Environment

The following affected environment discussion for vegetation resources includes a description of vegetation/cover types based on 2 baseline studies conducted at the Rochester Mine (IME 1992 *in* BLM 2003), one baseline study conducted at the Packard Mine (AGRA Earth & Environmental, Inc. [AEE] 2000a), vegetation resources described in the Coeur Rochester and Nevada Packard Mines Expansion Project Environmental Assessment (BLM 2003), and the U.S. Geological Survey (USGS) Gap Analysis Program (GAP) database (USGS 2004).

The Mine is located on the western flank of the Humboldt Range, which is biogeographically described as within the Central Great Basin Section of the Great Basin Floristic Division, Intermountain Region (Cronquist et al. 1972).

Three upland vegetation types and one disturbed vegetation type were identified within the Mine during a study conducted in 2000 (AEE). However, because the extent of these vegetation types was not quantitatively evaluated during that study, the analysis of impacts to specific vegetation communities for this EA was calculated using the USGS (2004) GAP vegetation database. The USGS (2004) GAP vegetation database identified 6 ecological systems within and adjacent to the Mine boundary (**Figure 3.12.1**). For the purposes of this analysis, comparisons were made between the AEE (2000a) study and the USGS (2004) GAP database, as follows.

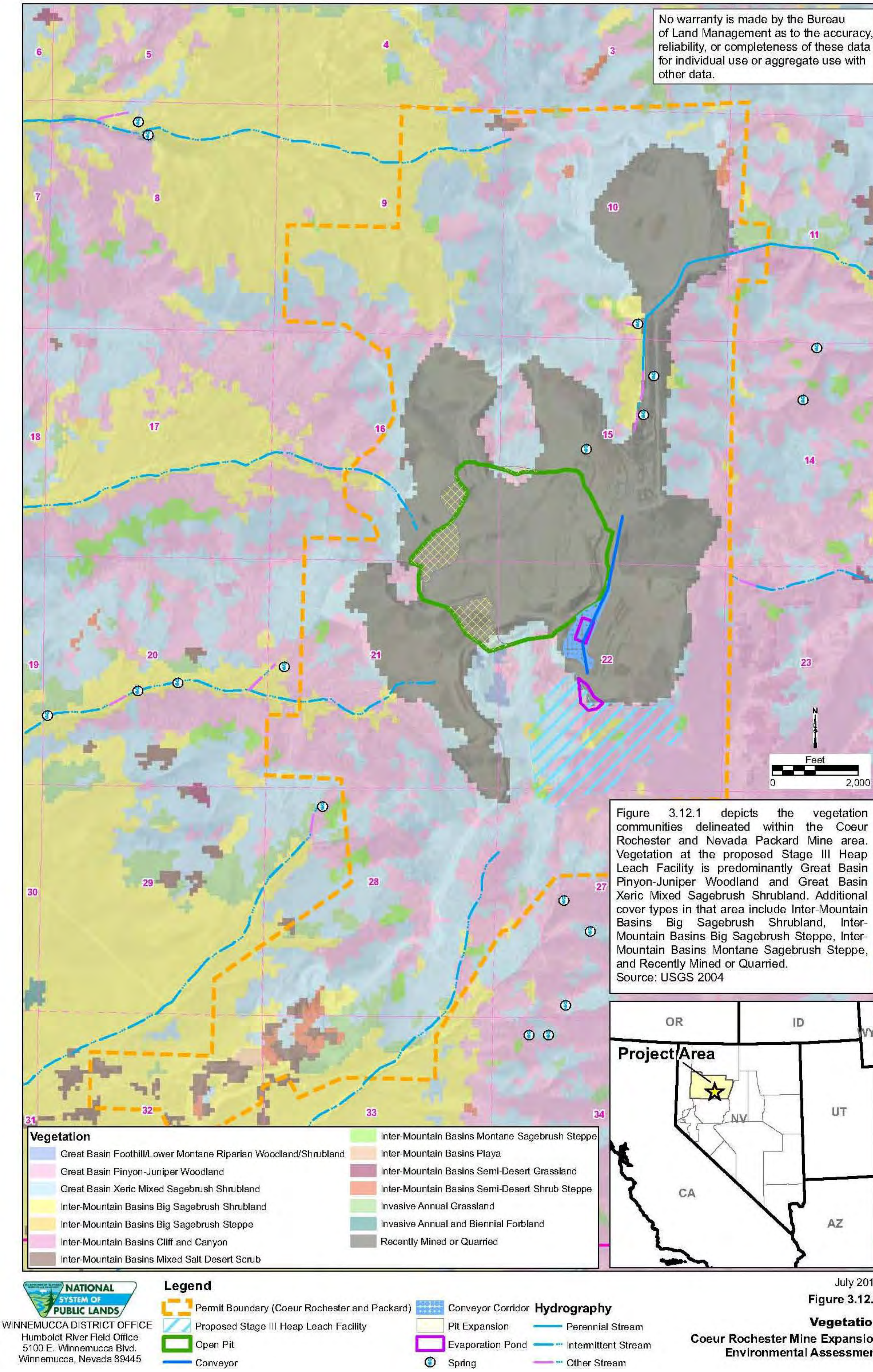
The AEE (2000a) study described the juniper woodland/mountain big sagebrush type as occurring on north-facing, upper elevation slopes, and the juniper woodland/low sagebrush type as occurring on drier, south-facing slopes of variable elevations in the area. For the purposes of this analysis, these types have been correlated with the Great Basin Pinyon-Juniper Woodland ecological system (USGS 2004). This system occurs on warm, dry sites on mountain slopes, mesas, plateaus, and ridges in mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada. It is typically found at lower elevations ranging from 5,300–8,500 feet amsl. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. The Great Basin Pinyon-Juniper Woodland ecological system is comprised of woodlands dominated by pinyon (*Pinus monophylla*) and juniper (*Juniperus osteosperma*), with this site consisting of only juniper. Associated species include shrubs such as low sagebrush (*Artemisia* (*A.*) *arbuscula*), black sagebrush (*A. nova*), and big sagebrush (*A. tridentata* (*t.*)). The understory is variable, but often includes bunch grasses such as Idaho fescue (*Festuca idahoensis*) and bluebunch wheatgrass (*Pseudoroegneria spicata*) (NatureServe 2009).

The AEE (2000a) study found that the southern and northern portions of the Mine consisted of the Wyoming big sagebrush/grassland vegetation type. For the purposes of this analysis, this type has been correlated with the following 4 ecological systems: Great Basin Xeric Mixed Sagebrush Shrubland, Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain basins Big Sagebrush Steppe, and Inter-Mountain Basins Montane Sagebrush Steppe (USGS 2004), each of which is described below.

The Great Basin Xeric Mixed Sagebrush Shrubland ecological system occurs in the Great Basin on dry flats and plains, alluvial fans, rolling hills, rocky hillslopes, saddles, and ridges at elevations between 3,200 and 8,500 feet amsl. Sites are dry, often exposed to desiccating winds, with typically shallow, rocky, non-saline soils. Shrublands are dominated by black sagebrush or low sagebrush and may be codominated by Wyoming big sagebrush (*A. t. ssp. wyomingensis*) or green rabbitbrush (*Chrysothamnus viscidiflorus*). Other shrubs that may be present include schadscale (*Atriplex confertifolia*), Mormon tea (*Ephedra* spp.), and goldenbush (*Ericameria* spp.). The herbaceous layer is likely sparse and composed of perennial bunch grasses such as Indian ricegrass (*Achnatherum hymenoides*), bottlebrush squirreltail (*Elymus elymoides*), or Sandberg bluegrass (*Poa secunda*) (NatureServe 2009). The Inter-Mountain Basins Big Sagebrush Shrubland ecological system occurs throughout much of the western U.S., typically in broad basins between mountain ranges, plains, and foothills between 5,000 and 7,500 feet amsl. Soils are typically deep, well-drained, and non-saline. These shrublands are dominated by big sagebrush (*A. t. ssp. tridentata*) and/or Wyoming big sagebrush. Scattered juniper, greasewood (*Sarcobatus vermiculatus*), and saltbush (*Atriplex* spp.) may be present in some stands. Rubber rabbitbrush (*Ericameria nauseosa*), green rabbitbrush, or antelope bitterbrush (*Purshia tridentata*) may codominate disturbed stands (e.g., burned stands). Perennial herbaceous components typically contribute less than 25 percent vegetative cover. Common graminoid species can include Indian ricegrass, and thickspike wheatgrass (*Elymus lanceolatus*). Some semi-natural communities are included that often originate on abandoned agricultural land or on other disturbed sites. In these locations, cheatgrass (*Bromus tectorum*) or other annual bromes and invasive weeds can be abundant (NatureServe 2009).

The Inter-Mountain Basins Montane Sagebrush Steppe is a widespread matrix-forming ecological system that occurs throughout much of the Columbia Plateau and northern Great Basin, east into the Wyoming Basins, central Montana, and north and east onto the western fringe of the Great Plains in Montana and South Dakota. It is found at slightly higher elevations in the more southern extent of its regional occurrence. Soils are typically deep and non-saline, often with a microphytic crust. This shrub-steppe is dominated by perennial grasses and forbs (greater than 25 percent cover) with big sagebrush (*A. t. ssp. xericensis*), Wyoming big sagebrush, or antelope bitterbrush dominating or codominating the open to moderately dense (10–40 percent cover) shrub layer. Schadscale, green rabbitbrush, or greasewood may be common especially in disturbed stands. Associated graminoids can include Indian ricegrass, plains reedgrass (*Calamagrostis montanensis*), and bluebunch wheatgrass. Idaho fescue is uncommon in this system, although it does occur in areas of higher elevations/precipitation; rough fescue (*Festuca campestris*) is also uncommon. Common forbs are spiny phlox (*Phlox hoodii*) and scarlet globemallow (*Sphaeralcea coccinea*). Areas with deeper soils more commonly support big sagebrush but have largely been converted for other land uses. The natural fire regime of this ecological system likely maintains a patchy distribution of shrubs, so the general aspect of the vegetation is a grassland (NatureServe 2009).

The disturbed area type was characterized by the AEE (2000a) study as consisting of pre-Coeur exploration and mine disturbance, and has been correlated with the Recently Mined or Quarried system (USGS 2004) for the purposes of this analysis.



July 2010

Figure 3.12.1

Vegetation

Coeur Rochester Mine Expansion Environmental Assessment

Left Blank Intentionally

3.13 Visual Resource Management

3.13.1 Regulatory Framework

FLPMA Section 102(a) (8) emphasizes the protection of the quality of scenic resources on public lands. NEPA Section 101(b) requires that measures be taken to ensure that aesthetically pleasing surroundings be retained for all Americans. Based on these requirements, BLM developed the Visual Resources Management (VRM) System (BLM 1984) to identify visual values, establish objectives for managing these values, and provide information to evaluate the visual effects of proposed projects. The inventory of visual values combines evaluations of scenic quality, sensitivity levels, and distance zones to establish visual resource inventory classes that are informational in nature and provide the basis for considering visual values in the land use planning process. VRM classes for public lands are determined through the use of the visual resource inventory as part of BLM's land use planning process. Four VRM classes have been developed, and one class is assigned to each unit of public land. Each VRM class has specific objectives, which vary from very limited management activity (Class I) to activity that allows major landscape modifications (Class IV) (BLM 1986).

3.13.2 Affected Environment

The Mine is located in the Basin and Range physiographic province at the southern extent of the Humboldt Mountain Range. Locally, Rochester, Limerick, and Weaver Canyons are situated to the west of the Mine, and American and South American Canyons are located to the east of the Mine. Packard Flat is located just below the western edge of the Mine. The area to the south of the Mine is a broad, flat-to-gently rolling landscape with abruptly rising foothills and mountains. The elevation of the Mine ranges from approximately 5,400 feet amsl to 7,300 feet amsl.

Vegetation in the valley consists of a shadscale-bunchgrass community with considerable cheatgrass in the understory and a greasewood community adjacent to the Packard Wash. Low sagebrush and Wyoming big sagebrush-bunchgrass communities occur on the upper valley floor and foothills. The higher elevations at the Mine are dominated by juniper mixed with mountain big sagebrush, a tall species growing up to 3 feet high, interspersed with patches of black sagebrush, a lower-growing sagebrush species, roughly 12–18 inches in height. This gives the landscape a coarse appearance, as a mosaic of dark green (juniper) mixed with gray-green (mountain big sagebrush) with coarse texture, with patches of dark-grey (black sagebrush) with a finer texture.

Rock outcrops (reddish brown to brown) are common in the area. The Mine area is generally a mixture of paler tans and browns due to exposed soil or bedrock. The general line of the horizon ranges from curvilinear to jagged, depending on the land form.

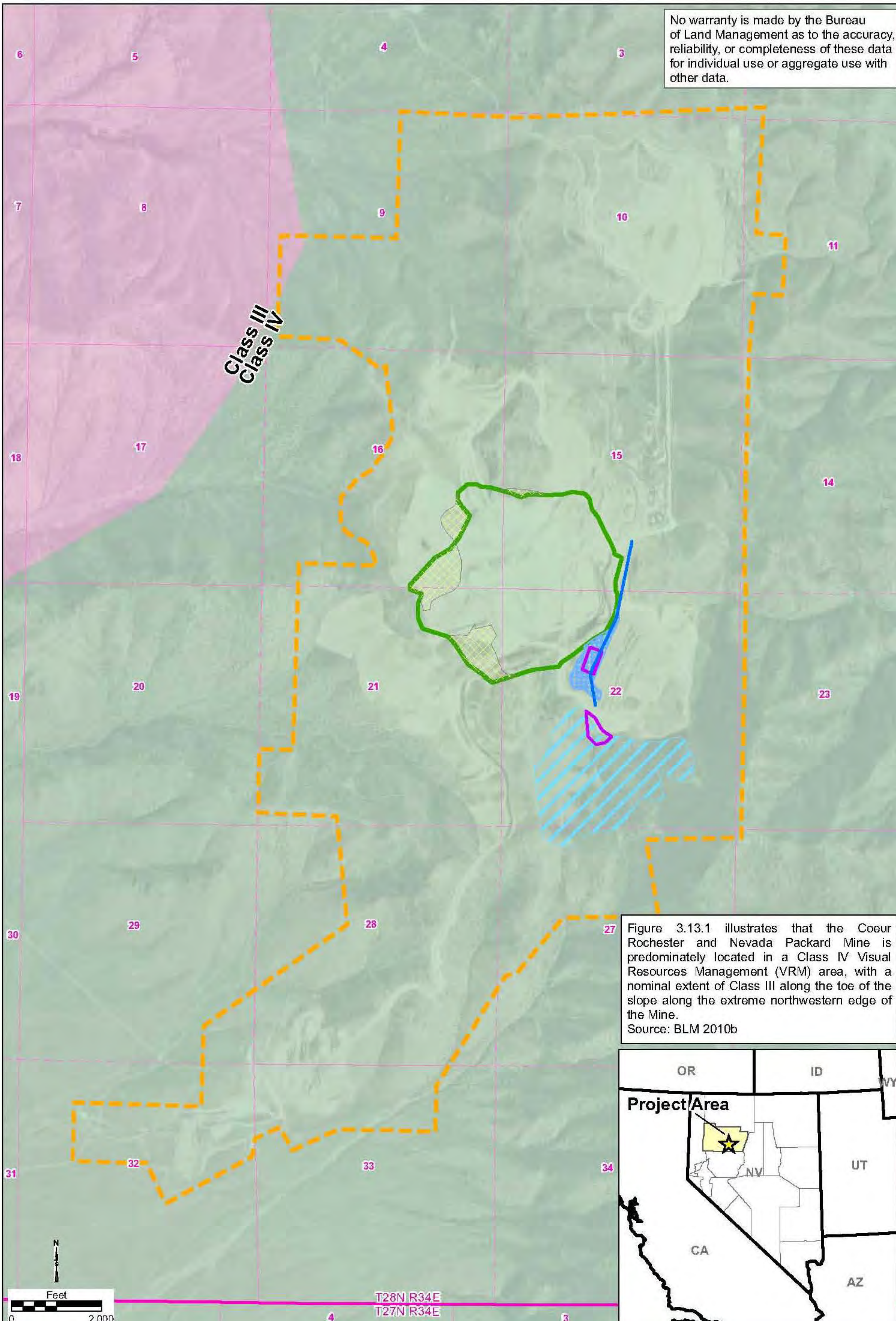
The Mine is located within an area characterized by visually dominant disturbance associated with the historic and existing Mine operations. Mining operations have added linear elements, such as pit benches, heap leach pad benches, a conveyor, fences, roads, power lines, and buildings, which introduce blocky, regular shaped objects into a background of irregularly shaped vegetation and a curvilinear landform.

The Mine is predominately located in a VRM Class IV area, with a nominal extent of Class III along the toe of the slope along the extreme northwestern edge of the Mine (Packard Flat) **Figure 3.13.1**. The objective of Class IV is to provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements (BLM 1986). Mine activities have the tendency to modify the landscape in such a way that mining activity becomes a dominant feature within the landscape. These activities and their subsequent appearance on the land are within the management objectives of the VRM Class IV. The Class III objective is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape (BLM 1986). Since the Mine is within a historic mining district with levels of disturbance pre-existing the designation of the visual classification system, the activities of the Mine would be considered consistent with these management objectives.

During scoping for this EA, the Nevada Division of State Lands identified impacts to visual resources as a concern and highlighted the need to retain "dark sky" attributes. The National Park Service (NPS) defines a dark night sky as an "environment that is undisturbed by light and air pollution" with "natural, cultural, and scenic importance" (NPS 2009). Wildlife species depend on dark skies for hunting, protection, navigation, and reproduction. Plants rely on dark skies to maintain a natural life cycle. Dark skies are also scenic resources, providing a natural lightscape experience for public viewing. Light pollution, primarily caused by artificial light sources, can negatively impact all of these resources (NPS 2009).

Existing, outside lighting is maintained for safety and access at the following Mine facilities: the administrative building, the lab building, the maintenance shop, the crusher administrative building and shop, the process plant, the electric substation facility, the load-out facility, the portable lime silo, the Stage IV Heap Leach Facility area, the heap leach crew maintenance yard and leak detection collection area, the water storage tank, the equipment fueling facilities, the weather station, and the guard shack. The primary, secondary, and tertiary crusher facilities currently have minimal lighting around the road areas. There are streetlights around the administrative and employee parking lots, and maintenance shop area. The Stage II Heap Leach Facility has lighting at the pregnant solution pump facility.

The current lighting is shielded downward for directional lighting as appropriate, and to reduce light pollution. Most of the lights are operated by a photo cell and turn on automatically under low light conditions. The crusher facility lights are manually controlled. The location and topography of the Mine site "terrain shields" facility lighting from general public viewing.



NATIONAL SYSTEM OF PUBLIC LANDS

WINNEMUCCA DISTRICT OFFICE
Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, Nevada 89445

Legend

- Permit Boundary (Coeur Rochester and Packard)
- Conveyor
- Conveyor Corridor
- Proposed Stage III Heap Leach Facility
- Open Pit
- Pit Expansion
- Evaporation Pond

Visual Resources Management Areas

- Class III
- Class IV

July 2010

Figure 3.13.1
Visual Resources Management
Coeur Rochester Mine Expansion Environmental Assessment

Left Blank Intentionally

3.14 <u>Wildlife</u>

3.14.1 Regulatory Framework

The following laws, regulations, guidelines, and procedures are applicable to management of the wildlife resources potentially present at the Mine. BLM's (1982) Sonoma-Gerlach MFP provides management objectives for habitat and populations of big game and upland game birds. In addition, BLM manages public land to supply forage, cover, and water for all wildlife species. Trend studies (BLM Manual 6630.2, 6630.3, and 6630.4) allow BLM to adjust and manage habitat toward a desired condition for multiple uses, including for wildlife. BLM and NDOW signed an MOU in 1971 regarding how wildlife and fisheries resources, and their respective habitats on public lands, would be managed cooperatively by the 2 agencies. The MOU defines BLM's role as managing habitat and NDOW's role as managing populations.

NAC 504.520 requires NDOW's approval for any activity that may obstruct, damage, diminish, destroy, change, modify, or vary the natural shape and form of a stream system or its banks by any type of construction or other activity that is detrimental to wildlife habitat. Such activity includes channelization, thermal pollution, and diversion.

An NDOW Industrial Artificial Pond Permit (NRS 502.390 and NAC 502.460 et seq.) is required for any operator of a mining operation which develops or maintains an artificial body of water containing chemicals directly associated with the processing of ore.

3.14.2 Affected Environment

The following affected environment discussion for wildlife resources is based on several previous baseline data collection efforts, including wildlife habitat assessments and wildlife surveys, that have been conducted for the Mine since operations began in 1986 (Henderson 1986 *in* BLM 2003; IME 1992 *in* BLM 2003; Croft 1993 *in* BLM 2003; AEE 2000b; SRK 2002; Sherwin and Gannon 2000a, b; Sherwin et al. 2000, 2002; JBR Environmental Consultants 2010). In addition to these studies, information provided by more recent wildlife distribution data and consultation with NDOW (NDOW 2010a, b; Tetra Tech 2010a, b) is incorporated into this wildlife discussion.

The vegetation communities present at the Mine are discussed in Section 3.12–*Vegetation*, and the extent of each habitat type is depicted in **Figure 3.12.1**. The wildlife species that have been recorded at the Mine are typical of the arid/semi-arid environment in the central Great Basin.

Raptor and passerine migratory birds are discussed in Section 3.5-*Migratory Birds*. Special status species, including all bats, are discussed in Section 3.11-*Special Status Species*. All other wildlife species, including big game, other mammals, game birds, and reptiles, are discussed in this section.

<u>Big Game</u>
Mule deer (*Odocoileus hemionus*) distribution mapping (NDOW 2010a) indicates that both summer and winter range occur within the Rochester Mine area (**Figure 3.14.1**). During the 1992 study (IME 1992 *in* BLM 2003), no mule deer were observed, and only 2 sets of tracks were observed, at the Rochester Mine. However, recent consultation with NDOW (2010b) indicates that mule deer are known to reside within a 3-mile buffer of the Mine, and the mule deer population is NDOW's primary concern regarding impacts to wildlife from implementation of POA No. 8 (Tetra Tech 2010a, b). Furthermore, tracks and pellets of mule deer were observed

during a recent survey of the proposed Stage III Heap Leach Facility site (JBR Environmental Consultants 2010).

Habitat for pronghorn antelope (*Antilocapra americana*) and potential habitat for desert bighorn sheep (*Ovis canadensis nelsoni*) have been mapped within a 3-mile buffer of the Mine (NDOW 2010b); however, the likelihood of occurrence of these species at the Mine is low (Tetra Tech 2010b). Occurrence of antelope may specifically be low because they tend to be found at lower elevations on the toe slopes of the Humboldt Range and in the valleys where the country is more wide open. Regardless, it is likely that some antelope pass through the Mine site on their travels to different open areas along the Humboldt Range (NDOW 2010d).

Other Mammals

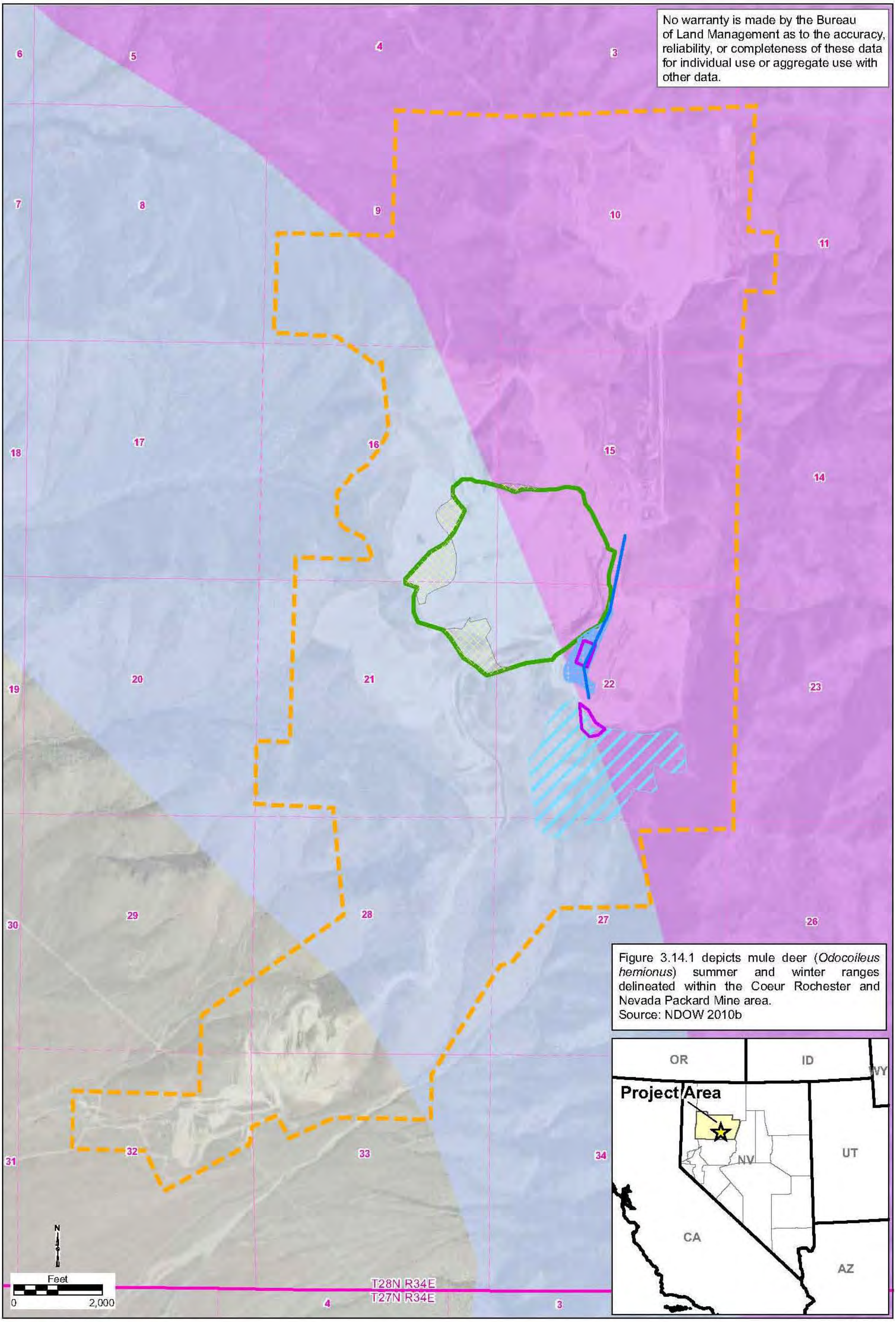
Other mammal species that are common in the area include coyote (*Canis latrans*), kit fox (*Vulpes macrotis*), desert cottontail (*Sylvilagus audubonii*), black tailed jackrabbit (*Lepus californicus*), badger (*Taxidea taxus)*, yellow-bellied marmot (*Marmota flaviventris)*, and white tailed antelope ground squirrel (*Ammospermophilus leucurus*) (AEE 2000). One least chipmunk (*Tamias minimus*) was observed during a recent survey of the proposed Stage III Heap Leach Facility site (JBR Environmental Consultants 2010). Other mammals that are known by NDOW (2010b) to reside within a 3-mile buffer of the Mine include bobcat (*Lynx rufus*), Merriam's kangaroo rat (*Dipodomys merriami*), and Great Basin pocket mouse (*Perognathus parvus*). BLM has reported that cougar (*Felix concolor*) habitat is known to occur in the Humboldt Range. This species has been observed consuming water in the Mine area (NDOW 2010a), although the population is unknown (BLM 2003).

Game Birds

Game birds observed at the Packard Mine include mourning dove (*Zenaida macroura*) and chukar (*Alectoris chukar*) (BLM 1993 *in* BLM 2003). Wild turkeys (*Meleagris gallopavo*) are also known to reside within a 3-mile buffer of the Mine; however, only within a riparian zone that is located at the periphery of the 3-mile buffer zone (NDOW 2010b). In addition, greater sage-grouse (*Centrocercus urophasianus*) distribution is mapped within a 3-mile buffer of the Mine and core breeding habitat is mapped in the northern portion of the 3-mile buffer of the Mine (NDOW 2010b); this species is discussed in Section 3.11–*Special Status Species*. One of these game birds, the mourning dove, is protected under the MBTA (USFWS 2010).

Reptiles

Reptile species observed at the Mine include the western whiptail (*Cnemidophorus tigris*), gopher snake (*Pituophis catenifer*), and Great Basin rattlesnake (*Crotalus oreganus lutosus*) (AEE 2000b). Additional reptile species known by NDOW (2010b) to reside within a 3-mile buffer of the Mine include the desert horned lizard (*Phrynosoma platyrhinos*), Great Basin collared lizard (*Crotaphytus bicinctores*), long-nosed leopard lizard (*Gambelia wislizenii*), western fence lizard (*Sceloporus occidentalis*), western patch-nosed snake (*Salvadora hexalepis*), yellow-backed spiny lizard (*Sceloporus uniformis*), and zebra-tailed lizard (*Callisaurus draconoides*).



NATIONAL SYSTEM OF PUBLIC LANDS

WINNEMUCCA DISTRICT OFFICE
Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, Nevada 89445

Legend

- Permit Boundary (Coeur Rochester and Packard)
- Proposed Stage III Heap Leach Facility
- Conveyor Corridor
- Conveyor
- Open Pit
- Pit Expansion
- Evaporation Pond

Mule Deer Habitat (NDOW)

- Summer
- Winter

July 2010

Figure 3.14.1

Mule Deer Habitat
Coeur Rochester Mine Expansion
Environmental Assessment

Left Blank Intentionally

Monitoring

Coeur conducts regular monitoring and provides quarterly reports to NDOW for mortalities of wildlife at the Mine. Mortalities associated with the permitted pond solutions or structures from the first quarter of 2007 through the third quarter of 2009 were reviewed for affected wildlife. Over this period of time, mortalities associated with the ponds or structures were 2 waterfowl (one egret and one coot), 2 deer, and one jackrabbit. Mortalities documented by NDOW that were not associated with the pond or structures were 4 songbirds (2 starlings, one finch, and one sparrow), one kit fox, and one badger (NDOW 2007a, b, c, d; 2008a, b, c, d; 2009a, b, c).

Left Blank Intentionally

4 ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

This chapter describes the direct and indirect effects (environmental consequences) expected to result from each alternative. The discussion of environmental consequences incorporates measures that would be implemented to avoid, minimize, or mitigate potential adverse effects. A list of environmental protection measures that would be incorporated as part of the project description under all alternatives is provided in Chapter 2. Cumulative effects are addressed in Chapter 5.

4.2 Air Quality

The environmental consequences section discusses the environmental effects of alternatives A–D. The primary indicators of air quality impacts are the Nevada AAQS and EPA NAAQS, which define air pollutant concentrations that are not to be exceeded in ambient air.

Analyses have been performed to quantify the emissions of the applicable criteria pollutants for current emissions at the Mine (Alternative A) and emissions under alternatives B–D. Air emission estimates were made based on the following factors: (1) maximum material throughput; (2) EPA-approved emission factors obtained from EPA's Compilation of Air Pollution Emission Factors, otherwise known as EPA AP-42; (3) existing air quality permits; and (4) information provided by Coeur (Enviroscientists 2010).

A comprehensive list of identified individual potential sources of project-related air pollutant emissions (emission units), organized into "emission groups" of similar activities (e.g., generators, conveyors, crushers, etc.), are presented in Enviroscientists Air Quality Impacts Assessment Report (2010). In all, 38 activities and sources were considered for their pollutant emission potential (Enviroscientists 2010). These activities were further grouped into 11 categories of emissions to characterize emissions under each alternative.

4.2.1 Effects of Alternative A – No Action

4.2.1.1 Air Emissions

Under Alternative A, POA No. 8 would not be approved and no additional mining would occur. Air emissions would be less than currently permitted levels because no additional mining would occur; declining as processing operations decrease and the Mine moves toward full closure in 2014. **Table 4.2.1** provides a summary of the maximum potential emissions of criteria air pollutants under Alternative A. Actual reported 2009 emissions where much lower than the maximum values (**Table 4.2.2**). These data suggest that moving forward actual emissions under Alternative A would be very low, particularly as processing emissions continue to decrease. While the 2009 reported values do not include fugitive emissions (not required to be reported or measured), most of the emissions under current conditions are point source emissions since active mining and crushing operations and associated road traffic are not occurring.

Table 4.2.1: Summary of Maximum Air Emissions by Source Category (pounds/hour) for Alternative A

Emissions Group	Summary of Sources	PM_{10}	$PM_{2.5}$	SO_2	NO_X	CO
In-pit Handling	Under No-Action this activity would not occur	0	0	0	0	0
Ore Handling	Under No-Action this activity would not occur	0	0	0	0	0
Backfill Material Handling	Under No-Action this activity would not occur	0	0	0	0	0
Heap Leaching	Under No-Action no new Heap Leach construction	0	0	0	0	0
Crushing System	Under No-Action very minimal crushing for road base only	0	0	0	0	0
Refinery	Retort, Furnace	0.093	0.093	0.003	1.22	0.495
Slag Crushing	Slag Crushing System	2.46	2.46	0	0	0
Laboratory	Sample Prep, Fire Assay Furnaces	2.06	2.06	0	0	0
Generators	Emergency & General Operation Generators	1.75	1.75	10.6	8.89	8.66
On-site Vehicles	Haul Trucks, Pickups, Flatbeds	21.4	2.47	0.67	14.2	9.75
Other Sources	Lime Silo, Light Plants, Heaters	0.127	0.122	0.0009	0.122	0.07
Total Emissions		**27.89**	**8.955**	**11.2739**	**24.432**	**18.975**

Table 4.2.2: 2009 Point Source Emissions of Criteria Pollutants (pounds/hour)

Criteria Pollutant	Emissions (pounds/hour)
PM_{10}	0.038
CO	4.3×10^{-5}
NO_X	0
SO_2	0.001

4.2.1.2 Air Quality Modeling

Air quality modeling has not been performed for the current operations at the mine, where no active mining is occurring. The concentrations of criteria pollutants at receptor locations, however, would be much lower than those predicted for alternatives B–D because of the very low projected emission rates.

4.2.1.3 Hazardous Air Pollutants

HAPs are also air pollutants that are regulated by NDEP and EPA. HAPs emissions are found at varying levels all over the United States but are generally less common than criteria air pollutants as emissions from the Nevada precious metals industry. EPA requires that HAPs be regulated since they can also harm human health, the environment, or property.

Maximum potential air emissions of HAPs under Alternative A would be 0.041 pounds per hour. Under all alternatives, no individual HAP (including hydrogen cyanide and mercury) would be emitted in a quantity greater than the major source limit of 10 tpy. Also, the combined HAP emissions are less than the major source limit of 25 tpy. Therefore, the project does not constitute a major HAP source.

Specifically, mercury is a naturally occurring element in many soils, volcanic rocks, and marine and geothermal water sources. It assumes many forms and can be found naturally in the environment as free metallic mercury, chemically combined with other elements in a number of soil or rock types, and in the form of methylmercury in plants and animals. Mercury is generally present in the atmosphere in 1 of 3 chemical forms: gaseous elemental mercury, gaseous reactive mercury, or particulate mercury.

Particulate mercury is present naturally in the soils, overburden, and ore at the Mine; therefore, it would be present as a small fraction of all particulate emissions produced during the various mine processes. Material handling; primary, secondary, and tertiary crushing; conveying; and stacking are potential emission sources of particulate mercury. Controls would be applied to each of the processes to reduce overall particulate emissions.

Mercury is often bound in gold ore and can be released into the atmosphere through a variety of thermal treatment processes involved with the refining of gold. Thermal sources of mercury emissions associated with the refining process include a retort oven and reverberatory furnaces. All refining occurs at the existing Mine retort ovens and reverberatory furnaces. Mercury emissions currently are, and would continue to be, controlled as required by the NMCP as shown in **Table 4.2.3**.

Table 4.2.3: Mercury Emissions Controls on Thermal Sources

Thermal Source	Control
Reverberatory furnace (charged emissions)	Wet electrostatic precipitators
Mercury retort (electric)	Mercury condenser with chilled water followed by sulfur impregnated carbon canisters

Pursuant to NMCP regulations, Coeur is required to submit total mercury emissions to BAPC annually. Mercury emissions are calculated for every thermal unit, which is not *de minimis*, using the most recent NDEP-approved stack test emission factor with actual throughput (production) values for the year. For the 2006 reporting year, not all thermal units had been stack tested for mercury emissions. Only Tier-1 units had the requirement to test prior to December 31, 2006; Tier-2 units began testing in the 2007 calendar year. For the 2007 reporting year, all thermal units were stack tested for mercury emissions, except *de minimis* designated units. All units were tested with Method 29, except for a few individual units which used Method 101A.

These source tests had NDEP-approved test protocols and NDEP-approved test results. Total mercury emissions reported in 2007 were 137 pounds for the thermal units in the processing facility. Subsequently, Coeur undertook a number of measures to reduce mercury emissions including: (1) increasing the run times of the mercury retort system that improved mercury recovery, and (2) reducing cooling water temperatures in the wet electrostatic precipitator, which improved mercury control removal efficiencies. In 2008 and 2009, the reported total mercury emissions were approximately 10 and 4 pounds, respectively. For reporting year 2008, which is the most recent EPA quality reviewed data; Coeur reported release of 4,410 pounds of airborne emissions under the TRI Program, of which less than 10 pounds consisted of mercury compounds (EPA 2010b). In 2008, the barren solution input to the process facility, including flow and grade, was comparable to 2007. In 2009, the flow was approximately the same but the grade was lower.

Fugitive mercury emissions would generally come from the pit, crushing, backfill, and heap leaching activities. Under Alternative A, the estimated annual mercury emissions from fugitive sources is less than 0.1 found; reflecting the inactive status of mining operations. Under Alternative A, overall mercury emissions are expected to continue to decline below these levels as refinery operations slow and the Mine moves toward closure.

4.2.1.4 Greenhouse Gas Emissions

Recent scientific evidence suggests there is a direct correlation between global warming and emissions of GHG. GHGs include carbon dioxide, methane, nitrogen oxide, and O_3. Although many of these gases occur naturally in the atmosphere, man-made sources substantially have increased the emissions of GHG over the past several decades.

GHG emissions associated with the proposed project primarily would be associated with the consumption of energy for mining and ore processing over the life of the Mine. Operations that would contribute to GHG emissions include:

- Fuel consumption (vehicles and machinery)
- Electricity consumption (machinery, milling, heap leach water circulation, dewatering)

Total GHG emissions for current operations of the Mine are approximately 1,351 metric tons per year. The current national annual GHG emissions are approximately 7 billion metric tons per year. Alternative A GHG emissions are less than 0.00002 percent of the national level and below EPA’s reporting threshold.

4.2.2 Effects of Alternative B – Proposed Action

Under Alternative B, Coeur would resume mining activities within the Rochester open mine pit to recover approximately 50 million tons of ore. Alternative B would add 5–7 years to the life of mining operations, so the duration of air emissions would be extended for this period.

4.2.2.1 Air Emissions

Table 4.2.4 presents the maximum potential emissions for criteria pollutants under Alternative B. These emissions are representative of facility operations at the maximum projected mining and processing rate.

Table 4.2.4: Summary of Maximum Air Emissions by Source Category (pounds/hour) for Alternative B

Emissions Group	Summary of Sources	PM_{10}	$PM_{2.5}$	SO_2	NO_X	CO
In-pit Handling	Blasting Equipment, Dozers, Loaders, Light Plants	156	91.4	15.1	109	405
Ore Handling	Unloading of Ore, Bulldozing.	1.14	0.387	0.465	9.93	6.60
Backfill Material Handling	Unloading Of Ore, Bulldozing, Wind Erosion	1090	601	0.243	5.18	3.44
Heap Leaching	Unloading of Ore, Bulldozing, Wind Erosion	4.71	2.88	0.405	13.8	9.18
Crushing System	Material transfer, Conveyance, Crushing, Screening.	0.573	0.210	0	0	0
Refinery	Retort, Furnace	0.093	0.093	0.003	1.22	0.495
Slag Crushing	Slag Crushing System	2.46	2.46	0	0	0
Laboratory	Sample Prep, Fire Assay Furnaces	2.06	2.06	0	0	0
Generators	Emergency & General Operation Generators (6)	1.75	1.75	10.6	8.89	8.66
On-site Vehicles	Haul Trucks, Pickups, Flatbeds	42.8	4.94	1.34	28.4	19.5
Other Sources	Lime Silo, Light Plants, Heaters	0.127	0.122	0.0009	0.122	0.07
Total Emissions		**1,302**	**707**	**28**	**177**	**453**

4.2.2.2 Air Quality Modeling

Air quality modeling was conducted to determine if emissions of particulates from the Mine result in ambient air concentrations in excess of NAAQS or AAQS. EPA's designation of AERMOD as the preferred air dispersion model became effective on December 9, 2005. Therefore, AERMOD (version 09292) was selected to conduct the air quality analysis. EPA's recommended default model options were used by Enviroscientists (2010). Dispersion modeling was conducted for 4 of the criteria air pollutants (PM_{10}, $PM_{2.5}$, CO, NO_2, and SO_2) with meteorological data sets for 1993, 1996, and 2000. $PM_{2.5}$ modeling was specifically conducted consistent with EPA's March 23, 2010 memo, "Modeling for Demonstrating Compliance with $PM_{2.5}$ NAAQS." The Scheffe screening method was used to evaluate the Mine's potential to contribute to low-level O_3 concentrations, and to demonstrate compliance with the 1-hour O_3 standard. The Mine does not directly produce O_3. O_3 is produced by photo-chemical reactions involving certain volatile organic compounds (VOCs) and nitrogen oxides (NO_X).

Modeling was not performed for the criteria pollutants lead or O_3 (for the 8-hour standard). As mentioned above, O_3 would not be directly emitted as a pollutant by the facility; however, it was modeled using the Scheffe screening model. The potential for lead emissions from the Mine is considered to be negligible; therefore, no analyses were performed.

As described above, the modeling analysis is designed to demonstrate compliance with the NAAQS. **Table 4.2.5** lists the criteria air pollutants, applicable averaging periods, and standards modeled for compliance with the ambient standards.

Table 4.2.5: Modeled Air Pollutants and NAAQS Applicable Time Periods and Standards

Criteria Pollutant	Averaging Time	Applicable Standard
Particulate Matter < 10 Microns (PM_{10})	24-Hour	150 µg/m^3
	Annual	50 µg/m^3
Particulate Matter < 2.5 Microns ($PM_{2.5}$)	24-Hour	35 µg/m^3
	Annual	15 µg/m^3
Carbon Monoxide (CO)	1-Hour	40,000 µg/m^3
	8-Hour (<5,000 feet)	10,000 µg/m^3
	8-Hour (>5,000 feet)	6,667 µg/m^3
Nitrogen Dioxide (NO_2)	Annual	100 µg/m^3
Ozone (O_3)	1-Hour	235 µg/m^3
Sulfur Dioxide (SO_2)	3-Hour	1,300 µg/m^3
	24-Hour	365 µg/m^3
	Annual	80 µg/m^3

Table 4.2.6 lists the ambient standards, modeled high concentrations, and locations of the modeled highs for the PM_{10} and $PM_{2.5}$ averaging periods modeled at a point of public access. The background concentration for particulate emissions has been added to the modeled high for comparison to the standards. Gaseous pollutants are addressed in **Table 4.2.7**. Under Alternative B, the modeled maximum concentrations of all pollutants are below the applicable NAAQS/AAQS at points accessible to the public.

Table 4.2.6: PM_{10} Modeled High Air Pollutant Concentrations for NAAQS/AAQS Compliance (Alternative B)

Criteria Pollutant	Met Year	Averaging Period	Ambient Standard (µg/m^3)	Modeled High (µg/m^3) (1)	Location (UTM meters)	
					Easting	Northing
Particulate Matter < 10 Microns (PM_{10})	1993	Annual	50	14.84	403,348	4,459,668
	1993	24-Hour	150	147.45	403,348	4,459,668
	1996	Annual	50	13.92	403,348	4,459,668
	1996	24-Hour	150	111.69	403,410	4,459,786
	2000	Annual	50	12.94	403,348	4,459,668
	2000	24-Hour	150	117.30	403,410	4,459,786
Particulate Matter < 2.5 Microns ($PM_{2.5}$)	1993	Annual	15	4.67	403,348	4,459,668
	1993	24-Hour	35	15.21	403,348	4,459,668
	1996	Annual	15	4.08	403,348	4,459,668
	1996	24-Hour	35	13.24	403,410	4,459,786
	2000	Annual	15	4.21	403,348	4,459,668
	2000	24-Hour	35	12.83	403,410	4,459,786

(1) Background included in the particulate modeled highs for comparison to the ambient standard

Table 4.2.7: Gaseous Pollutant Emissions Modeled High for NAAQS/AAQS Compliance (Alternative B)

Criteria Pollutant	Modeled Year	Averaging Period	Ambient Standard (µg/m^3)	Modeled High (µg/m^3)	Location (UTM meters)	
					Easting	Northing
Sulfur Dioxide (SO_2)	1993	3-Hour	1,300	388.57	403,589	4,461,875
	1993	24-Hour	365	55.00	403,589	4,461,875
	1993	Annual	80	6.83	403,589	4,461,897
	1996	3-Hour	1,300	210.03	403,589	4,461,897
	1996	24-Hour	365	69.73	403,589	4,461,897
	1996	Annual	80	6.41	403,589	4,461,897
	2000	3-Hour	1,300	212.82	403,592	4,464,897
	2000	24-Hour	365	53.02	403,589	4,461,897
	2000	Annual	80	6.58	403,589	4,461,897
Nitrogen Dioxide (NO_2)	1993	Annual	100	34.12	403,589	4,461,897
	1996	Annual	100	27.30	403,589	4,461,897
	2000	Annual	100	29.79	403,589	4,461,897
Ozone (O_3)	-	1-Hour	235	189.30	-	-
Carbon Monoxide (CO)	1993	1-Hour	40,000	6,299.17	403,415	4,459,761
	1993	8-Hour	10,000	2,302.17	403,520	4,459,802
	1996	1-Hour	40,000	6,103.01	403,415	4,459,761
	1996	8-Hour	10,000	2,333.91	403,592	4,461,897
	2000	1-Hour	40,000	6,142.12	403,366	4,459,685
	2000	8-Hour	10,000	2,145.90	403,410	4,459,786

4.2.2.3 Hazardous Air Pollutants

Under Alternative B, the maximum potential emission of all HAPs is 0.060 pounds per hour. Using the average mercury grades for ore and waste (from previous mining operations), fugitive mercury emissions would be 0.21 pounds per year. As indicated in Section 4.2.1.3, fugitive mercury emissions would come from the pit, crushing, backfill, and heap leaching activities.

4.2.2.4 Greenhouse Gas Emissions

The estimated annual fuel and electrical power consumption under Alternative B are 1.4 million gallons and 41 thousand megawatts per hour, respectively. Under Alternative B, with fuel and energy consumption as described above, estimated GHG emissions from the project would be approximately 4,000 metric tons annually (Carter Lake Consulting 2009). This level is below EPA's reporting threshold and is less than approximately 0.00005 percent of the national annual GHG emissions.

4.2.3 Effects of Alternative C – Backfill Pit to Create an Evaporative Sink

Under Alternative C, the pit would be backfilled to approximately 6,150 feet amsl instead of 6,175 feet amsl to create a hydrologic sink after Mine closure. The air quality impacts would be essentially the same as Alternative B.

4.2.4 Effects of Alternative D – Out-of-Heap Solution Management

Under Alternative D, a 6.5-acre pond would be constructed outside of the State III pad footprint for process solution management during operations. The air quality impacts would be essentially the same as Alternative B.

4.3 Cultural Resources

Impacts on cultural resources are assessed by applying the "criteria of adverse effect," as defined in 36 CFR 800.5(a): "An adverse effect is found when an action may alter the characteristics of a historic property that qualify it for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, workmanship, feeling, or association." Surface disturbing activities may cause direct impacts to cultural resources through the damage or destruction of historic properties or loss of information by the disturbance of the context of artifacts. Indirect impacts may be created by increased accessibility to important cultural resources, leading to looting or vandalism.

4.3.1 Effects of Alternative A – No Action

Alternative A maintains the status quo under which Coeur would continue to operate and close the Mine under the currently approved Plan of Operations. No additional mining or backfilling would occur, and no additional land disturbance would occur, from this alternative. The Stage II and Stage IV heap leach facilities would be reclaimed. No impacts to cultural resources are anticipated as a result of Alternative A.

4.3.2 Effects of Alternative B – Proposed Action

Because the Mine is already heavily disturbed, any cultural resources present that may be directly affected by surface disturbance would be those that are within the footprint of new disturbance. This includes approximately 162.0 acres at the location of the proposed Stage III Heap Leach Facility and the adjacent ancillary facility area where the evaporation pond would be constructed.

None of the cultural resources present are eligible for listing on the NRHP as individual properties or as contributing elements to the discontiguous NRHP–eligible Rochester Cultural District. Because there are no historic properties present, there would be no anticipated impacts on cultural resources as a result of Alternative B.

Although not anticipated, there is always the possibility that buried cultural resources may be encountered during ground-disturbing activities. However, if any cultural resources are discovered during the proposed operations, environmental protection measures incorporated into Alternative B would be implemented to avoid or minimize impacts on cultural resources.

4.3.3 Effects of Alternative C – Backfill Pit to Create an Evaporative Sink

Under Alternative C, the extent of newly disturbed land, mining and leaching operations, and the implementation of mitigation measures, if necessary, would proceed as described under Alternative B. Therefore, the potential direct and indirect impacts to cultural resources as a result of Alternative C would be the same as those described for Alternative B.

4.3.4 Effects of Alternative D – Out-of-Heap Solution Management

Under Alternative D, the extent of newly disturbed land, mining and leaching operations, and the implementation of mitigation measures, if necessary, would generally proceed as described under

Alternative B. Therefore, the potential direct and indirect impacts to cultural resources as a result of Alternative D would be the same as those described for Alternative B.

4.4 Invasive Nonnative Species

4.4.1 Effects of Alternative A – No Action

Under Alternative A, Coeur would continue to operate and close the Mine under the currently approved Plan of Operations, with no additional disturbance to vegetation that would create potential habitat for invasive, nonnative species populations or promote the spread and establishment of noxious weeds invasive, nonnative species. Closure of the Stage II and Stage IV heap leach facilities would be initiated in 2012 and 2014, respectively. A final permanent closure plan would be submitted as a separate action 2 years prior to final closure of these facilities, as required under NDEP and BLM requirements, and associated NEPA analysis would be conducted.

Coeur employs a noxious weed control plan that would continue to be used to control the establishment and spread of noxious weeds. Coeur would coordinate with BLM prior to herbicide treatment to ensure intended chemicals and formulations are approved for use on BLM administered lands, and that an approved, current Pesticide Use Proposal exists. Herbicides that may be used at the Mine and that are approved for use on public lands include 2,4-D, Bromacil, Chlorsulfuron, Clopyralid, Dicamba, Diflufenzopyr + Dicamba, Diquat, Diuron, Fluridone, Glyphosate, Hexazinone, Imazapic, Imazapyr, Metsulfuron methyl, Picloram, Sulfometuron methyl, Tebuthiuron, and Triclopyr (BLM 2007d).

Under Alternative A, development of a lake in the Rochester Pit after closure would have a negligible effect on invasive, nonnative species.

4.4.2 Effects of Alternative B – Proposed Action

In the 16.4-acre ancillary facility area, vegetation has already been impacted by previous operations. The disturbance of 145.7 acres of established vegetation communities within the footprint of new disturbance of the proposed Stage III Heap Leach Facility would create potential habitat for invasive, nonnative species populations and promote the spread and establishment of invasive, nonnative species. However, these impacts would be minimal based on implementation of environmental protection measures outlined in Chapter 2.

Coeur employs a noxious weed control plan that would continue to be used to control the establishment and spread of noxious weeds. Coeur would coordinate with BLM prior to herbicide treatment to ensure intended chemicals and formulations are approved for use on BLM administered lands, and that an approved, current Pesticide Use Proposal exists. Herbicides that may be used at the Mine and that are approved for use on public lands include 2,4-D, Bromacil, Chlorsulfuron, Clopyralid, Dicamba, Diflufenzopyr + Dicamba, Diquat, Diuron, Fluridone, Glyphosate, Hexazinone, Imazapic, Imazapyr, Metsulfuron methyl, Picloram, Sulfometuron methyl, Tebuthiuron, and Triclopyr (BLM 2007d).

4.4.3 Effects of Alternative C – Backfill Pit to Create an Evaporative Sink

Under Alternative C, the area of disturbance and the reclamation of those areas would proceed as described under Alternative B, and would, therefore, result in direct impacts to noxious weed populations as described for Alternative B. In addition, Alternative C would require construction and traffic activity, as well as implementation of environmental protection measures, similar to those described under Alternative B, and would, therefore, result in indirect impacts to noxious weed populations as described for Alternative B.

As discussed in the SLERA, backfilling the pit to approximately 6,150 feet elevation amsl would cause no consistent surface expressions of water on the backfill surface. However, the hydrologic sink could lead to the spread of noxious weed species, such as tamarisk, which are adapted to wet conditions that would exist on the backfill surface during wetter than normal years and seasonally after storm events and associated periods of runoff.

4.4.4 Effects of Alternative D – Out-of-Heap Solution Management

Under Alternative D, the extent of newly disturbed vegetation and the reclamation of those areas would proceed as described under Alternative B, and would, therefore, cause direct impacts to noxious weed populations as described for Alternative B. In addition, Alternative D would require construction and traffic activity, as well as implementation of environmental protection measures, similar to those described under Alternative B, and would, therefore, result in indirect impacts to noxious weed populations as described for Alternative B.

4.5 Migratory Birds

4.5.1 Effects of Alternative A – No Action

Under Alternative A, Coeur would continue to operate and close the Mine under the currently approved Plan of Operations. No additional mining, backfilling, or disturbance to migratory birds would occur. A lake would ultimately form in the Rochester Pit after closure. The size of the lake would vary seasonally in response to water inputs and evaporative processes; the lake would cover approximately 16.5 acres at its largest and would be approximately 125 feet deep at its deepest part. There would be no additional short-term or long-term disturbance of migratory bird habitat. The Stage II and Stage IV heap leach facilities would be reclaimed, with closure of these components initiating in 2012 and 2014, respectively. A final permanent closure plan would be submitted as a separate action 2 years prior to final closure of these facilities, as required under NDEP and BLM requirements, and associated NEPA analysis would be conducted.

Under Alternative A, there may be a long-term increase in avian (including waterfowl) use of the Mine due to the increase in available surface water that would be provided by the pit lake that would develop. The pit lake would not have avian deterrents installed and would therefore present an opportunity for birds to access the pit lake water. The SLERA (Appendix A) was conducted to evaluate potential ecological risks associated with each of the project alternatives as related to identified receptor organisms specific to the regional ecology and site-specific habitats. Four migratory birds were selected as receptor organisms for analysis; these species can be used as surrogates for inferring the potential impacts to other similar species. Constituents of Potential Concern (COPCs) were identified by comparing predicted water chemistry for each of the pit alternatives. The calculated risks are presented as a Hazard Quotient (HQ), and HQ values equal to or greater than one indicate that the potential risk cannot be eliminated under the conservative assumptions of the SLERA (not that toxicity is expected). Open water would provide the greatest risk to environmental receptors; therefore, the actions associated with the pit were analyzed in the SLERA. Since Alternative A is the only alternative that would result in a large area of permanent open water (i.e., the pit lake), this alternative presents a greater risk than the other alternatives for the pit area. The specific results for each of the 4 analyzed migratory bird species are provided below.

- Red-tailed hawk – The SLERA indicates no potential risk for this species.
- Mallard (Anas platyrhynchos) - The SLERA indicates no potential risk for this species.
- Common barn owl - The SLERA indicates no potential risk for this species.
- Rough-winged swallow (Stelgidopteryx serripennis) - The SLERA indicates that risk cannot be ruled out for Alternative A for the direct ingestion of pit lake water by this species for the following COPC: antimony, boron, cadmium, fluoride, lead, manganese, selenium, thallium, and zinc. For the purposes of this analysis, this species serves as a surrogate for avian species that are insectivorous.

In summary, potential post-closure risks from the pit lake cannot be ruled out for a number of pathways and species. Additional SLERA results are presented in Section 4.14-*Wildlife* and Section 4.11-*Special Status Species*.

Under Alternative A, there is very slight potential for traffic-related injury or mortality. Other potential direct impacts may include disturbance resulting from the limited noise, dust, traffic, general human presence, and nighttime lighting associated with Mine operations that do not include active mining. Given the historic and current activity at the Mine, birds in the area are likely habituated to these conditions at the minimal activity level that is anticipated under Alternative A. In addition, environmental protection measures that would be implemented include adherence to posted speed limits on all roads used, adherence to the Mine's fugitive dust control plan, and conducting pre-construction clearance surveys for new disturbance during the avian nesting season.

Certain project design elements under this alternative would address mortality concerns by preventing exposure to process solutions. With the heap leach facility valley-fill design, process solutions would continue to be stored within the heap leach facilities instead of in solution ponds. In addition, the counter-current system is a closed system that directs the flow of process solutions throughout the heap leach facilities and process system and would manage process solutions without the use of pregnant and barren solution storage ponds.

In summary, while Alternative A has the potential to impact migratory birds, it would occur at the individual level rather than the population level and would not threaten the viability of any species.

4.5.2 Effects of Alternative B – Proposed Action

As noted in Section 4.4.2, vegetation in the 16.4-acre ancillary facility area has previously been impacted. The migratory bird habitat that would be affected by surface disturbance would, therefore, be the habitat within the footprint of proposed Stage III Heap Leach Facility, which includes approximately 145.7 acres. As described in Section 3.12–*Vegetation*, this activity would occur in juniper woodland habitat and sagebrush shrubland habitat (**Figure 3.12.1**). The proposed Reclamation Plan for the expanded Rochester Open Pit and the Stage III Heap Leach Facility is provided in POA No. 8, under which all acres of disturbance would be reclaimed and restored as terrestrial wildlife habitat. Restored vegetation communities suitable for terrestrial wildlife habitat would also be functional as migratory bird habitat. As discussed in Section 4.12–*Vegetation*, impacts from the removal of vegetation for herbaceous and annual plant communities would occur over 17 years because reclamation of the Stage III Heap Leach Facility would be initiated within 9 years of construction of the facility and would continue for 8 years. Furthermore, sagebrush communities (approximately 53.3 acres) may take 50–100 years to recover from disturbances and juniper communities (approximately 91.1 acres) may take up to 100 years (Laudenslayer and Boggs 2010);

therefore, impacts to these vegetation components would be considered long-term. While disturbances would be long-term, the intensity of disturbance, given the extent of vegetation communities in the surrounding area, would be limited.

Alternative B would result in long-term impacts to migratory birds with suitable foraging or nesting habitat in juniper woodland or sagebrush shrubland. Alternative B could also cause disturbance to migratory birds and migratory birds may abandon nests if they are present in proximity (distance is species-specific) to project activities. However, environmental protection measures included under all alternatives (Section 2.2) would establish seasonal and spatial restrictions on project activities near any active nest sites, thereby reducing the potential for impacts to breeding birds. No raptor nests have been identified within proximity to the proposed project activities, with the exception of the burrowing owl, which is discussed in Section 4.11–*Special Status Species*.

Alternative B would also create additional surface water in the 2 evaporation ponds that would be constructed at closure of the Stage III Heap Leach Facility. Therefore, this alternative may present opportunities for increased migratory bird use of the Mine. Alternative B could result in mortality if migratory birds are exposed to toxic water or are unable to escape the water after entering. Exposure of migratory birds to water containing cyanide could also result in mortalities (USGS 1999).

In comparison to Alternative A, Alternative B backfilling would be used to prevent formation of a pit lake, which would reduce the potential attraction of the Mine to migratory birds and eliminate any potential impacts from toxicity of pit lake water. The SLERA concluded that because Alternative B would preclude the formation of a post-mining pit lake or a hydrologic sink, the only exposure pathways would be via deep-rooted plant uptake that would occasionally be possible on the backfill surface.

In conclusion, while Alternative B has the potential to impact migratory birds, it would occur at the individual level rather than the population level and would not threaten the viability of any migratory bird species. The best evidence of the low level of risk is the limited extent of past mortalities as reported to NDOW and discussed in Section 3.5–*Migratory Birds*.

4.5.3 Effects of Alternative C – Backfill Pit to Create an Evaporative Sink

Under Alternative C, the potential direct and indirect impacts to migratory birds would be similar to those described for Alternative B because the following aspects would be the same: the extent of new surface disturbance, habitat reclamation, preclusion of a pit lake, development of 2 evaporation ponds at closure of the Stage III Heap Leach Facility, traffic levels, and environmental protection measures to be implemented (Section 2.2). The same closed, counter-current system form of managing process solutions would be employed, eliminating the use of pregnant and barren solution storage ponds and thus the potential for exposure of migratory birds to those solutions.

The SLERA indicates that Alternative C has less risk potential than Alternative A, due to the lack of pit lake formation. However, Alternative C differs from Alternative B and Alternative D in that it would maintain the pit as a hydrologic sink and may subsequently result in the creation of wetland vegetation. Therefore, risk cannot be ruled out (but is considered low) for Alternative C for the transfer of COPCs from pit water to the soil, soil to plants, then uptake of boron by birds that feed on plant material.

In conclusion, while Alternative C has the potential to impact migratory birds, it would occur at the individual level rather than the population level and would not threaten the viability of any migratory bird species. The best evidence of the low level of risk is the limited extent of past mortalities as reported to NDOW and discussed in Section 3.5–*Migratory Birds*.

4.5.4 Effects of Alternative D – Out-of-Heap Solution Management

Under Alternative D, the potential direct and indirect impacts to migratory bird would be similar to those described for Alternative B because the following aspects would be the same: the extent of new surface disturbance, habitat reclamation, preclusion of a pit lake, extent of new surface water availability (the one storage pond under Alternative D would cover the same area as the 2 evaporation ponds under Alternative B), traffic levels, and environmental protection measures to be implemented (Section 2.2).

Alternative D would differ from Alternative B and Alternative C in that the Stage III Heap Leach Facility would operate as a free draining system rather than providing for in-heap storage. Certain project design elements under this alternative would address migratory bird mortality concerns by preventing exposure of migratory birds to process solutions. Pregnant solution would be routed through a lined solution channel to an enclosed tank and pump system. Except during process plant unavailability or high precipitation conditions, pregnant solution would be pumped from the tank via pipeline directly to the process plant. However, during plant shutdown or high flow conditions, excess pregnant solution could be routed to a 6.5-acre storage pond that would take the place of the 2 evaporative ponds proposed for heap draindown under Alternative B. Therefore, Alternative D would have a greater potential to impact migratory birds compared to Alternative B, due to the increased exposure to process solutions in surface water. The process solution storage pond would have floating balls to deter avian species.

Like Alternative B, there would be no risk associated with the 6,175 backfill scenario. In comparison, Alternative A has several factors that present risk potential, and Alternative C presents low risk potential.

In conclusion, while Alternative D has the potential to impact migratory birds, it would occur at the individual level rather than the population level and would not threaten the viability of any migratory bird species. The best evidence of the low level of risk is the limited extent of past mortalities as reported to NDOW and discussed in Section 3.5–*Migratory Birds*.

4.6 <u>Native American Religious Concerns</u>

4.6.1 Effects of Alternative A – No Action

Alternative A maintains the status quo under which Coeur would continue to operate and close the Mine under the currently approved Plan of Operations. No impacts to Native American religious concerns are anticipated as a result of Alternative A.

4.6.2 Effects of Alternative B – Proposed Action

No impacts to Native American religious concerns are anticipated as a result of Alternative B. If any human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during the proposed operations, environmental protection measures incorporated into Alternative B would be implemented to avoid or minimize impacts on Native American religious concerns.

4.6.3 Effects of Alternative C – Backfill Pit to Create an Evaporative Sink

No impacts to Native American religious concerns are anticipated as a result of Alternative C. If any human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during the proposed operations, environmental protection measures incorporated into Alternative C would be implemented to avoid or minimize impacts on Native American religious concerns.

4.6.4 Effects of Alternative D – Out-of-Heap Solution Management

No impacts to Native American religious concerns are anticipated as a result of Alternative D. If any human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during the proposed operations, environmental protection measures incorporated into Alternative D would be implemented to avoid or minimize impacts on Native American religious concerns.

4.7 Water Quality (Surface and Ground)

4.7.1 Environmental Effects of All Alternatives

4.7.1.1 Surface Water Resources

The surface water resources potentially impacted by the Mine are found only in the perched South American Canyon and American Canyon springs and wetlands and in ephemeral drainages. Their flows rarely reach any downstream perennial water bodies (e.g., Buena Vista Valley Playa), and the potential for effects on surface water uses by humans and wildlife are limited. As a result, the impacts of all alternatives on surface water beyond the immediate vicinity of the Mine are minimal.

Environmental impacts of proposed Mine development to surface water resources would be directly associated with changes in groundwater levels in the pit area. No changes are predicted associated with existing springs (SWS 2010a) under any alternative. This prediction considers that the proposed development under alternatives B–D would not limit recharge to the perched aquifers to which the springs are connected. In addition, continued drawdown of ground water during mining activities would occur primarily within the BRF aquifer which is separate from the perched aquifer associated with the springs.

Impacts are anticipated to occur associated with evaporation of surface water during continued existence of the pit lake under Alternative A. In addition, evaporation would be enhanced through development of wetlands within the pit under Alternative C as described in Section 4.7.4.

Under alternatives B–D, the proposed Stage III Heap Leach Facility would have diversion channels constructed to manage stormwater runoff. Channels would divert runoff to the northeast into South American Canyon and to the northwest into American Canyon (Robison Engineering 2009). These diversions would not be expected to result in any direct or indirect impacts to basin wide hydrology, hydrogeology, or the hydrologic balance. The emergency water management ponds are located in the Mine area to provide storage capacity during emergency situations and control site runoff and sedimentation from any extreme storm events. These control systems are essentially the same under all alternatives. Impacts from sediment control ponds to the hydrologic balance of the basin or to the geomorphology to channels downstream of the project site would be expected to be very minor or non-existent. This is because the project site straddles the upper boundary (headwaters) of 3 very large hydrographic areas and occupies a relatively small acreage in comparison to each of their total area. The amount of runoff and stream flow that would be detained or contained by the ponds would be very small compared to the runoff that a large storm would generate in the rest of each of these watersheds.

Storm generated runoff, stream flows, and fluvial geomorphological factors within these watersheds would be expected to be largely unaffected.

4.7.1.2 Ground Water Resources

The primary focus of the analysis of impacts on ground water resources is predicting the effects associated with the open pit. The impacts of each alternative have been estimated using the predictions of the SWS (2010a) numerical model. SWS (2010a) developed a numerical groundwater model of the site using MODFLOW-SURFACT^{TM} (MFST). The area addressed by the model is shown in **Figure 4.7.1**. The model was completed as a tool to describe and quantify components of the site groundwater system and to assess the impacts of the alternatives to the aquifer quantity and quality.

The SWS (2010a) model was calibrated to approximate pre-mining conditions at the end of 1986 prior to water supply pumping within the BRF. A follow-up transient calibration was completed to approximate the changes in the aquifer due to water supply pumping from within the BRF zone between January 1987 and October 2007. Groundwater level changes during mining are limited to two main areas, 1) the BRF and, 2) the pit area. Therefore, water levels and groundwater flow directions within the model area have, for the most part, not changed substantially over time in the site groundwater system. Currently, the water table is 300-500 feet lower than pre-mining as observed in water supply wells in the BRF. Future conditions were simulated by variation of the model parameters (**Table 4.7.1**) to reflect each of the alternatives.

Table 4.7.1: Model Parameters for Prediction of Environmental Consequences to Ground Water System

Parameter	Value	Comments
Water Supply Pumping	Yr: 1-5: 200 gpm 6-7: 100 gpm 8-10: 50 gpm >10: 0 gpm	Pumping from wells PW-1A and PW-2A; effects of drawdown and recovery to 95 percent final equilibrium
Direct Precipitation	13.41 inches/year	Correlated with pit area changes over time
Pit Wall Runoff	Runoff coefficient of 5 percent of annual average precipitation (1)	Dependent on mining or reclamation stage and changing pit wall area
Backfill Infiltration	Estimated 20 percent of mean annual precipitation	Considers enhanced infiltration due to backfill surface flatness, high vertical infiltration rates, low sun and low wind conditions (minimizing evaporation)
Evaporation	37.5 inches/year	Backfill and lake surface evaporation; taken as zero until water level recovery to 1 foot below backfill surface

(1) Runoff coefficient determined during model verification by iteratively adjusting the coefficient until the model response reflects actual conditions observed at the site. Runoff from areas outside the open pit was assumed to be zero because berms will be installed around the pit to prevent runon into the pit area.

Estimation of the water quality resulting from the alternatives considers contact with pit wall surface and backfill material. The modeling approach (SWS 2010a) predicts the chemical composition of water in the pit, for each alternative. Standard techniques are used to integrate projected flows of water into the pit, for each alternative, with their respective chemical composition. Potential geochemical water-rock reactions are considered and modeled using the standard geochemical modeling code PHREEQC (public domain product of the United States Geological Society). The chemical composition for the various pit inflows is derived from the geochemical characterization program data or characterization of local ground water.

The chemical composition of water in the pit, whether as an open pit lake or in backfill pore water, was estimated for a series of model time steps (10, 50, 100, and 200 years). All flows reporting to the pit were combined with the associated concentrations, and the chemical release from the Mine backfill was calculated. The resulting water chemical composition was modeled in PHREEQC to determine what, if any, minerals might precipitate resulting in removal of chemical mass from the water. Chemical loading was established using either HCT results or groundwater quality data. Evaporation was assumed to remove only water and no chemical mass. Direct precipitation was likewise assumed to carry no chemical mass, except where it contacts pit walls or backfill material. Pit wall runoff was estimated based on late-time HCT results per rock type, and water contacting backfill material was estimated based on results from the initial HCT period.

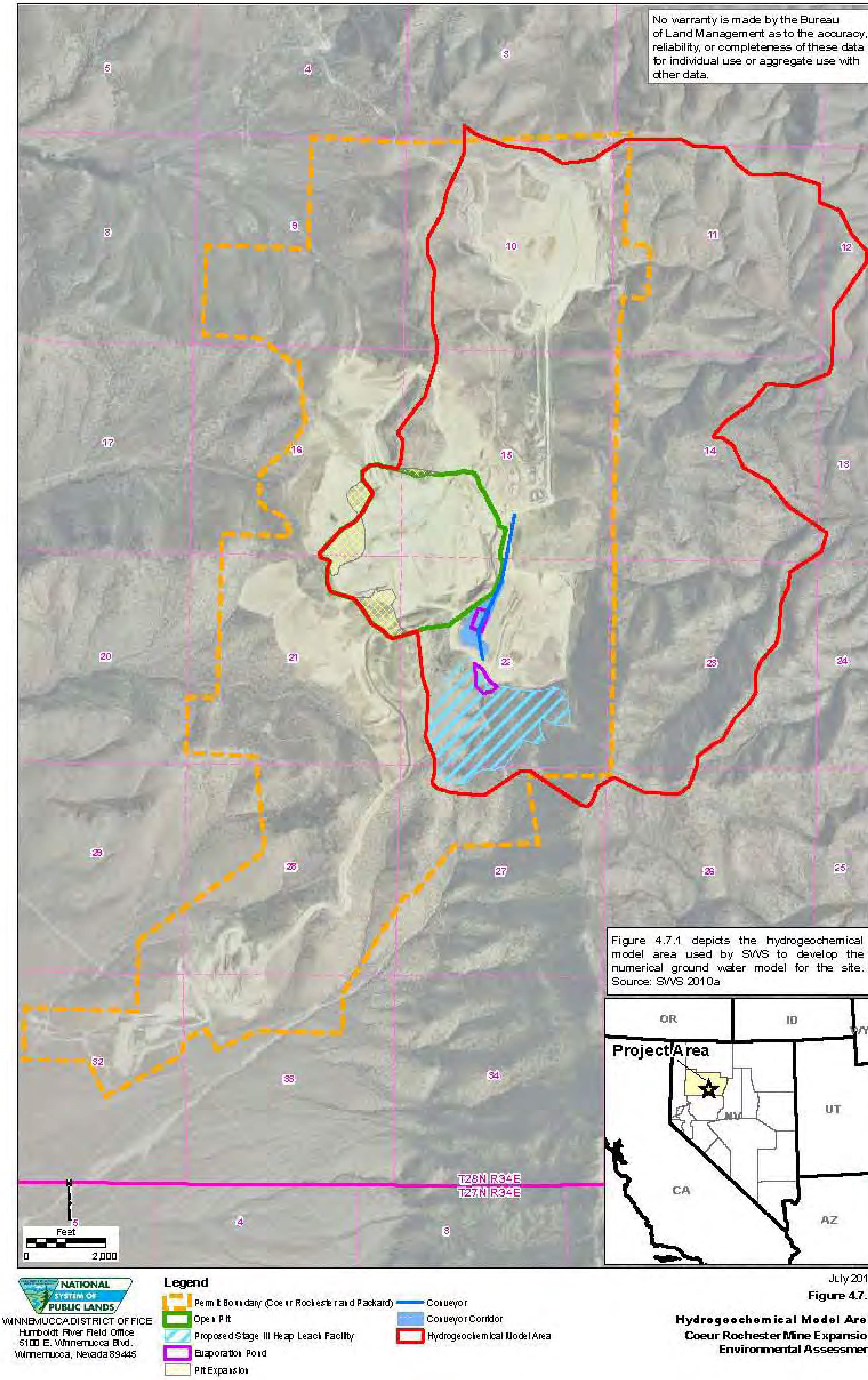
4.7.2 Effects of Alternative A – No Action

Under Alternative A, the pit lake would continue to exist in the near term with relatively low pH (without lime addition) and otherwise poor water quality. Approximately 50 pounds per day of lime is currently being added to the lake to maintain circumneutral pH. Over the next year, the pH is expected to become neutral and the water quality should improve without lime addition. This is because the sulfide areas have now been covered with water (SWS 2010b).

With closure of the Mine under Alternative A and the cessation of pumping activities, the long-term effects would be associated with the overall restoration of the water table to pre-drawdown conditions. Simulation of post-closure changes that would occur with no additional mining or pit backfill includes development of a post-closure pit lake that is relatively small (16.5 acres) compared to most other pit lakes in Nevada over the long-term. The pit lake would be recharged by pit surface runoff, direct precipitation, and ground water that would recover from the maximum drawdown, which was observed in October 2007.

After mining, ground water recovery would occur to between 6,097 and 6,111 feet elevation amsl 175 years after the end of mining. During the first 10-15 years of pit lake filling, approximately 5 gpm of pit lake water could flow through to the underlying aquifer. Given this limited volume, any impacts on underlying ground water quality would be localized and minimal. Ground water would ultimately flow permanently towards the pit lake due to evaporation. Ground water would also recover within the BRF to approximately 6,000 feet amsl at well PW-1A and 6,250 feet amsl at well PW-4, as raw water supply pumping would be discontinued.

The results of post-closure geochemical modeling for all alternatives are presented in **Table 4.7.2**. For Alternative A, this includes projected pit lake chemistry at 10, 50, 100, and 200 years after closure. The analysis indicates that current acidic conditions would be replaced by near neutral pH due to the abundance of non-PAG pit wall rock and only very small exposures of PAG material in the pit walls. Pit lake water quality is predicted to exceed several water quality standards (cadmium, lead, and manganese) during the early (10 to 15 year) time period when a flow-through condition exists. Due to evapo-concentration, standards would continue to be exceeded for the pit lake up to the end of the 200-year model time period.



July 2010

Figure 4.7.1

Hydrogeochemical Model Area
Coeur Rochester Mine Expansion
Environmental Assessment

Left Blank Intentionally

Appendix A presents the SLERA for the pit closure approaches under all alternatives. The SLERA shows that the pit lake poses potential risk to humans and a number of wildlife species for a range of chemical parameters and exposure pathways. This includes potential risk associated with direct ingestion of water by mule deer, rough-winged swallow, and humans. The presence of open water under Alternative A allows for exposure via uptake into aquatic plants and associated potential risk to mule deer. Uptake of contaminants through soil transfer into plants can further occur and the risk potential for this exposure pathway also cannot be eliminated for mule deer.

4.7.3 Effects of Alternative B – Proposed Action

Alternative B (Proposed Action) includes backfill to the approximate elevation of 6,175 feet amsl. Coeur would conduct monitoring of backfill materials to be placed below the water table in the pit to ensure that they are non-PAG (ANP:AGP > 3:1). Where appropriate, the backfill would be amended with alkalinity (e.g., lime) to avoid acid generating conditions.

During operations, backfill would eliminate the current pit lake. After closure, ground water would equilibrate within the backfill to just below the approximately 6,175 feet elevation amsl after 75 years following the end of mining. Precipitation and runoff into the pit would in part evaporate, but a portion would infiltrate through the backfill and permanently recharge the aquifer at a rate of approximately 2 gpm.

As shown in **Table 4.7.2**, the geochemical model results for this alternative show that most metals in the pore water would remain below standards. The predicted pH would be slightly alkaline (pH 8.6 to 9.7) due to lime addition to the backfill. Upon water level recovery to maximum predicted levels within the pit, evaporation effects would drive an increase in the concentration of chemical constituents in the pore water; most notably cadmium, lead, and manganese. While those parameters are predicted to potentially exceed the applicable MCLs/NRVs, the maximum projected concentrations are within the range of concentrations previously observed in BRF wells (see Table 3.7.14). Given these results and the low flow rate, no impacts to ground water quality are anticipated.

The SLERA shows no risk associated with Alternative B because of the lack of consistent expression of open water on the surface of the backfill.

Unlike the Stage I Heap Leach Facility, development of a Stage III Heap Leach Facility would not overlie existing springs and seeps. With the lined Stage III Heap Leach Facility and associated facilities, including the evaporation ponds planned for closure, no releases to underlying ground water are anticipated from these facilities.

Finally, Alternative B would extend the use of existing processing facilities at the Mine. The historic releases from these facilities are being addressed by the CAPs in coordination with BLM and the state of Nevada. Note that, to date, no Mine-related impacts have been observed in the BRF ground water quality. Neither Alternative B nor any of the alternatives would have an effect on the impacts from historical releases.

4.7.4 Effects of Alternative C – Backfill Pit to Create an Evaporative Sink

Under Alternative C, the pit would be partially backfilled to approximately 6,150 feet amsl to create a hydrologic sink. As for Alternative B, backfilling during operations would eliminate the current pit lake. After closure, ground water would recover (rise) with flow directed towards the pit. Recovery of the water table to approximately 6,150 feet elevation amsl would occur at approximately Year 60 after closure. After Year 60, sufficient evaporation would occur to maintain groundwater flow toward the pit and at approximately 6,150 feet elevation amsl.

During groundwater recovery after cessation of mining, surface water runoff would, in part, infiltrate through pit backfill to the aquifer. This infiltrated water would not migrate away from the pit as the direction of groundwater flow would be inward. After Year 60, when the water table stabilizes, there would be no discharge to the underlying ground water.

A seasonal, shallow wetland is expected to develop in the backfill at approximately 6,150 feet elevation amsl approximately 60 years after cessation of mining as ground water recovers. The extent of the wetland would be dependent on seasonal variability in evaporation and precipitation (as explicitly accounted for in the ground water model), as well as climatic variation between wet and dry years. The wetland would generally consist of a saturated ground surface although it could occasionally include very small areas with “puddles” of water. These water bodies would be shallow and only present during periods of excess precipitation and low evapotranspiration.

As shown in **Table 4.7.2**, the geochemical model results for this alternative show that most metals in the pore water would remain below standards. The predicted pH would be slightly alkaline (pH 8.7 to 9.6) due to lime addition to the backfill. Upon water level recovery to maximum predicted levels within the pit, evaporation effects would drive an increase in the concentration of chemical constituents in the pore water, most notably arsenic, cadmium, and selenium. As noted above, there would be no long-term flow to the underlying aquifer.

The SLERA addresses the risk associated with exposure to the wetlands that would be formed in hydrologic sink. The analysis shows that the potential risk is associated with boron uptake to plants for mule deer. As further discussed in the SLERA, this determination of potential risk is highly conservative because it is based on the unlikely 100 percent use of the wetland for forage by this species.

4.7.5 Effects of Alternative D – Out-of-Heap Solution Management

The only difference between Alternative D and Alternative B is the construction of one external solution pond (6.5 acres) during operations. Because the pond would be lined and constructed according to state of Nevada and BLM requirements, no impacts on underlying ground water are predicted. Otherwise the effects of Alternative D are the same as Alternative B.

Table 4.7.2: Summary of Predicted Ground Water Quality for All Alternatives

Location			Alternative A - No Action				Alternatives B and D – 6,175 Backfill					Alternative C – 6,150 Backfill				
Analyte	Units	EPA MCL or NRV (1,2)	Pit Lake 10 Years (3)	Pit Lake 50 Years (3)	Pit Lake 100 Years (3)	Pit Lake 200 Years (3)	Pore Water 10 Years (3)	Pore Water 50 Years (3)	Pore Water 100 Years (3)	Pore Water 200 Years (3)	Seasonal Wetland (3)	Pore Water 10 Years (3)	Pore Water 50 Years (3)	Pore Water 100 Years (3)	Pore Water 200 Years (3)	Seasonal Wetland (3)
Alkalinity	mg/L	ns (5)	27	47	91	168	51	59	160	162	307	52	58	97	149	393
Aluminum	mg/L	0.2	BDL (6)	BDL	BDL	BDL	0.093	0.080	BDL	BDL	BDL	0.09	0.08	0.025	BDL	BDL
Antimony	mg/L	0.006	0.00063	0.0072	0.013	0.023	0.0026	0.0012	0.0016	0.0020	0.0024	0.0025	0.0012	0.0033	0.015	0.053
Arsenic	mg/L	0.01	0.0054	0.0046	0.0041	0.0035	0.0092	0.0087	0.0074	0.0079	0.0065	0.0091	0.0087	0.012	0.019	0.047
Barium	mg/L	2	0.011	0.021	0.016	0.012	0.036	0.049	0.051	0.052	0.057	0.036	0.048	0.043	0.018	0.0084
Beryllium	mg/L	0.004	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Boron	mg/L	ns	0.25	0.37	0.52	0.9	0.40	0.38	0.37	0.40	0.43	0.39	0.37	0.66	2.0	6.4
Cadmium	mg/L	0.005	0.17	0.034	0.028	0.033	0.0049	0.0045	0.006	0.0064	0.0078	0.0049	0.0046	0.0056	0.0077	0.018
Calcium	mg/L	ns	50	25	41	72	25	23	64	64	123	26	23	39	63	169
Chloride	mg/L	400	3.7	40	83	154	12	4.8	5	8	10	11	4.8	13	73	257
Chromium	mg/L	0.1	0.0019	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Copper	mg/L	1.0	0.07	0.037	0.014	0.014	0.042	0.043	0.046	0.05	0.054	0.043	0.043	0.065	0.14	0.43
Fluoride	mg/L	4.0	0.24	0.49	0.85	1.5	0.21	0.14	0.15	0.18	0.2	0.21	0.14	0.29	0.9	2.9
Iron	mg/L	0.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Lead	mg/L	0.015	0.68	0.00025	0.00017	0.00019	0.0032	0.014	0.028	0.027	0.044	0.0032	0.014	0.0043	0.00065	0.00024
Magnesium	mg/L	150	5.0	5.7	11	19	2.1	0.70	0.8	1.1	1.3	2.1	0.70	1.8	9	33
Manganese	mg/L	0.1	0.12	0.30	0.60	0.64	0.023	0.021	0.062	0.062	0.16	0.024	0.021	0.037	0.061	0.18
Mercury	mg/L	0.002	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nickel	mg/L	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.025
Nitrate (4)	mg/L	10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
pH	su	6.5-8.5	6.9	7.2	7.4	7.7	9.7	9.6	8.6	8.6	7.9	9.6	9.6	9.0	8.7	8.0
Potassium	mg/L	ns	5.4	12	23	41	5.4	3.2	3.3	3.9	4.3	5.3	3.2	6.7	26	89
Selenium	mg/L	0.05	0.018	0.013	0.015	0.024	0.017	0.014	0.014	0.016	0.02	0.017	0.014	0.026	0.083	0.27
Silver	mg/L	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Sodium	mg/L	ns	17	37	73	134	14	7.4	7.7	10	11	13	6.4	15	69	241
Sulfate	mg/L	500	161	80	126	216	43	14	15	19	21	43	14	31	128	437
Thallium	mg/L	0.002	0.00094	0.00056	0.00091	0.0015	0.00051	0.00031	0.00028	0.0003	0.0003	0.0005	0.0003	0.00057	0.002	0.0066
Zinc (2)	mg/L	5	1.1	0.38	0.41	0.55	0.24	0.12	0.13	0.14	0.16	0.25	0.12	0.21	0.61	2.0

Adapted from Coeur Rochester Hydrologic Monitoring Database (Coeur 2009b). (1) National primary drinking water standards are legally enforceable standards that apply to public water systems. The MCL is the highest level of a contaminant allowed in drinking water. (2) National secondary drinking water standards. These are non-enforceable guidelines regulating contaminants that my cause cosmetic or aesthetic effects in drinking water (EPA 2009). Secondary standards listed are for Nevada per NAC 445A.455 for public water systems http://www.leg.state.nv.us/NAC/NAC-445A.html#NAC445ASec455. (3) Shaded cells indicate exceedance of EPA primary or Nevada secondary drinking water standard. (4) Nitrate value is NO_3 as N, NO_3, or $N0_3$+NO_2. (5) ns = No standard. (6) BDL = Below lab detection limits.

Left Blank Intentionally

4.8 Economics and Social Values

The Mine's activities can be considered a basic industry, as it draws dollars from outside the area. These dollars are used to employ people at the Mine. Additional local economic linkages are from the Mine's purchases of goods and services from the local service sectors, including businesses such as restaurants, gas stations, hotels, and other retail businesses. As earnings increase in these businesses, they hire additional people and buy more inputs from other businesses. Thus, the change in the economic base works its way throughout the entire local economy (Harris and Dobra 2009).

The total impact of a change in the economy consists of direct, indirect, and induced impacts. Direct impacts are the changes in the activities of the impacting industry, such as the reopening of operations at the Mine. The impacting business, such as the Mine, changes its purchases of inputs as a result of the direct impact. This produces an indirect impact in the local business sectors. Both the direct and indirect impacts change the flow of dollars to the county's households, and the local households alter their consumption accordingly. The effect of this change in local household consumption upon businesses in a county is referred to as an induced impact. The "multiplier effect" is a measure that yields the effects created by an increase or decrease in economic activity (Harris and Dobra 2009).

Within a defined region, there are numerous economic sectors that are interdependent. To assess the data associated with these sectors, input-output models are used to derive the associated economic, employment and household information. For this EA, the IMPLAN input-output economic model (IMPLAN 2004) was used to derive the linkages and multipliers for various economic sectors in the Pershing and Humboldt regional economy, specifically employment and income data associated with the reopening of the Mine. The IMPLAN model has a long record in studies completed for BLM and the U.S. Forest Service for economic analysis of changes in public land grazing, recreation development, and expansion of mining activities (Harris 2010).

4.8.1 Effects of Alternative A – No Action

For the purposes of this analysis, the impacts of Alternative A are assessed for 2 distinct time periods: (1) through 2014, at which point residual leaching of the Stage II and Stage IV heap leach facilities would be complete and closure of these facilities would begin, and (2) 2014 through 2020, at which point closure of the Stage II and Stage IV heap leach facilities would be complete. A final permanent closure plan would be submitted as a separate action 2 years prior to final closure of these facilities, as required under NDEP and BLM requirements, and associated NEPA analysis would be conducted.

Under Alternative A, local economic and social resources would be affected by a reduction in workforce, summer student employment, sales/use tax, property tax, and the net minerals proceeds tax.

Direct economic impacts would also include a reduction in the annual operating expenditures associated with mining activities (which are injected into the local economy). Annual operating costs (which include all Mine costs including capital expenditures and labor costs) are estimated to be $9,000,000 in 2014 and $500,000 in 2020 (compared to $21,223,000 in 2009) (Coeur 2010a).

The Mine would continue to operate with a limited number of staff through residual leaching of the Stage II and Stage IV heap leach facilities, gradually decreasing to 20 employees in 2014 (compared to 40 currently; 34 Coeur employees and 6 contract workers). Closure of those facilities would cause a further reduction in workforce to 8 employees in 2020. Coeur anticipates Mine wages and benefits to total $2.4 MM in 2014 and $960,000 in 2020 (compared to $3.4 MM in 2009). Furthermore, this workforce reduction would result in lower payroll taxes ($140,000 in 2014 and $40,000 in 2020, compared to $201,573 in 2009) (Coeur 2010a).

The mining industry and related mining job base in Nevada has always been transitory. Mining workers generally relocate to areas where mineral production is occurring. The Mine workforce would experience a steady decline, and several of these workers would likely relocate to other locations where their services are needed. Currently, other parts of Nevada, particularly the Elko region, could potentially provide replacement employment opportunities for displaced workers. Although this shift in workforce may represent an economic loss to the local economy, it could also represent an economic benefit to other parts of the state. The loss of mining jobs and the associated population losses would also result in a reduction in the number of service job opportunities in Winnemucca and Lovelock, and lower demands for public services, infrastructure needs, and housing. However, these impacts would be minimal, considering that the current Mine workforce is only 40 people (34 Coeur employees and 6 contract workers.)

Under Alternative A, Coeur anticipates the following tax payments would be made (Coeur 2010a):

- Sales/use tax revenues from the Mine would total $200,000 in 2014 and less than $50,000 in 2020 (compared to $415,000 in 2009).
- Taxes paid on the value of mineral production would total $117,000 in 2014 and $0 in 2020, as residual draindown diminishes (compared to $1.4 MM in 2009).
- Annual property tax revenues from the Mine would be $300,000 in 2014 and under $100,000 in 2020 (compared to $368,000 in 2009) due to removal of structures and equipment from the Mine site.

Table 4.8.1 illustrates and compares the operating costs and taxes for the Mine for alternatives A and B. The tax and operating costs for Alternatives C and D would be the same as Alternative B. Taxes and costs are presented from 2006, the last full year of operations, through final closure in 2020.

Table 4.8.1: Operating Costs and Taxes from 2006 through Proposed Site Closure

	Alternative A					Alternatives B–D				
Year	Annual Operating Costs	Sales & Use Tax Revenues	Property Tax Revenues	Net Proceeds of Minerals Taxes	Payroll Taxes	Annual Operating Costs	Sales & Use Tax Revenues (1)	Property Tax Revenues (1)	Net Proceeds of Minerals Taxes (1)	Payroll Taxes (1)
2006	$74,240,000	$1,200,000	$405,000	$1,980,000	$1,051,711	-	-	-	-	-
2007	$53,359,000	$838,000	$413,000	$2,500,000	$1,035,278	-	-	-	-	-
2008	$22,018,000	$375,000	$384,000	$2,400,000	$249,856	-	-	-	-	-
2009	$21,223,000	$415,000	$368,000	$1,400,000	$201,573	-	-	-	-	-
2010	$21,693,000	$461,000	$360,000	$1,250,000	$218,736	$21,693,000	$500,000	$450,000	$1,400,000	$218,736
2011	$18,000,000	$315,000	$345,000	$750,000	$200,000	$95,500,000	$500,000	$450,000	$1,600,000	$1,050,000
2012	$15,000,000	$238,000	$330,000	$500,000	$180,000	$61,300,000	$750,000	$450,000	$1,800,000	$1,050,000
2013	$12,000,000	$220,000	$315,000	$250,000	$160,000	$58,350,000	$1,000,000	$450,000	$2,000,000	$1,050,000
2014 (2)	$9,000,000	$200,000	$300,000	$117,000	$140,000	$51,650,000	$1,000,000	$450,000	$2,000,000	$1,050,000
2015	$500,000	$50,000	$100,000	$0	$120,000	$56,750,000	$1,000,000	$450,000	$2,000,000	$1,050,000
2016	$500,000	$50,000	$100,000	$0	$110,000	$20,950,000	$838,000	$413,000	$2,500,000	$1,035,000
2017	$500,000	$50,000	$100,000	$0	$100,000	$10,750,000	$400,000	$384,000	$2,000,000	$250,000
2018	$500,000	$50,000	$100,000	$0	$80,000	$3,850,000	$375,000	$365,000	$1,500,000	$200,000
2019	$500,000	$50,000	$100,000	$0	$60,000	$750,000	$350,000	$350,000	$1,000,000	$180,000
2020	$500,000	$50,000	$100,000	$0	$40,000	$750,000	$325,000	$325,000	$750,000	$160,000

(1) Estimated values under the Proposed Action and alternatives B–D.
(2) 2014 is estimated as the height of full production.

4.8.2 Effects of Alternative B – Proposed Action

For the purposes of this analysis, the impacts of Alternative B are assessed through 2020. This includes the conditions when the Mine would be in full production in 2014, and provides a comparison to the Alternative A 2014 estimates. Under Alternative B, the Stage II and Stage IV heap leach facilities would be closed in 2020 as described for Alternative A; the new Stage III Heap Leach Facility would also be closed. It is assumed that the socioeconomic conditions for alternatives C and D would be similar to Alternative B, therefore there is no discussion of these 2 alternatives.

A direct impact under Alternative B would be the creation of approximately 200 full time jobs and 31 full time contractor jobs at the Mine for the 5–7 years of the project life. Coeur anticipates that the direct salaries for the 200 employees would average $17.2 MM for the life of the project, while the salaries of the 31 contractor employees would average approximately $2.67 MM per year over the project life. It is anticipated that the great majority of the employees would be drawn from the existing Pershing and Humboldt counties labor pool. Many of the employees are expected to be former Mine employees who were laid off after the Mine ceased full operations in 2006. The full time employment is anticipated to “ramp up” from the 34 Coeur employees and 6 contract workers currently employed at the Mine site over a 12–18 month period from the initiation of Alternative B activities (Coeur 2010a).

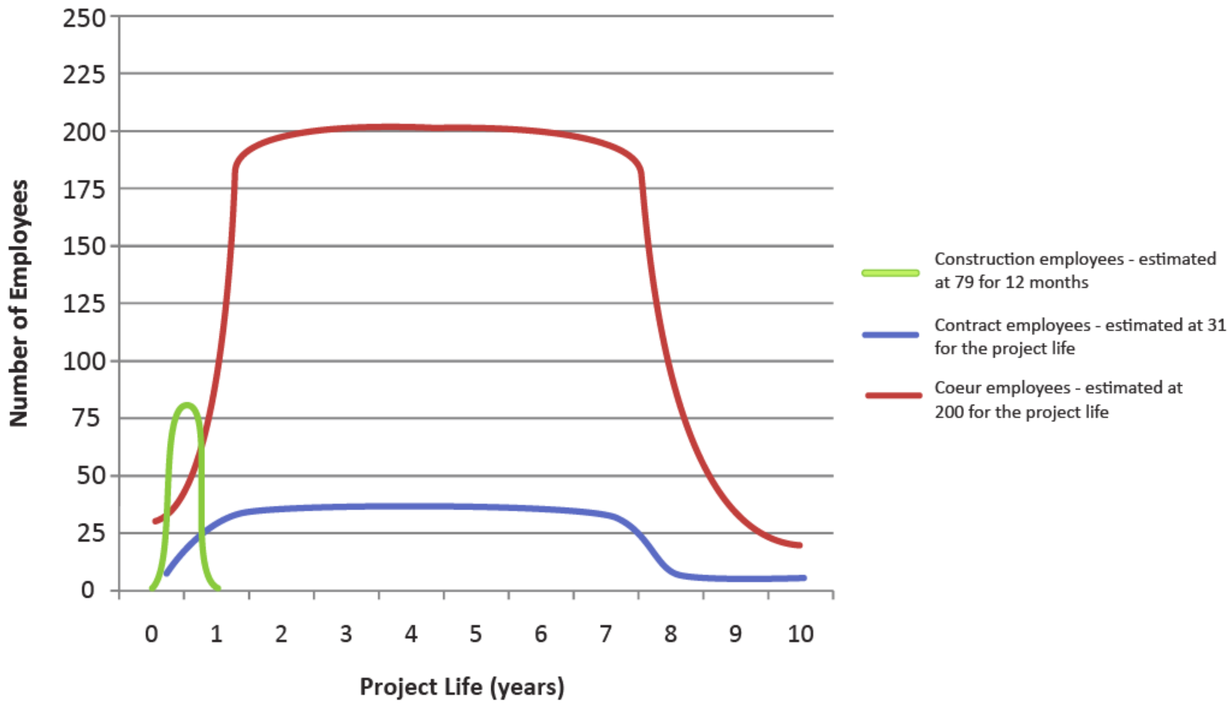
An additional, direct, short-term impact of Alternative B would be the creation of approximately 79 construction jobs. These jobs would last for approximately 12 months, which is the expected construction period for the Alternative B facilities. As is typical for a mine construction project, it is expected the selected contractor would hire a certain percentage of the construction workers from the regional labor pool, along with a certain percentage of outside workers who are brought in. Based on the regional mining and agriculture influence, it is expected that Pershing and Humboldt counties would support a pool of skilled construction workers. Coeur estimates the total costs, including labor, for constructing the Alternative B facilities at approximately $31.5 MM (Coeur 2010a).

Figure 4.8.1 graphically illustrates the numbers of anticipated full time, contract, and construction employees associated with Alternative B.

For Alternative B, the IMPLAN model was used to predict data direct, indirect and induced impacts. Direct impacts would be the anticipated 200 full time jobs created, and their associated salaries. Indirect impacts would be the additional jobs created between economic sectors, and their associated salaries and/or earnings, after the initial direct employment is made. Induced impacts would be the additional jobs and earnings attributable to household sector interactions (Dobra and Harris 2009; Harris 2010). The following discussion presents the results of the IMPLAN model for employment and associated earnings for the combined Pershing and Humboldt county economies.

Note the 31 estimated contract employees and the 79 estimated construction employees were not assessed by IMPLAN as these positions are paid through the individual contracting company.

Figure 4.8.1: **Anticipated Employment Associated with Alternative B**



Information provided by Coeur indicates that approximately 200 full time employees would be hired under Alternative B. Using the Gold Mining economic sector employment multiplier of 1.70 for the 2 counties, IMPLAN calculated the combined Pershing and Humboldt county employment would be 340. The multiplier assumes that for every full time employee hired by Coeur, an additional 0.70 employee would be hired in the combined regional county economy. This additional hiring equates to 140 indirect/induced employment effects (Dobra and Harris 2009; Harris 2010).

For labor income, Coeur estimates the yearly salary for the 200 full time employees at $17,225,934. Applying the Gold Mining sector household income multiplier of 1.36 for the 2 counties, IMPLAN calculated the total combined income for Pershing and Humboldt counties under Alternative B at $23,448,634 in the Pershing and Humboldt counties. This means for every $1.00 increase in household income resulting from the salaries associated with the 200 full time employees, an additional $0.36 in income is generated by economic linkages for the 2-county regional area. This equates to $6,222,709 in indirect/induced economic effects. **Table 4.8.2** presents the employment and labor income impacts of Alternative B on the combined economies of Pershing and Humboldt counties (Dobra and Harris 2009; Harris 2010).

Table 4.8.2: Employment and Labor Income Impact of the Rochester Mine on the Pershing and Humboldt County Economics (Alternatives B–D)

Category of Impacts	Direct Effects	Indirect and Induced Effects	Total Effects
Employment (number of jobs)	200	140	340
Labor Income (total salaries)	$17,225,934	$6,222,709	$23,448,634
Source: Harris and Dobra 2009			

Under Alternative B, local economic and social resources would be positively impacted by an increase in workforce, salaries, operating costs, sales/use tax, property tax, and net proceeds tax. The following discussion provides an overview of these positive impacts.

Alternative B would include a substantial increase in the annual operating expenditures of the Mine (which are injected into the local economy.) For comparison, the Alternative B budget for 2014 includes $51,650,000 in operating costs, as compared to $21,223,000 in 2009, and $9,000,000 estimated for Alternative A in 2014 (Coeur 2010a).

The increase in employment at the Mine would also result in an increase in annual payroll tax revenues, estimated to be $1,050,000 in 2014 (compared to $201,573 in 2009 and $200,000 in 2014 under Alternative A) (Coeur 2010a).

The demand for public services, infrastructure needs, and housing is not anticipated to increase substantially since workers would likely be drawn from the local pools of workers. Coeur anticipates that under Alternative B sales/use tax revenues from the Mine would total $1 MM annually in 2014 (compared to $415,000 in 2009 and $200,000 in 2014 under Alternative A) (Coeur 2010a).

Coeur anticipates that under Alternative B taxes paid on the value of mineral production would total $2 MM in 2014 (compared to $1.4 MM in 2009 and $117,000 in 2014 under Alternative A) (Coeur 2010a).

Coeur also anticipates that under Alternative B annual property tax revenues from the Mine would be $450,000 in 2014 (compared to $368,000 in 2009 and $300,000 in 2014 under Alternative A) (Coeur 2010a).

Table 4.8.1 illustrates and compares the operating costs and taxes that would be realized under Alternative B, in comparison to Alternative A.

4.8.3 Effects of Alternative C – Backfill Pit to Create an Evaporative Sink

The socioeconomic effects of Alternative C would be the same as for Alternative B.

4.8.4 Effects of Alternative D – Out-of-Heap Solution Management

The socioeconomic effects of Alternative D would be the same as for Alternative B.

4.9 <u>Paleontology</u>

Surface disturbing activities may cause direct impacts to paleontological resources through the damage or destruction of fossils, or loss of valuable scientific information by the disturbance of the stratigraphic context in which fossils are found. Indirect impacts may be created by increased accessibility to important paleontological resources, leading to looting or vandalism.

4.9.1 Effects of Alternative A – No Action

Alternative A maintains the status quo under which Coeur would continue to operate and close the Mine under the currently approved Plan of Operations. No additional mining or backfilling would occur, and no additional land disturbance would occur from this alternative. The Stage II and Stage IV heap leach facilities would be reclaimed. There would be no impacts to paleontological resources as a result of Alternative A.

4.9.2 Effects of Alternative B – Proposed Action

Because the Mine is already heavily disturbed, any paleontological resources that may be directly affected would be only those that are within the footprint of new disturbance. This includes approximately 162.0 acres at the location of the proposed Stage III Heap Leach Facility. These activities would occur in a PFYC Class 1 area.

Since the potential for major paleontological resources in the project area is low and there are no known paleontological localities there, the potential for impacts to paleontological resources as a result of Alternative B is minimal. If any significant or scientifically important paleontological resources are found during project construction or operations, impacts would be mitigated through avoidance and/or recovery. Environmental protection measures incorporated into Alternative B would be implemented to avoid or minimize impacts on paleontological resources.

4.9.3 Effects of Alternative C – Backfill Pit to Create an Evaporative Sink

Under Alternative C, the extent of newly disturbed land, mining and leaching operations, and the implementation of mitigation measures, if necessary, would proceed as described under Alternative B. Therefore, the potential direct and indirect impacts to paleontological resources as a result of Alternative C would be the same as those described for Alternative B.

4.9.4 Effects of Alternative D – Out-of-Heap Solution Management

Under Alternative D, the extent of newly disturbed land, mining and leaching operations, and the implementation of mitigation measures, if necessary, would proceed as described under Alternative B. Therefore, the potential direct and indirect impacts to paleontological resources as a result of Alternative D would be the same as those described for Alternative B.

4.10 Soils

4.10.1 Effects of Alternative A – No Action

Under Alternative A, Coeur would continue to operate and close the Mine under the currently approved Plan of Operations, with no additional new disturbance to soils. The Stage II and Stage IV heap leach facilities would be reclaimed, with closure of these components, including installation of a soil cover, initiating in 2012 and 2014, respectively. A final permanent closure plan would be submitted as a separate action 2 years prior to final closure of these facilities, as required under NDEP and BLM requirements. Under Alternative A, the lake that would ultimately form in the Rochester Pit after closure would have a negligible effect on soils.

4.10.2 Effects of Alternative B – Proposed Action

Construction of the Stage III Heap Leach Facility under Alternative B would disturb 162.0 acres of soils that have not previously been impacted. Virtually all of this activity would occur in the Roca-Reluctan association shown in **Figure 3.10.1** and characterized in **Table 4.10.1**.

Impacts to soils may include modification of physical characteristics and decreased biological activity. Changes in soil characteristics would include soil horizon mixing, compaction, and pulverization from equipment and traffic. Soil mixing would reduce organic material, lowering soil productivity and increasing coarse fragments in the surface soil. Soil compaction and pulverization would lead to loss of structure and decreased permeability and available water-holding capacity. These impacts would be minimized through the addition of soil amendments and application of mulch, as described in the Reclamation Plan included in POA No. 8.

Table 4.10.1: Characteristics of Soils Directly Impacted by Alternative B

Soil Association	Roca-Reluctan	
Soil Series	Roca	Reluctan
Range in Depth to Bedrock	20 - 40 inches	20 - 40 inches
Landscape Position/% Slope	Side slopes south facing 30-50%	Side slopes north & east facing 30-50%
Profile Soil Texture	very cobbly loam	gravelly loam
Permeability	very slow	moderately slow
Runoff	rapid	rapid
Erosion Hazard by Water	moderate	severe
Erosion Hazard by Wind	slight	slight
Soil Reactions (top layer)	mildly alkaline; nonsaline; nonsodic	mildly alkaline; nonsaline; nonsodic
Saturated Infiltration Rate	very slow	very slow
Available Water Capacity (inches)	3.6 – 4.5	2.7 – 3.4
Soil Rating	poor	poor
Acres Impacted	162.0	

Under Alternative B, wind and water erosion would increase where soils are disturbed until reclamation is successfully completed. Some of the soils that would be used as growth media have relatively high erosion potential for slopes greater than 30 percent, and where these soils are used in reclamation there would be a higher potential for water erosion until revegetation of the growth media occurs. The majority of impacts to soils would be localized to the small area of new surface disturbance and would be short-term because reclamation of the Stage III Heap Leach Facility would be initiated within 7 years of construction of the facility. Following successful reclamation, further soil loss by wind or water would be minimal. The potential erosion hazard of the affected soils would be minimized by measures incorporated into the project design through the Reclamation Plan included in POA No. 8 and the SWPPP. The SWPPP includes structural, vegetative, and stabilization measures to limit erosion. The Reclamation Plan includes measures to reduce soil erosion, such as the application of a soil amendment, revegetation, and noxious weed control. The environmental protection measures proposed under all alternatives are summarized in Section 2.2.

Soils removed for construction and operation of Alternative B would be stockpiled as growth media for later use during reclamation efforts. Vegetation would be established on stockpiles to reduce the potential for wind and water erosion. Coeur would salvage and stockpile all soil suitable for growth media for use in reclamation of the Stage III Heap Leach Facility.

Under Alternative B, the Stage III Heap Leach Facility would be reclaimed as described in the Reclamation Plan in POA No. 8 and summarized above. These closure activities would occur independent of final closure of the entire Mine. Alternative B would extend the life of the Mine, and thus the time before comprehensive reclamation of the Mine begins, by an additional 9 years, and reclamation would occur over an 8-year period.

4.10.3 Effects of Alternative C – Backfill Pit to Create an Evaporative Sink

Under Alternative C, the extent of newly disturbed soils, the implementation of environmental protection measures, and the reclamation method and timeline would proceed as described under Alternative B. Therefore, the effects of Alternative C to soils would be as described under Alternative B.

4.10.4 Effects of Alternative D – Out-of-Heap Solution Management

Alternative D would affect 162.0 acres of soils not previously impacted. The implementation of environmental protection measures, and the reclamation method and timeline would proceed as described under Alternative B. Therefore, the effects of Alternative D to soils would be as described under Alternative B.

4.11 <u>Special Status Species</u>

4.11.1 Effects of Alternative A – No Action

Under Alternative A, Coeur would continue to operate leaching and processing facilities and then close the Mine under the currently approved Plan of Operations. No additional mining, backfilling, or additional disturbance to vegetation would occur. A lake would ultimately form in the Rochester Pit after closure. The size of the lake would vary seasonally in response to water inputs and evaporative processes; the lake would cover approximately 16.5 acres at its largest and would be approximately 125 feet deep at its deepest part. There would be no additional short-term or long-term disturbance of habitat. The Stage II and Stage IV heap leach facilities would be reclaimed. A final permanent closure plan would be submitted as a separate action 2 years prior to final closure of these facilities, as required under NDEP and BLM requirements, and associated NEPA analysis would be conducted.

4.11.1.1 Special Status Plants

Under Alternative A there would be no additional surface disturbance, and therefore, no additional loss of habitat beyond that which has already occurred as a result of previous and existing operations. Indirect impacts from the establishment and spread of noxious weeds are possible but of low likelihood. Furthermore, Coeur employs a noxious weed control plan that would continue to be used to control the establishment and spread of noxious weeds.

4.11.1.2 Special Status Wildlife

Under Alternative A, there may be a long-term increase in special status wildlife use of the Mine due to the increase in available surface water that would be provided by the pit lake that would develop. The pit lake would not be fenced or have other wildlife deterrents and would present an opportunity for special status wildlife that are in the area to access the pit lake water. The SLERA (Appendix A) was conducted to evaluate potential ecological risks associated with each of the project alternatives as related to identified receptor organisms specific to the regional ecology and site-specific habitats. The Rochester Mine SLERA indicates that open water provides the greatest potential of risk to environmental receptors; therefore, the actions associated with the pit were analyzed in the SLERA. Since Alternative A is the only alternative that would result in a large area of permanent open water (i.e., the pit lake), this alternative presents a greater risk than the other alternatives. The special status species that are likely to visit the pit lake are considered receptors warranting evaluation; however, the evaluation of surrogate species is necessary because exposure data are unavailable for the special status species. A summary of the potential risk for each special status species under Alternative A follows:

- Because greater sage-grouse are not likely to occur at the Mine and the pit lake area in particular lacks suitable habitat for this species, greater sage-grouse are not expected to visit the pit lake. Therefore, the SLERA evaluation is not relevant to this species.
- Several raptors species, including golden eagles, northern goshawks, Swainson’s hawks, prairie falcons, and peregrine falcons, may visit the pit lake for drinking water and may feed on animals that ingest pit lake water. Of the species considered for the SLERA, the red-tailed hawk is a suitable surrogate species because all of these raptors feed primarily on mammals and birds (Cornell Lab of Ornithology 2010). The SLERA identified no risk potential for the red-tailed hawk.
- An observation of a nesting pair of burrowing owls was identified immediately adjacent to the Nevada Packard Old Heap Leach Pad 1 (AEE 2000). The SLERA identified the barn owl as the most suitable surrogate species for the burrowing owl. However, note that while the barn owl feeds primarily on small mammals, the burrowing owl’s diet consists of insects, birds, amphibians, and reptiles, as well as small mammals (Owling 2001, Cornell Lab of Ornithology 2010). The barn owl also serves as a suitable surrogate for the long-eared owl and the short-eared owl. The SLERA identified no risk potential for the barn owl.
- Because pygmy rabbits are not likely to occur at the Mine and the pit lake area in particular lacks suitable habitat for this species, pygmy rabbits are not expected to visit the pit lake. The SLERA is not relevant to this species.
- Several bat species, including Townsend’s big-eared, small-footed myotis, California myotis, and western pipistrelle, may visit the pit lake for drinking water and feed on insects that ingest pit lake water (Bradley et al. 2006). Of the species considered for the SLERA, the little brown bat (*Myotis licifigus*) is the most suitable surrogate species; however, some of these species primarily feed on terrestrial moths (Bradley et al. 2006), whereas the diet of little brown bats is primarily aquatic insects (Colorado Division of Wildlife 2008). The SLERA identified no risk potential for the little brown bat.

The 4 ponds currently on-site do not contain process solutions and are usually dry. The ponds are part of the emergency fluid management system. In the event the ponds are used for emergency process solution storage, the solution would have to be removed (returned to the countercurrent system) within 20 days, per the Mine’s WPCP. The ponds can also hold meteoric waters after precipitation events, but meteoric waters are not considered an issue in regards to wildlife impacts, and meteoric water must be removed within 20 days, per the Mine’s WPCP.

Under Alternative A, there is a very slight potential for traffic-related injury or mortality of wildlife; adherence to speed limits on all roads used would minimize the potential for wildlife collisions. Other potential direct impacts to wildlife may include a minor level of disturbance resulting from the limited noise, dust, traffic, general human presence, and nighttime lighting associated with Mine operations that do not include active mining. Given the historic and current activity at the Mine, the wildlife in the area are likely habituated to these conditions at the minimal activity level that is anticipated under Alternative A. In addition, environmental protection measures that would be implemented include adherence to posted speed limits on all roads used, adherence to the Mine's fugitive dust control plan, and conducting pre-construction clearance surveys for new disturbance during the avian nesting season.

Certain project design elements under this alternative would address wildlife mortality concerns by preventing exposure of wildlife to process solutions. With the heap leach facility valley-fill design, process solutions would be stored within the heap leach facilities instead of in solution ponds. In addition, the counter-current system is a closed system that would direct the flow of process solutions throughout the heap leach facilities and process system and would manage process solutions without the use of pregnant and barren solution storage ponds.

In conclusion, while Alternative A has the potential to impact special status wildlife, it would occur at the individual level rather than the population level and would not exacerbate further decline of special status wildlife species. The best evidence of the low level of risk is the limited extent of past mortalities as reported to NDOQ and discussed in Section 3.11–*Wildlife*.

4.11.2 Effects of Alternative B – Proposed Action

4.11.2.1 Special Status Plants

Alternative B would directly impact approximately 38.6 acres of marginal Lahontan milkvetch habitat. Indirect impacts from the establishment and spread of noxious weeds are possible but of low likelihood, based on the limited amount of marginal Lahontan milkvetch habitat and the low likelihood of Lahontan milkvetch individuals occurring in the area. Furthermore, mitigation measures would be implemented to control the establishment and spread of noxious weeds (Section 2.2). It is unlikely that Alternative B would adversely affect Lahontan milkvetch individuals or habitat.

4.11.2.2 Special Status Wildlife

The pit area has already been heavily disturbed and vegetation in the 16.4-acre ancillary facility area has also been impacted by previous operations. The wildlife habitats that would be affected now by surface disturbance, therefore, are only those that are within the footprint of the 145.7 acres at the location of the proposed Stage III Heap Leach Facility (Section 3.12–*Vegetation* and **Figure 3.12.1**). The proposed Reclamation Plan for the expanded Rochester Open Pit and the Stage III Heap Leach Facility is provided in POA No. 8, under which all acres of disturbance would be reclaimed and restored as terrestrial wildlife habitat. As discussed in Section 4.12–*Vegetation*, impacts from the removal of vegetation would occur over 17 years for herbaceous and annual plant communities because reclamation of the Stage III Heap Leach Facility would begin within 9 years of the construction of the facility and would occur over an 8-year period. However, sagebrush communities may take 50–100 years to recover from disturbances and pinyon-juniper communities may take up to 100 years (Laudenslayer and Boggs 2010); therefore, impacts to these vegetation components would be considered long-term. All of the special status wildlife species analyzed in this EA require the sagebrush or pinyon-juniper components; therefore, in all cases any habitat loss would be considered long-term.

<u>Greater Sage-Grouse</u>
The area proposed for development of the Stage III Heap Leach Facility is comprised of approximately 53.5 acres of big sagebrush and low sagebrush communities that are consistent

with sage-grouse habitats, including Great Basin Xeric Mixed Sagebrush Shrubland, Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Big Sagebrush Steppe, and Inter-Mountain Basins Montane Sagebrush Steppe (Section 4.12). Removal of the habitat in this area would be considered a negative impact to sage-grouse; however, the likelihood of sage-grouse actually using this particular area of habitat is low, given that it is immediately adjacent to extensive existing disturbance from the Mine and the sage-grouse population in the area is known to be small.

Golden Eagle

All of the proposed habitat removal under Alternative B would constitute a long-term impact to approximately 144.6 acres of suitable golden eagle foraging habitat, including 53.3 acres of sagebrush-dominated shrublands and 91.1 acres of juniper woodlands.

Northern Goshawk

Alternative B would cause the loss of approximately 91.1 acres of juniper woodlands that are potential hunting habitat for northern goshawks.

Burrowing Owl

Approximately 53.5 acres of sagebrush-dominated shrublands that are potential nesting and foraging habitat for the burrowing owl would likely be affected by Alternative B. In addition, Alternative B could cause disturbance to and abandonment of nesting burrowing owls if they are present within approximately 250 feet of project activities (USFWS 2007); in 2000, a pair of burrowing owls was observed very near the Nevada Packard Mine, approximately one mile south of the proposed activities, and was presumed to be nesting.

Long-Eared Owl

Alternative B would cause the loss of approximately 144.6 acres of potential foraging habitat for the long-eared owl including 91.1 acres of juniper woodlands and 53.5 acres of sagebrush shrublands.

Short-Eared Owl

All of the proposed habitat removal under Alternative B would constitute a long term impact to approximately 144.6 acres of foraging and nesting habitat for the short-eared owl.

Swainson’s Hawk

All of the proposed habitat removal under Alternative B would constitute a long term impact to approximately 144.6 acres foraging and nesting habitat for the Swainson’s hawk, including 91.1 acres of juniper woodlands and 53.5 acres of sagebrush shrublands.

Prairie Falcon

All of the proposed habitat removal under Alternative B would constitute a long term impact to approximately 144.6 acres of prairie falcon habitat including 91.1 acres of nesting habitat and 53.5 acres of foraging habitat.

Peregrine Falcon

Alternative B would cause the loss of approximately 53.5 acres of sagebrush-dominated shrublands that are potential foraging habitat for the peregrine falcon.

Pygmy Rabbit

The Inter-Mountain Basins Big Sagebrush Shrubland identified in the USGS (2004) GAP database may provide suitable habitat for the pygmy rabbit, approximately 8.9 acres of which would be removed under Alternative B. However, the likelihood of pygmy rabbits actually using this particular area of habitat is low, given that pygmy rabbits are not known or expected to occupy the area (JBR Environmental Consultants 2010).

Townsend's Big-Eared Bat

Alternative B would cause the loss of approximately 91.1 acres of juniper woodlands that are potential, though marginal, foraging habitat for Townsend's big-eared bats. No impacts to hibernating bat individuals would occur from Alternative B, based on removal of the bats as described in the Nevada Packard Mine Bat Habitat Mitigation Plan (Sherwin 2002). Furthermore, Alternative B would not include mining disturbance within 600 feet of known bat habitat in old mine workings; therefore, no hibernation roosts would be affected.

Other Bats

All of the proposed habitat removal under Alternative B would constitute a long-term impact to suitable foraging habitat for a variety of bat species, including small-footed myotis, California myotis, and western pipistrelle (NatureServe 2009). No impacts to hibernating bat individuals are expected to occur from Alternative B, based on removal of the bats as described in the Nevada Packard Mine Bat Habitat Mitigation Plan (Sherwin et al. 2002). Furthermore, Alternative B would not include mining disturbance within 600 feet of known bat habitat in old mine workings; therefore, no hibernation roosts would be affected.

Impacts Common to All Special Status Wildlife Species

In addition to the evaporation ponds discussed under Alternative A, Alternative B would also create surface water in the 2 evaporation ponds that would be constructed at closure of the Stage III Heap Leach Facility. Therefore, this alternative may present opportunities for special status wildlife use of the Mine. The new evaporation ponds would be fenced as needed, based on water quality; however, the special status species that are most likely to visit the Mine are bats and birds, which would not be deterred by a fence. Alternative B could result in mortality if wildlife are exposed to toxic water or are unable to escape the water after entering.

In comparison to Alternative A, Alternative B backfilling would be used to prevent formation of a pit lake, which would reduce the potential attraction of the Mine to wildlife and eliminate any potential impacts from toxicity of pit lake water. Because Alternative B would preclude the formation of a post-mining pit lake or a hydrologic sink, the SLERA shows that there would be no risk potential associated with Alternative B. In comparison, Alternative A has several factors that present risk potential, and Alternative C presents low risk potential (**Appendix A**).

The estimated frequency of traffic traveling to and from the Mine, including employees and vendors, would be approximately 940 roundtrips per week during the height of operations. Traffic rates would be much lower once the proposed mining activities have been completed and operations are limited to residual leaching and subsequent closure of the Stage III Heap Leach Facility. Under this alternative, there is the potential for traffic-related injury or mortality of special status wildlife. However, adherence to speed limits on all roads used would minimize the potential for wildlife collisions.

Other potential direct impacts to special status wildlife may include disturbance resulting from noise, dust, traffic, general human presence, and nighttime lighting associated with Mine operations, and more so during construction of the Stage III Heap Leach Facility and the evaporation ponds for closure of the facility. Responses to this disturbance may be individuals being temporarily displaced. Such disturbance is anticipated to be elevated under Alternative B compared to Alternative A. However, given the historic and current activity at the Mine, wildlife in the area are likely habituated to these conditions. In addition, environmental protection measures would be implemented to minimize impacts to wildlife, including measures to protect breeding birds (although no special status bird species are expected to nest near the project activities), to minimize dust, to minimize nighttime lighting impacts, and to adhere to posted traffic speed limits.

Certain project design elements under this alternative would address wildlife mortality concerns by preventing exposure of wildlife to process solutions. With the heap leach facility valley-fill design, process solutions would be stored within the heap leach facilities instead of in solution ponds. In addition, the counter-current system is a closed system that would direct the flow of process solutions throughout the heap leach facilities and process system and would manage process solutions without the use of pregnant and barren solution storage ponds.

Under Alternative B, the Stage II and Stage IV heap leach facilities would be reclaimed under the currently approved Plan of Operations (as they would be under Alternative A). The Stage III Heap Leach Facility would be reclaimed as described in the Reclamation Plan in POA No. 8. These closure activities would occur independent of final closure of the entire Mine. Alternative B would extend the life of the Mine, and thus the time before comprehensive reclamation of the Mine begins, by an additional 9 years, and reclamation would occur over an 8-year period.

In conclusion, while Alternative B has the potential to impact special status wildlife, it would occur at the individual level rather than the population level and would not exacerbate further decline of any special status wildlife species. The best evidence of the low level of risk is the limited extent of past mortalities as reported to NDOW and discussed in Section 3.11–*Wildlife*.

4.11.3 Effects of Alternative C – Backfill Pit to Create an Evaporative Sink

Under Alternative C, the potential direct and indirect impacts to special status species would be similar to those described for Alternative B because the following aspects would be the same: the extent of new surface disturbance, habitat reclamation, preclusion of a pit lake, development of 2 evaporation ponds at closure of the Stage III Heap Leach Facility, traffic levels, types and extent of disturbance, and environmental protection measures to be implemented (Section 2.2). The same closed, counter-current system form of managing process solutions would be employed, eliminating the use of pregnant and barren solution storage ponds and thus the potential for exposure of wildlife to those solutions. The SLERA (Appendix A) indicates that there is no additional risk associated with this alternative that is relevant to the special status species that may be present at the Mine.

In conclusion, while Alternative C has the potential to impact special status wildlife, it would occur at the individual level rather than the population level and would not threaten the viability of any special status wildlife species.

4.11.4 Effects of Alternative D – Out-of-Heap Solution Management

Under Alternative D, the potential direct and indirect impacts to special status species would be similar to those described for Alternative B because the following aspects would be the same: the extent of new surface disturbance, habitat reclamation, preclusion of a pit lake, extent of new surface water availability (the one storage pond under Alternative D would cover the same area as the 2 evaporation ponds under Alternative B), traffic levels, types and extent of disturbance, and environmental protection measures to be implemented (Section 2.2).

Alternative D would differ from Alternative B and Alternative C in that the Stage III Heap Leach Facility would operate as a free draining system rather than providing for in-heap storage. Certain project design elements under this alternative would address wildlife mortality concerns by preventing exposure of wildlife to process solutions. Pregnant solution would be routed through a lined solution channel to an enclosed tank and pump system. Except during process plant unavailability or high precipitation conditions, pregnant solution would be pumped from the tank via pipeline directly to the process plant. However, during plant shutdown or high flow conditions, excess pregnant solution could be routed to a 6.5-acre storage pond that would take the place of the 2 evaporative ponds proposed for heap draindown under Alternative B. Therefore, Alternative D would have slightly more potential to impact special status wildlife due to the increased exposure to process solutions in surface water. The process solution storage pond would be fenced; however, the special status species are bats and birds, which would not be deterred by a fence. The process solution storage pond would have floating balls to deter avian species.

Like Alternative B, Alternative D would preclude the formation of a post-mining pit lake, and therefore, the several factors that present risk potential under Alternative A. There would be no risk potential associated with this alternative.

In conclusion, while Alternative D has the potential to impact wildlife, it would occur at the individual level rather than the population level and would not threaten the viability of any special status wildlife species. The best evidence of the low level of risk is the limited extent of past mortalities as reported to NDOW and discussed in Section 3.11–*Wildlife*.

4.12 <u>Vegetation</u>

4.12.1 Effects of Alternative A – No Action

Under Alternative A, Coeur would continue to operate and close the Mine under the currently approved Plan of Operations, with no additional disturbance to vegetation. A final permanent closure plan would be submitted as a separate action 2 years prior to final closure of these facilities, as required under NDEP and BLM requirements, and associated NEPA analysis would be conducted. Under Alternative A, development of a lake in the Rochester Pit after closure would have a negligible effect on vegetation.

4.12.2 Effects of Alternative B – Proposed Action

In the 16.4-acre ancillary facility area, vegetation has already been impacted by previous operation. However, the vegetation covering the 145.7 acres within the footprint of new disturbance of the proposed Stage III Heap Leach Facility would be directly affected by Alternative B. An additional 3 acres of vegetation previously approved for disturbance, but not yet physically disturbed, would also be affected by creation of an evaporation pond. Most activity would occur primarily in the Great Basin Pinyon-Juniper Woodland vegetation community (approximately 62.5 percent) and the Great Basin Xeric Mixed Sagebrush Shrubland vegetation type (approximately 26.5 percent) (**Figure 3.12.1** and **Table 4.12.1**) (USGS 2004). Three additional vegetation communities would be impacted to a lesser degree (**Figure 3.12.1** and **Table 4.12.1**). The USGS (2004) GAP data also show that a minimal amount of one disturbed cover type falls within the Stage III Heap Leach Facility (**Figure 3.12.1** and **Table 4.12.1**); however, that reflects an approximation of the spatial data; and in reality, the entire Stage III Heap Leach Facility would be new surface disturbance. No surface disturbance of the wetland vegetation type would occur under Alternative B (**Figure 3.12.1**).

Table 4.12.1: Vegetation Communities Directly Impacted by Alternative B

Vegetation Community	Acres Impacted
Great Basin Pinyon-Juniper Woodland	91.1
Great Basin Xeric Mixed Sagebrush Shrubland	38.6
Inter-Mountain Basins Big Sagebrush Shrubland	8.9
Inter-Mountain Basins Big Sagebrush Steppe	0.7
Inter-Mountain Basins Montane Sagebrush Steppe	5.3
Recently Mined or Quarried [(1)]	1.3
Total	**145.7**

(1) Acreages impacted are approximations. All 145.7 acres would be new surface disturbance. This total does not include the minor disturbance associated with the evaporation pond (approximately 3 acres that has been previously approved for disturbance but has never been physically impacted).

Vegetation reclamation would begin within 9 years and reclamation would occur over an 8-year period. Therefore, direct impacts for the removal of herbaceous and annual vegetation communities would occur over approximately 17 years. Impacts to sagebrush communities would be long-term, as sagebrush communities may take 50–100 years to recover (Beck et al. 2009). Likewise, juniper communities may also take up to 100 years to recover from disturbances; therefore, the proposed impacts to juniper communities would be considered long-term (Laudenslayer and Boggs 2010). The Great Basin Pinyon-Juniper Woodland ecological system mapped within the project area is a pure stand of juniper and there would be no direct impacts to pinyon trees. While disturbances would be long-term, the intensity of disturbance, given the extent of vegetation communities in the surrounding area, would be limited. The presence of cheatgrass could further delay the recovery of vegetation in disturbed areas if not properly managed. Cheatgrass may increase the fire-return interval and permanently alter sagebrush shrublands by replacing them with annual grasslands (Zouhar 2003).

The proposed Reclamation Plan for the expanded Rochester Pit and the Stage III Heap Leach Facility is provided in POA No. 8 and summarized below. More details of the environmental protection measures proposed under Alternative B are provided in Section 2.2.

The goal of Coeur's revegetation program is to stabilize reclaimed areas and establish a productive vegetative community in accordance with the Sonoma-Gerlach Resource Area MFP (BLM 1982) and designated post-mining land uses. Growth media and soil amendments would be used during reclamation of the Stage III Heap Leach Facility. The seed mix proposed for use at the Stage III Heap Leach Facility is comprised of native and introduced species representative of the area. Other site-specific seed mixtures, amendments, and application rates would be developed through consultation and approval by BLM and NDEP as necessary. The seed mix selected would represent a Reclaimed Desired Plant Community and would be appropriate for the representative ecological site. A perimeter fence along the permit boundary would remain in place until vegetation is established on reclaimed areas.

Criteria for bond release of revegetated areas would be in accordance with 43 CFR 3809.5 which requires, in part, "…regrading and reshaping to conform with adjacent landforms, facilitate revegetation, control drainage, and minimize erosion;" as well as "…establishment of self-sustaining revegetation."

Vegetation that is in proximity to any areas used during implementation of Alternative B may also incur direct, short-term impacts from increased exposure to dust generated by construction activities and traffic, which could result in a reduction of photosynthetic ability. To mitigate impacts from dust, fugitive dust from the Mine traffic would be controlled through water application and surface treatment of access and haul roads. Water sprays would be used at the crushing system for dust suppression.

Vegetation that is in proximity to any areas used during construction, operation, or closure of the Mine may also be indirectly affected by the introduction and spread of noxious weeds and other invasive, non-native plant species. Coeur would be responsible for controlling noxious weeds and other non-native invasive plant species until revegetation has been determined successful by BLM and NDEP. Coeur would coordinate with BLM prior to herbicide treatment to ensure intended chemicals and formulations are approved for use on BLM administered lands, and that an approved, current Pesticide Use Proposal exists. All seed would be tested for purity and presence of noxious, poisonous, and/or prohibited plant species. Coeur would conduct annual weed surveys to direct weed control efforts. Monitoring weed infestations and weed control efforts would continue until reclamation is complete and potential for weed invasion is minimized. Certified weed free straw bales would be used for sediment control.

Under Alternative B, the Stage III Heap Leach Facility would be reclaimed as described in the Reclamation Plan in POA No. 8. These closure activities would occur independent of final closure of the entire Mine. Alternative B would extend the life of the Mine, and thus the time before comprehensive reclamation of the Mine begins, by an additional 9 years, and reclamation would occur over an 8-year period.

As discussed in the SLERA, backfilling the pit to approximately 6,175 feet elevation amsl would cause no consistent surface expressions of water on the backfill surface. However, during spring, ground water would be at an elevation below the backfill surface that could allow growth of deep rooted vegetation.

4.12.3 Effects of Alternative C – Backfill Pit to Create an Evaporative Sink

Under Alternative C, the extent of newly disturbed vegetation and the reclamation of those areas would proceed as described under Alternative B, and would, therefore, cause direct impacts to vegetation as described for Alternative B. In addition, Alternative C would require construction and traffic activity, as well as implementation of environmental protection measures, similar to those described under Alternative B, and would, therefore, result in indirect impacts to vegetation as described for Alternative B.

As discussed in the SLERA, backfilling the pit to approximately 6,150 feet elevation amsl would cause no consistent surface expression of water on the backfill surface. However, the hydrologic sink could lead to creation of emergent wetland vegetation on the backfill surface during wetter than normal years.

4.12.4 Effects of Alternative D – Out-of-Heap Solution Management

Under Alternative D, the 145.7 acres of newly disturbed vegetation would be affected by construction. The 6.5-acre process pond would be located in the area where vegetation has already been impacted. Reclamation of those areas would proceed as described under Alternative B, and would cause direct impacts to vegetation as described for Alternative B. In addition, Alternative D would require construction and traffic activity, as well as implementation of environmental protection measures, similar to those described under Alternative B, and would, therefore, result in indirect impacts to vegetation as described for Alternative B.

4.13 Visual Resource Management

4.13.1 Effects of Alternative A – No Action

Under Alternative A, Coeur would continue to operate and close the Mine under the currently approved Plan of Operations. No additional mining, backfilling, or disturbance to vegetation or soils would occur. The Stage II and Stage IV heap leach facilities would be reclaimed beginning in 2012 and 2014, respectively. A final permanent closure plan would be submitted as a separate action 2 years prior to final closure of these facilities, as required under NDEP and BLM requirements, and associated NEPA analysis would be conducted.

In 2007, 2 key observation points (KOPs) were selected from which changes to the characteristic landscape could be compared. KOP 1 was located southwest of the Mine boundary and provided a view of the top of the heaps from the intersection of Coal Canyon Road and Packard Flat. KOP 2 was located just northwest of the Mine boundary along Limerick Canyon Road, near the intersection to Unionville, and provided a view upslope toward the Mine disturbance on the hillside.

It was concluded that because of the local topography and the location of the heap leach pads and pumps, the Stage II and Stage IV heap leach facilities were not visible to the public from the KOPs. This level of analysis is not required for this EA because only VRM Class IV would be affected by the proposed project; however, the analysis is relevant to Alternative A, which is limited to activities occurring at the Stage II and Stage IV heap leach facilities.

Mine lighting under Alternative A would remain the same as it currently is, until around 2014, when Coeur would begin closure operations including the closing and removal of buildings which would result in a reduction of light sources. All lighting, except at one small building, would be gone by 2020.

4.13.2 Effects of Alternative B – Proposed Action

In the 16.4-acre ancillary facility area, vegetation has already been impacted by previous operations. However, the vegetation covering the 145.7 acres within the footprint of new disturbance of the proposed Stage III Heap Leach Facility and disturbance associated with the evaporation pond (approximately 3 acres that has been previously approved for disturbance but has never been physically impacted) would be directly affected by Alternative B. This activity would occur primarily in juniper woodland and sagebrush shrubland vegetation communities. Impacts would be long-term, due to the long regeneration times of these vegetation types. The proposed Reclamation Plan is provided in POA No. 8. To the extent possible, buildings would be painted in colors that are compatible with the natural environment.

Any changes to the landscape under Alternative B would be moderate in nature, given the local topography, the remote nature of the site, the existing extent of major modification in the landscape, and the relatively small area that the proposed modifications would occupy compared to the entire Mine. The area proposed for disturbance is not visible from any major roadway, town, or recreation area. Prominent views are from the Mine access route, making the primary viewers Mine employees and service contractors. Occasional recreationists or hunters could view the area. To limit impacts to the landscape, existing utility corridors, roads, and areas of disturbed land would be utilized wherever possible. Construction of new roads would be avoided to the extent possible.

Under Alternative B, the primary lighting would continue as described for current operations. In addition, new lighting under this alternative would include the following: lights on the overland conveyor from the tertiary crusher to the Stage III Heap Leach Facility load-out; 2 portable light plants for stacking of the Stage III Heap Leach Facility; up to 4 portable light plants in the pit for mining activities; and the use of all existing lights on the primary, secondary and tertiary crushing facility.

The majority of lights would be automatically controlled by photo cells that turn on in low light conditions. The crusher facility lights would continue to be manually controlled. The portable light plants would also be manually controlled. All lights would be shielded downward for directional lighting as appropriate, and to reduce light pollution. All lights would be operated from sunset to sunrise following the general Mine schedule, 365 days per year.

Coeur would implement the following lighting BMPs and environmental protection measures, as introduced in Chapter 2 under the proposed action, to reduce light pollution and maintain dark sky attributes:

- All proposed lighting use screens that do not allow the bulb to shine up or out.
- All proposed lighting shall be located/directed to avoid light pollution onto any adjacent lands as viewed from a distance.
- All lighting fixtures shall be hooded and shielded, face downward, located within soffits and directed on to the pertinent site only, and away from adjacent parcels or areas.

The location and topography of the Mine site would "terrain shield" the Alternative B facilities and lighting from general public viewing. There would be a gradual decrease of lighting upon the initiation of closure operations starting in approximately 2016, with the removal of specific facilities. All lighting, except at one small building, would be gone by 2020.

4.13.3 Effects of Alternative C – Backfill Pit to Create an Evaporative Sink

The impacts to visual resources would be the same under Alternative C as are described for Alternative B because the following aspects would be the same under both alternatives: location, extent, and type of new disturbance; the reclamation process and timeframe; the lighting requirements; and the environmental protection measures that would be implemented.

4.13.4 Effects of Alternative D – Out-of-Heap Solution Management

With one exception, the impacts to visual resources would be the same under Alternative D as are described for Alternative B because the following aspects would be the same under both alternatives: location, extent, and type of new disturbance; the reclamation process and timeframe; the lighting requirements; and the environmental protection measures that would be implemented. Additional lighting would be required at the external pond for safe access to the pregnant tank and operation. This lighting would be managed to reduce impacts and maintain dark sky attributes as described in Alternative B.

4.14 Wildlife

4.14.1 Effects of Alternative A – No Action

Under Alternative A, Coeur would continue to operate and close the Mine under the currently approved Plan of Operations. No additional mining, backfilling, or disturbance to wildlife would occur. A lake would ultimately form in the Rochester Pit after closure. The size of the lake would vary seasonally in response to water inputs and evaporative processes; the lake would cover approximately 16.5 acres at its largest and would be approximately 125 feet deep at its deepest part. There would be no additional short-term or long-term disturbance of wildlife habitat. The Stage II and Stage IV heap leach facilities would be reclaimed, with closure of these components initiating in 2012 and 2014, respectively. A final permanent closure plan would be submitted as a separate action 2 years prior to final closure of these facilities, as required under NDEP and BLM requirements, and associated NEPA analysis would be conducted.

Under Alternative A, there may be a long-term increase in mammal, reptile, and avian (including waterfowl) use of the Mine due to the increase in available surface water that would be provided by the pit lake that would develop. The pit lake would not be fenced or have other wildlife deterrents and would present an opportunity for all wildlife to access the pit lake water. The SLERA (Appendix A) was conducted to evaluate potential ecological risks associated with each of the project alternatives as related to identified receptor organisms specific to the regional ecology and site-specific habitats. The following receptors were selected for the exposure analysis: little brown bat, white-footed mouse (*Peromyscus leucopus*), desert cottontail rabbit, coyote, mule deer, northern bobwhite quail, red-tailed hawk, mallard, and common barn owl. Open water provides the greatest potential of risk to environmental receptors; therefore, the actions associated with the pit were analyzed in the SLERA. Since Alternative A is the only alternative that would result in a large area of permanent open water (i.e., the pit lake), this alternative presents a greater risk than the other alternatives for the pit area. The SLERA indicates that risk cannot be ruled out for Alternative A for the following exposure pathways:

- Mule deer – 1) for the direct ingestion of water by mule deer for the following COPCs: antimony, boron, cadmium, fluoride, and zinc; 2) for exposure via boron uptake into aquatic plants; and 3) for uptake of boron and cadmium through soil transfer into plants
- Northern bobwhite quail (Colinus virginianus) – for the direct ingestion of water, the uptake via insects and aquatic plants, and through soil transfer into plants,

terrestrial invertebrates, and mammals, for the following COPCs: antimony, boron, cadmium, fluoride, lead, manganese, selenium, thallium, and zinc.

In summary, potential post-closure risks from the pit lake cannot be ruled out for a number of pathways and species. Additional SLERA results are presented in Section 4.5-*Migratory Birds* and Section 4.11-*Special Status Species*.

The 4 ponds currently on-site do not contain process solutions and are usually dry. The ponds are part of the emergency fluid management system. In the event the ponds are used for emergency process solution storage, the solution would have to be removed (returned to the countercurrent system) within 20 days, per the Mine's WPCP. The ponds can also hold meteoric waters after precipitation events, but meteoric waters are not considered an issue in regards to wildlife impacts, and meteoric water must be removed within 20 days, per the Mine's WPCP.

Under Alternative A, there is very slight potential for traffic-related injury or mortality of terrestrial wildlife; adherence to speed limits on all roads used would minimize the potential for wildlife collisions. Other potential direct impacts to wildlife may include a level of disturbance resulting from the limited noise, dust, traffic, general human presence, and nighttime lighting associated with Mine operations that do not include active mining. Given the historic and current activity at the Mine, wildlife in the area are likely habituated to these conditions at the minimal activity level that is anticipated under Alternative A. In addition, environmental protection measures that would be implemented include adherence to posted speed limits on all roads used, adherence to the Mine's fugitive dust control plan, and conducting pre-construction clearance surveys for new disturbance during the avian nesting season.

Certain project design elements under this alternative would address wildlife mortality concerns by preventing exposure of wildlife to process solutions. With the heap leach facility valley-fill design, process solutions would continue to be stored within the heap leach facilities instead of in solution ponds. In addition, the counter-current system is a closed system that directs the flow of process solutions throughout the heap leach facilities and process system and would manage process solutions without the use of pregnant and barren solution storage ponds.

In summary, while Alternative A has the potential to impact wildlife, it would occur at the individual level rather than the population level and would not threaten the viability of any wildlife species. The best evidence of the low level of risk is the limited extent of past mortalities as reported to NDOW and discussed in Section 3.5–*Migratory Birds*. Potential post-closure risks from the pit lake cannot be ruled out for a number of pathways and species.

4.14.2 Effects of Alternative B – Proposed Action

The pit area has already been heavily disturbed and vegetation in the 16.4-acre ancillary facility area has also been impacted by previous operations. The wildlife habitats that would be affected now by surface disturbance, therefore, are only those that are within the footprint of the 145.7 acres at the location of the proposed Stage III Heap Leach Facility. As described in Section 3.12–*Vegetation*, this activity would occur in juniper woodland habitat and sagebrush shrubland habitat (**Figure 3.12.1**). The proposed Reclamation Plan for the expanded Rochester Pit and the Stage III Heap Leach Facility is provided in POA No. 8, under which all acres of disturbance would be reclaimed and restored as terrestrial wildlife habitat. As discussed in Section 4.12–*Vegetation*, impacts from the removal of vegetation would occur over 17 years for herbaceous and annual plant communities because reclamation of the Stage III Heap Leach Facility would begin within 9 years of construction of the facility, and reclamation would occur over an 8-year period. However, sagebrush communities (approximately 53.3 acres) may take 50 to 100 years to recover from disturbances and juniper communities (approximately 91.1 acres) may take up to 100 years (Laudenslayer and Boggs 2010); therefore, impacts to these vegetation components would be considered long-term. While disturbances would be long-term, the intensity of disturbance, given the extent of vegetation communities in the surrounding area, would be limited

4.14.2.1 Bats

All of the proposed habitat removal under Alternative B would constitute a long-term impact to suitable foraging habitat for a variety of bat species, which are addressed in Section 4.11–*Special Status Species*.

4.14.2.2 Big Game

Of the 145.7 acres of new surface disturbance, 51.3 acres are mapped as mule deer summer range and 94.5 acres are mapped as mule deer winter range (**Figure 3.14.1**) (NDOW 2010a). Deer would likely reinitiate summer use of the Stage III Heap Leach Facility area once the herbaceous understory is reestablished (approximately 17 years), but they are less likely to reinitiate winter use of this area until vegetation that provides cover is reestablished (i.e., long-term impact). Consultation indicated that the mule deer population is NDOW's primary concern regarding impacts to wildlife from the proposed project (Tetra Tech 2010a, b).

No impacts to hibernating bat individuals are expected to occur from Alternative B, based on removal of the bats as described in the Nevada Packard Mine Bat Habitat Mitigation Plan (Sherwin et al. 2002). Furthermore, Alternative B would not include mining disturbance within 600 feet of known bat habitat in old mine workings; therefore, no hibernation roosts would be affected.

4.14.2.3 Other Mammals

All of the proposed habitat removal under Alternative B would constitute a long-term impact to suitable hunting and foraging habitat for coyote, kit fox, and bobcat (NDOW 2010c, NatureServe 2009, Meaney et al. 2006). All of the proposed habitat removal under Alternative B would also constitute a long-term impact to suitable foraging habitat for desert cottontail, black tailed jackrabbit, white tailed antelope ground squirrel, yellow-bellied marmot, and Great Basin pocket mouse (NatureServe 2009, Howard 1995). Merriam's kangaroo rat foraging habitat includes sagebrush shrublands (NatureServe 2009), of which approximately 53.5 acres would incur long-term impact under Alternative B. Cougar require large tracts of undisturbed habitat (NatureServe 2009). Even with the potential for prey species to occur in the vicinity of Alternative B, the existing activities at the Mine would preclude the possibility of any potential cougar hunting habitat being disturbed by Alternative B.

4.14.2.4 Game Birds

All of the proposed habitat removal under Alternative B would constitute a long-term impact to suitable mourning dove foraging habitat (Tesky 1993). Chukar foraging habitat includes sagebrush shrubland, of which approximately 53.5 acres would incur long-term impact from Alternative B (Sullivan 1994). Alternative B may impact suitable wild turkey habitat; however, this species is more likely to occur within the riparian zone that is located approximately 3 miles from the Mine (NDOW 2010b). The greater sage-grouse is a game bird that is addressed in Section 4.11–*Special Status Species*.

4.14.2.5 Reptiles

Western whiptail, desert horned lizard, long-nosed leopard lizard, yellow-backed spiny lizard, and zebra-tailed lizard hunting and foraging habitat includes sagebrush shrubland (Burkholder and Walker 1973, NatureServe 2009), of which approximately 53.5 acres would incur long-term impact under Alternative B. All of the proposed habitat removal under Alternative B would constitute a long-term impact to suitable gopher snake, Great Basin rattlesnake, Great Basin collared lizard, western fence lizard, and western patch-nosed snake hunting and foraging habitat (Maxell et al. 2003; NatureServe 2009).

4.14.2.6 Impacts Common to All Wildlife Species

In addition to the evaporation ponds discussed under Alternative A, Alternative B would also create additional surface water in the 2 evaporation ponds that would be constructed at closure of the Stage III Heap Leach Facility. Therefore, this alternative may present opportunities for mammal, reptile, and avian (including waterfowl) use of the Mine. The evaporation ponds would be fenced as needed, based on water quality, to inhibit access by large mammals. Other types of wildlife, especially birds and bats, would be able to access the evaporation ponds. Alternative B could result in mortality if wildlife are exposed to toxic water or are unable to escape the water after entering.

In comparison to Alternative A, Alternative B backfilling would be used to prevent formation of a pit lake, which would reduce the potential attraction of the Mine to wildlife and eliminate any potential impacts from toxicity of pit lake water. The SLERA concluded that because Alternative B would preclude the formation of a post-mining pit lake or a hydrologic sink, the only exposure pathways would be via deep-rooted plant uptake that would occasionally be possible on the backfill surface. The SLERA shows no risk potential associated with Alternative B. In comparison, Alternative A has several factors that present risk potential, and Alternative C presents low risk potential.

The estimated frequency of traffic traveling to and from the Mine, including employees and vendors, would be approximately 940 roundtrips per week during the height of operations. Traffic rates would be much lower once the proposed mining activities have been completed and operations are limited to residual leaching and subsequent closure of the Stage III Heap Leach Facility. Under this alternative, there is the potential for traffic-related injury or mortality of wildlife. However, adherence to speed limits on all roads used would minimize the potential for wildlife collisions.

Other potential direct impacts to wildlife may include mortality of less mobile species during the short-term earth moving activities, while more mobile species would be able to leave the area during construction. Direct impacts to wildlife may also include disturbance resulting from noise, dust, traffic, general human presence, and nighttime lighting associated with Mine operations, and more so during construction of the Stage III Heap Leach Facility and the evaporation ponds for closure of the facility. Responses to this disturbance may be individuals being temporarily displaced, including breeding birds abandoning their nests. Such disturbance is anticipated to be elevated under Alternative B compared to Alternative A. However, given the historic and current activities at the Mine, wildlife in the area are likely habituated to these conditions. In addition, environmental protection measures would be implemented to minimize impacts to wildlife, including measures to protect breeding birds, to minimize dust, to minimize nighttime lighting impacts, and to adhere to posted traffic speed limits.

Certain project design elements under this alternative would address wildlife mortality concerns by preventing exposure of wildlife to process solutions. With the heap leach facility valley-fill design, process solutions would be stored within the heap leach facilities instead of in solution ponds. In addition, the counter-current system is a closed system that would direct the flow of process solutions throughout the heap leach facilities and process system and would manage process solutions without the use of pregnant and barren solution storage ponds.

Under Alternative B, the Stage III Heap Leach Facility would be reclaimed as described in the Reclamation Plan in POA No. 8. These closure activities would occur independent of final closure of the entire Mine. Alternative B would extend the life of the Mine, and thus the time before comprehensive reclamation of the Mine begins, by an additional 9 years, and would occur over an 8-year period.

In conclusion, while Alternative B has the potential to impact wildlife, it would occur at the individual level rather than the population level and would not threaten the viability of any wildlife species. The best evidence of the low level of risk is the limited extent of past mortalities as reported to NDOW and discussed in Section 3.5–*Migratory Birds*.

4.14.3 Effects of Alternative C – Backfill Pit to Create an Evaporative Sink

Under Alternative C, the potential direct and indirect impacts to wildlife would be similar to those described for Alternative B because the following aspects would be the same: the extent of new surface disturbance, habitat reclamation, preclusion of a pit lake, development of 2 evaporation ponds at closure of the Stage III Heap Leach Facility, traffic levels, and environmental protection measures to be implemented (Section 2.2). The same closed, counter-current system form of managing process solutions would be employed, eliminating the use of pregnant and barren solution storage ponds and thus the potential for exposure of wildlife to those solutions.

The SLERA indicates that Alternative C has less risk potential than Alternative A, due to the lack of pit lake formation. However, Alternative C differs from Alternative B and Alternative D in that it would maintain the pit as a hydrologic sink; therefore, risk cannot be ruled out (but is considered low) for Alternative C for the transfer of COPCs from pit water to the soil, soil to plants, then uptake of boron to mule deer.

In conclusion, while Alternative C has the potential to impact wildlife, it would occur at the individual level rather than the population level and would not threaten the viability of any wildlife species. The best evidence of the low level of risk is the limited extent of past mortalities as reported to NDOW and discussed in Section 3.5–*Migratory Birds*.

4.14.4 Effects of Alternative D – Out-of-Heap Solution Management

Under Alternative D, the potential direct and indirect impacts to wildlife would be similar to that described for Alternative B because the following aspects would be the same: the extent of new surface disturbance, habitat reclamation, preclusion of a pit lake, extent of new surface water availability (the one storage pond under Alternative D would cover the same area as the

2 evaporation ponds under Alternative B), traffic levels, and environmental protection measures to be implemented (Section 2.2).

Alternative D would differ from Alternative B and Alternative C in that the Stage III Heap Leach Facility would operate as a free draining system rather than providing for in-heap storage. Certain project design elements under this alternative would address wildlife mortality concerns by preventing exposure of wildlife to process solutions. Pregnant solution would be routed through a lined solution channel to an enclosed tank and pump system. Except during process plant unavailability or above average precipitation conditions, pregnant solution would be pumped from the tank via pipeline directly to the process plant. During plant shutdown or above average precipitation conditions, excess pregnant solution could be routed to a 6.5-acre storage pond that would take the place of the 2 evaporative ponds proposed for heap draindown under Alternative B. Alternative D would have slightly more potential to impact wildlife compared to Alternative B, due to the physical presence of the lined storage pond and exposure to process solution. The process solution storage pond would be fenced to inhibit access by larger wildlife and would have floating balls to deter avian species.

Like Alternative B, there would be no risk associated with the 6,175 backfill scenario. In comparison, Alternative A has several factors that present risk potential, and Alternative C presents low risk potential.

In conclusion, while Alternative D has the potential to impact wildlife, it would occur at the individual level rather than the population level and would not threaten the viability of any wildlife species. The best evidence of the low level of risk is the limited extent of past mortalities as reported to NDOW and discussed in Section 3.5–*Migratory Birds*.

Left Blank Intentionally

5 CUMULATIVE EFFECTS

The Council on Environmental Quality's regulations for implementing NEPA define a cumulative impact as follows: "...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" (40 CFR 1508.7).

As required under the NEPA and the regulations implementing NEPA, this chapter addresses those cumulative effects on the environmental resources in the Cumulative Effects Study Areas (CESAs) which could result from the implementation of each of the alternatives. The extent of the CESA would vary with each resource, based on the geographic or biologic limits of that resource. As a result, the list of projects considered under the cumulative analysis may vary according to the resource being considered. In addition, the length of time for cumulative effects analysis would vary according to the duration of impacts from the alternatives on the particular resource.

Under federal regulations, the terms "impacts" and "effects" are assumed to have the same meaning and are often used interchangeably. The cumulative impacts analysis was performed through the following steps:

1. Identify and quantify the location of potential specific impacts from the alternatives and determine these contributions to the overall impacts.
2. Define the time frames, scenarios, and acreage estimates for cumulative impact analysis.
3. Identify, describe, and map the cumulative impacts assessment areas for each resource to be evaluated in this chapter.

For the purpose of cumulative assessments in this EA, high impacts are those impacts that are considered significant; medium impacts are discernable to moderate and would occur over an extended time frame; and low impacts would be short term in length and minor.

5.1 <u>Assumptions for Analysis</u>

5.1.1 Description of CESA Boundaries

The geographical areas considered for the analysis of cumulative effects vary in size and shape to reflect each evaluated environmental resource and the potential area of impact.

The Air, Water, and Visual Resources CESA encompasses the airsheds surrounding the project area. These airsheds are generally consistent with the hydrologic units in the Project Area potentially subject to cumulative effects.

The Biology CESA (243,733 acres) was developed to assess potential cumulative impacts to soils, vegetation, wildlife, and special status species including migratory birds (**Figure 5.2.1**). The basis for the extent of the Biology CESA is the Humboldt Mountain Range, which is located primarily in Pershing County, along with a small portion in Churchill County. The Rochester Mine is located in the east-central area of the range. The Humboldt Range includes the habitat of many terrestrial wildlife species present throughout the year. Migratory birds also make use of habitat within the Humboldt Mountains during the time they are present in the area. The Biology

CESA further reflects the distribution of soils and vegetation within the region since the plant communities and soils at the Mine more closely resemble those within the Humboldt Mountains compared to the low lying valleys to the south, east, and west.

Employees, contractors, and service providers supporting the Mine come from both Humboldt and Pershing counties; the Mine therefore influences the socioeconomics of both counties. This being the case, the Socioeconomics CESA encompasses Humboldt and Pershing counties.

Table 5.1.1: Cumulative Effects Study Areas

Resource	Cumulative Effects Study Area	CESA Name	CESA Size (Acres)
Air; Water Resources; Visual Resources	Airsheds 129, 73A, and 101A (groundwater hydrologic boundaries)	Air, Water, and Visual CESA	1,132,193
Soils, Vegetation; Invasive Nonnative Species; Wildlife, Migratory Birds, and Special Status Species	Humboldt Mountains	Biology CESA	243,733
Socioeconomics	Humboldt and Pershing counties	Socioeconomics CESA	N/A

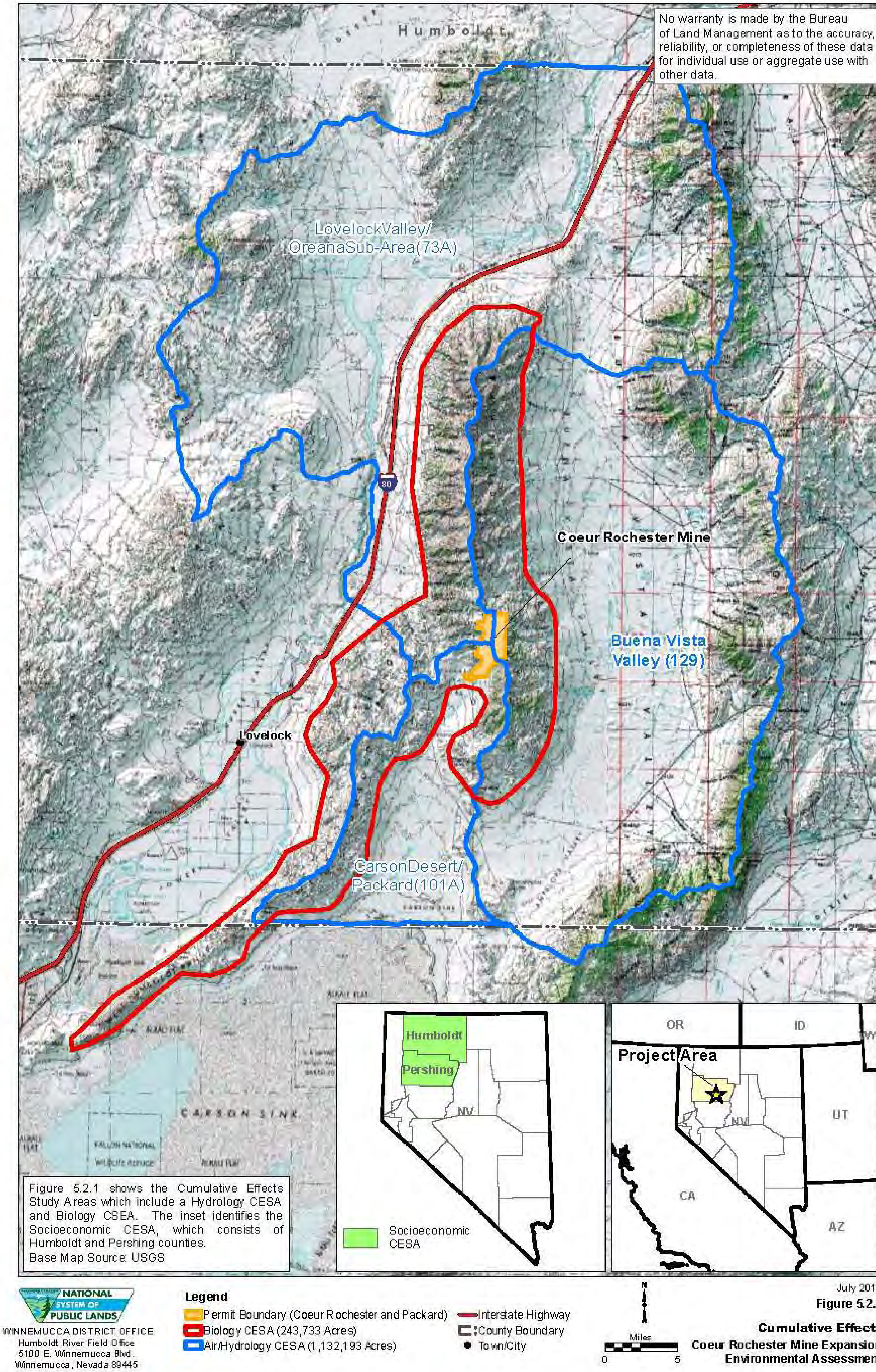
5.2 Past and Present Actions

Past and present actions in the 3 CESAs include localized mineral exploration and development at the Rochester and Nevada Packard Mines; Jipangu International's Florida Canyon Mine and Standard Mine; Victoria Gold Corp's Relief Canyon Mine, livestock grazing; rangeland improvements; right-of-ways (ROWs); fuels treatments; wildland fire; development of transportation networks; and dispersed recreation. Past and present actions that occur outside the Air, Water, Visual and Biology CESAs but within the Socioeconomic CESA include additional mineral exploration and mine development for industrial minerals and precious metals within Humboldt and Pershing counties including activities at EP Minerals' Colado Mine (industrial minerals); U.S. Gypsum's Empire Mine (industrial minerals); Newmont Mining Corporation's Twin Creeks Mine and Lone Tree Mine; Goldcorp, Inc.'s Marigold Mine; and Barrick Gold Corporation's Turquoise Ridge Joint Venture Mine. The following are brief descriptions of these past and present actions based on available information.

Mineral Exploration and Development

Coeur has been actively mining the Rochester deposit and conducting exploration activities since 1986. Road building and other surface disturbance activities connected with the Nevada Packard deposit began in 2002. The Mine boundary currently encompasses approximately 4,368 acres with an approved life-of-mine disturbance of 1,714 acres.

The nearest mineral exploration and development activities to the Rochester Mine are Jipangu International's Standard Mine and Florida Canyon Mine. The Standard Mine is located approximately 16 miles north of the Rochester and Nevada Packard Mines and encompasses approximately 330 acres of mine-related disturbance with an additional 75 acres of exploration disturbance. The Florida Canyon Mine is located 5 miles north of the Standard Mine and has a disturbance footprint of approximately 2,500 acres.


No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.
Humboldt
Lovelock Valley/ Oreana Sub-Area (73A)
80
Coeur Rochester Mine
Buena Vista Valley (129)
Lovelock
Carson Desert/ Packard (101A)
CARSON SINK
Humboldt
Pershing
NV
Socioeconomic CESA
OR
ID
WY
Project Area
UT
CA
AZ
Figure 5.2.1 shows the Cumulative Effects Study Areas which include a Hydrology CESA and Biology CSEA. The inset identifies the Socioeconomic CESA, which consists of Humboldt and Pershing counties.
Base Map Source: USGS
NATIONAL SYSTEM OF PUBLIC LANDS
WINNEMUCCA DISTRICT OFFICE
Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, Nevada 89445
Legend
Permit Boundary (Coeur Rochester and Packard)
Biology CESA (243,733 Acres)
Air/Hydrology CESA (1,132,193 Acres)
Interstate Highway
County Boundary
Town/City
N
Miles
0
5
July 2010
Figure 5.2.1
Cumulative Effects
Coeur Rochester Mine Expansion
Environmental Assessment

Left Blank Intentionally

The Relief Canyon Mine located approximately 2 miles south of the Rochester and Nevada Packard Mines has disturbed approximately 965 acres and operated between 1986 and 1989 and re-opened in 2007 but has since ceased activity and is bankrupt (FirstGold 2010).

Additional past and present mineral exploration and mine development actions for industrial minerals and precious metals within the two regional CESAs include activities at EP Minerals' Colado Mine (industrial minerals); Newmont Mining Corporation's Twin Creeks Mine and Lone Tree Mine (precious metals); Goldcorp, Inc.'s Marigold Mine (precious metals); and Barrick Gold Corporation's Turquoise Ridge Joint Venture Mine (precious metals). Within the Socioeconomic CESA, these activities have had positive and negative effects on various social and economic factors including employment, local and regional economics, housing needs, public services, and infrastructure depending on the needs of national and international markets for minerals and associated commodities.

Livestock Grazing and Rangeland Improvements

The Biology CESA includes portions of 8 allotments including the Star Peak, Humboldt House, Prince Royal, Coal Canyon-Poker, Rye Patch, Rawhide, South Rochester, and Humboldt Sink allotments. Range improvements have been limited to water development projects, with 3 in the Coal Canyon-Poker Allotment, 2 in the Prince Royal Allotment, and one each in the Humboldt House, Rawhide, and South Rochester allotments.

Wildland Fires and Fuels Treatments

Wildland fires burned approximately 59,300 acres within the Biology CESA between 1985 and 2007. Vegetation treatments within the Biology CESA, primarily in response to fire have encompassed approximately 12,246 acres. The majority of treatments were applied in 1999 and 2000 in response to the Rochester fire; aerial seeding was applied to most of the treated acres.

Transportation Networks

A mixture of private and public roads traverses the Biology CESA with paved county roads accounting for approximately 11.4 miles, unpaved county roads accounting for 10.0 miles, and unpaved, 2-track roads covering approximately 259.2 miles.

ROWs

Numerous ROWs occur within the Biology CESA including roads, electric transmission lines, electric distribution lines, electric substations and water pipelines. At least one ROW exists for communications. Leases also exist for wind and geothermal projects although no formal proposals have been submitted for work within those leases.

Recreation

Dispersed recreation occurs throughout the CESAs; however, there are no data on the level of past and present uses.

5.3 Reasonably Foreseeable Future Actions

Reasonably Foreseeable Future Actions (RFFAs) that would continue to occur in the Biology and Socioeconomic CESAs include localized and widespread mineral exploration and mining; livestock grazing; fuels treatments; wildland fire; continued development of transportation networks; ROWs; and dispersed recreation. Mineral exploration and development activities are expected to continue based on current supply and demand of minerals and commodities. A planned expansion at the Standard Gold Mine would result in the long-term disturbance of 45 acres of vegetation, associated with the development of the pit (BLM 2010b). This disturbance would be within the Biology CESA. Livestock grazing and road maintenance are expected to continue at their current levels. BLM expects that recreation within the CESA areas would increase an average of 5 percent per year (BLM 2005).

A great deal of interest has been expressed in exploration to investigate the potential for developing geothermal power. While numerous energy leases have been issued, few specific exploration plans have been submitted. Since none of the lessees within the CESAs have submitted formal exploration or development plans, estimating the extent or scope of their activities would be speculative; therefore, this activity is not considered reasonably foreseeable.

5.4 Cumulative Impacts

This section describes the cumulative impacts of the alternatives on each resource where cumulative effects could potentially occur. There is no potential for cumulative effects on paleontological, cultural or associated with Native American religions since none of the alternatives has any effect on these resources. Where resources have similar impacts (e.g., wildlife, migratory birds, special status species), they are grouped together in the same subsections.

5.4.1 Air Quality

The CESA for air quality is the Air, Water, and Visual CESA, which correspond to the State's designation of airshed and watershed boundaries. The Air, Water, and Visual CESA covers 1,132,193 acres.

Past and Present Actions
Past actions that are and have been impacting air quality include mineral exploration and development, livestock grazing, rangeland improvements, wildland fires and fuels treatments, transportation networks, and dispersed recreation. Most of these activities produce in fugitive dust emissions although fires would contribute other particulate matter to fugitive emissions and mineral exploration and development would also include stationary sources.

RFFAs
Potential impacts to air quality from fuels treatments, transportation networks, dispersed recreation, loss of vegetative cover associated with future wildland fires, and mineral exploration and development could occur.

5.4.1.1 Cumulative Impacts from Alternative A

Alternative A would contribute limited additional air emissions within the Air, Water, and Visual CESA as production activities wind down. This is evidenced by the very low total emissions of PM_{10}, CO, NO_X, and SO_2 reported in 2009 for the Mine (**Table 4.2.2**). Since the facility has operated within the parameters established in its air quality permit, past and present actions have not affected the level of attainment within the project's airsheds and therefore not contributed to a cumulative effect on air quality. The effect of these past and present actions is likewise not expected to affect the attainment of air quality standards in the future. Since air quality permitting considers all emissions within an airshed in establishing permit criteria, past, present, and future emissions associated with the other mining operations within the Air, Water, and Visual CESA, combined with Alternative A, are expected to continue to demonstrate attainment of air quality standards.

Past and present emissions in the form of fugitive dust have occurred and will continue to occur following fires until vegetation is reestablished. Transportation activity from normal road traffic and dispersed recreation, particularly on unpaved roads has and would continue to contribute fugitive dust within the airsheds. While these effects could produce localized effects cumulatively where they occur in close proximity, such effects would tend to be short-lived since burned areas are revegetated either naturally or as part of fire recovery programs. If a fire were to burn in the immediate vicinity of the Mine, cumulative effects from fugitive dust associated the Mine, burned areas, and transportation could occur. Fugitive dust could affect vegetation by coating leaves and reducing primary productivity; however, such effects likely would be short-term (less than 5 years) and of limited extent. Fugitive dust could also affect transportation by limiting visibility but such occurrences would be temporary and limited in extent. These types of effects would not be expected to last long enough to warrant the area being considered in nonattainment for fugitive dust. As a result, Alternative A is expected to have little to no incremental impact to air quality within the Air, Water, and Visual CESA.

As noted in Section 3.2.1, NDEP established mercury emissions controls under the NMCP in 2006, which have led to reduced mercury emissions. As mining activity decreases at the site, future mercury emissions under Alternative A would be expected to continue to drop below the 2009 level of 4 pounds per year. The only other mine operations located within the airshed are the Florida Canyon/Standard operations, approximately 16 miles northeast of the Mine. The Relief Canyon Mine site is located approximately 2 miles south of Packard but is in bankruptcy and there are no plans for future operations.

Under the NMCP, mercury emissions from Florida Canyon/Standard were reported as 90.9 pounds in 2009. Given the low level of emissions under Alternative A, there are unlikely to be any mercury related cumulative impacts on air quality.

GHG emissions would also be expected to decrease over time with a smaller annual contribution from the Mine on a cumulative basis.

5.4.1.2 Cumulative Impacts from Alternatives B–D

Compared to Alternative A, alternatives B–D would result in additional air emissions including fugitive dust, GHGs, carbon monoxide and mercury (Section 4.2). Emissions under each of these alternatives would be governed by a NDEP permit, which would prohibit degradation of air quality below applicable standards. Other projects in the area, including the Florida Canyon, Standard, and Relief Canyon mines have emissions at present, have had emissions in the past and will continue to generate emissions into the future. In each of these cases, emissions are governed by NDEP permits intended to avoid a deterioration of air quality within the respective airsheds. Therefore, the potential for cumulative impacts from alternatives B–D combined with the other mining projects would be limited through NDEP's permitting requirements.

As noted above for Alternative A, cumulative effects from fugitive dust would be less predictable for alternatives B–D when taken in conjunction with a burn or other dust-generating activity should the right conditions occur (e.g., high winds). Again, temporary to short-term affects to vegetation and transportation over a limited area could occur. The relatively short duration of the additional Mine life under alternatives B–D would limit the period of time during which contributions to cumulative air quality impacts would occur.

In 2007, the mine reported mercury emissions of 137 pounds from the process facility. Subsequently, Coeur modified the process facility ventilation system to increase the efficiency of the mercury controls. In 2008 and 2009, this modification reduced process facility mercury emissions to between 4 and 10 pounds per year. Under alternatives B-D, process facility emissions are anticipated to remain within the 4 to 10 pounds range, with fugitive emissions of 0.21 pounds per year.

Within the Air Quality CESA, the only other precious metals mine projects that would contribute to mercury emissions are Jipangu International's Standard Mine and Florida Canyon Mine. The Standard Mine is located approximately 16 miles north of the Rochester Mine, while the Florida Canyon Mine is located 5 miles north of the Standard Mine. Ore from the Standard Mine is processed at the Florida Canyon mill facility. The combined processing facility mercury emissions for the two mines are reported at 94 to 100 pounds per year. The combined cumulative mercury emissions within the 1,132,192-acre Air Quality CESA, resulting from precious metals mine activities, are estimated to be 98 to 110 pounds. This includes 4 to 10 pounds for the Rochester Mine and 94 to 100 pounds for the Florida Canyon Mine/Standard Mine complex.

Within the Air Quality CESA, prevailing winds blow from the northwest to the southeast (EnviroScientists 2010). There are no established air quality or water quality monitoring sites to the east/southeast and downwind of the Rochester Mine. Therefore it is not possible to accurately measure mercury deposition downwind from the mine site. However, Rochester Mine operations experience indicates the low elevation/profile of stacks at the process facility, and the topographic/terrain conditions would shield downwind emissions deposition from the mine site.

There are no perennial or annual bodies of water downwind of the Rochester Mine within the air quality CESA. The only perennial water sources within the CESA are the Humboldt River and Rye Patch Reservoir, including a stretch which is located approximately 10 miles west and upwind from the Mine site. Rye Patch Reservoir has existing elevated levels of mercury as documented by the State of Nevada. However, the upwind location of the reservoir and Humboldt River from the Rochester Mine and the low level mercury emissions under alternatives B-D would inhibit mercury deposition into this water source from the Mine site. Based on existing information and data, cumulative mercury impacts from the Rochester Mine would be low to medium within the Air, Water, and Visual CESA.

GHG emissions under alternatives B–D would be approximately 4,000 metric tons per year compared to 1,351 metric tons per year under current conditions. There are clearly many sources of GHG emissions throughout the region and country that would combine with the Mine. However, given that this increase is a very small percentage of overall national GHG emissions, the contribution to cumulative effects attributable to the Mine is very slight.

5.4.2 Water Resources

The CESA for water resources is the Air, Water, and Visual CESA, which correspond to the State's designation of airshed and watershed boundaries. The Air, Water, and Visual CESA covers 1,132,193 acres.

Past and Present Actions

Past actions that are and have been affecting water resources include mineral exploration and development, livestock grazing, rangeland improvements, wildland fires and fuels treatments, transportation networks, and dispersed recreation.

RFFAs

Potential impacts to water resources from fuels treatments, transportation networks, dispersed recreation, loss of vegetative cover associated with future wildland fires, and mineral exploration and development could occur.

5.4.2.1 Cumulative Impacts from Alternative A

As discussed in Section 4.7–*Water Resources*, the impacts from each of the alternatives on surface and ground water are localized to the immediately vicinity of the Mine. For surface water, no springs would be affected by the proposed action or other alternatives. Further, in the 3 hydrographic units drained by the project area, the surface drainages rarely reach perennial waterbodies and, as a result, the potential for effects on surface water uses by humans and wildlife are slight. For ground water, the analysis shows that predicted impacts on flow and quality are limited to the aquifers in the immediate vicinity of the Mine site, including the BRF. Therefore, the only cumulative effects on water resources are those related to past, present, and future activities that have occurred at the Mine site.

The combination of past, current, and proposed activities under all alternatives would have minimal impacts on surface water resources. The flows in the small springs that have previously been affected by the project will continue to be impacted. Under Alternative A, the existing pit lake would continue to exist, although water quality is expected to improve with time since the sulfide mineralization is now covered with water. As the Mine moves into closure, a long-term pit lake would form with elevated levels of a range of metals as previously shown in **Table 3.7.2**. As documented in Section 3.7–*Water Quality*, water quality in the American Canyon Spring may have been impacted by mining existing operations and the slightly rising trends in chloride, nitrate, TDS, and selenium concentrations could continue to be observed.

Under Alternative A, pumping of water supply wells would continue to drawdown ground water in the BRF until the Mine enters closure. The impacts on flow are limited to the immediate vicinity of the Mine. Similarly, under Alternative A, pumping of ground water in the process area to contain contaminated seepage would continue to occur resulting in very localized drawdown in the shallow alluvium and bedrock aquifers. Ground water quality impacts from historic contamination associated with the existing leaching facilities would continue, along with ongoing measures to capture and contain impacted water.

At closure, under Alternative A, there would be no additional impacts on surrounding ground water quality because the pit lake (maximum of 16 acres) would act as a hydrologic "sink."

5.4.2.2 Cumulative Impacts from Alternatives B–D

Like Alternative A, all of the impacts on water resources from alternatives B–D are limited to the immediate vicinity of the Mine. The cumulative effects are therefore, associated with past, current, and proposed activities at the Mine site.

Surface water resources within the CESA are limited. The only major, perennial surface water resource within the CESA is the Humboldt River which is located approximately 9 miles to the west of Mine site. Other surface water resources include annual and perennial springs, and ephemeral drainages. The diversions associated with alternatives B–D would not add to the existing, localized impacts on surface water flow or quality in the project area. There are no surface drainage from the mine site to the Humboldt River. Conditions in the ephemeral drainages would not change from the current site conditions. No additional springs would be affected. Further, the existing pit lake would be eliminated by backfilling; there would be no pit lake after closure. Cumulative impacts to surface water resources resulting Alternatives B-D would be considered a low within the CESA.

Under alternatives B–D, ground water flow would not be impacted beyond current conditions during operations, although the duration of water supply pumping would be extended. After closure, backfilling the pit to an elevation of approximately 6,175 feet amsl under alternatives B and D, would eventually cause a small amount (approximately 2 gpm) of discharge into the underlying ground water. Under Alternative C, backfilling to approximately 6,150 feet elevation amsl would cause the pit to act as hydrologic sink without creating a permanent pit lake.

Like Alternative A, leaching operations under alternatives B–D would not cause additional impacts on ground water quality. While contamination from existing facilities would continue to occur, the Stage III Heap Leach Facility would be designed and constructed to minimize the potential for ground water releases. After closure, like Alternative A, the hydrologic sink in the pit under Alternative C would not affect the underlying ground water quality. The flow through condition under alternatives B and D would create little or no impact on ground water quality after closure. Because of the low discharge rate with all parameters below applicable standards or within the range of background conditions, the overall impacts to groundwater resources within the CESA under alternatives B-D is considered low.

5.4.3 Visual

The CESA for visual resources is the 1,132,193 acre Air, Water, and Visual CESA.

<u>Past and Present Actions</u>
Past actions that are and have been impacting visual resources within the CESA include mineral exploration and development, wildland fires and fuels treatments, and the construction and operation of infrastructure facilities including transportation networks, transmission lines, along with localized and widespread commercial, ranching and residential facilities.

<u>RFFAs</u>
Potential impacts to visual resources within the CESA resulting from RFFAs would be similar to the past and present actions including mineral exploration and development, wildland fires and fuels treatments, and the construction and operation of infrastructure facilities including transportation networks, transmission lines, along with localized and widespread commercial, ranching and residential facilities.

5.4.3.1 Cumulative Impacts from Alternative A

Alternative A would result in no additional visual impacts within the CESA beyond those that have occurred as a result of past and present mining activities. As discussed in Section 4.13, visual impacts for Alternative A would remain the same as current operations. In 2007, two

KOPS were established to assess visual impacts from the mine site including the Stage II and Stage IV heap leach facilities. The results of this analysis indicated these facilities were not visible to the public from the KOPs. Under Alternative A, 2014 Coeur would begin final closure around 2014 which would include the removal of buildings. This would result in a reduction of light sources. Therefore, cumulative visual impacts associated with Alternative A are considered low.

5.4.3.2 Cumulative Impacts from Alternatives B-D

The implementation of alternatives B-D would not contribute to any cumulative visual impacts. All proposed POA No. 8 operations would be conducted within the area of the existing Rochester Mine site. The Stage III Heap Leach Facility would be constructed south of the existing Stage I Heap Leach Facility. It would not be visible from any KOPs or observers traveling any primary or secondary roads within the CESA as evidenced by the 2007 visual assessment discussed in Section 5.4.1.1. Mine and backfilling operations would be conducted within the existing Rochester Pit. Mining activities, including any lighting used for night activities within the pit, would be terrain shielded from any observers and KOPs. The existing ore crushing and processing facilities would be used for these respective activities. Potential impacts associated with general mine site lighting would remain the same as current operations. Therefore, cumulative visual impacts under alternatives B-D are considered low.

5.4.4 Soils

The CESA for soils is the Biology CESA, which covers 243,733 acres.

<u>Past and Present Actions</u>
Past actions that are and have been impacting soils include mineral exploration and development, rangeland improvements, wildland fires and fuels treatments, and transportation networks. Livestock grazing and dispersed recreation are activities that could also contribute to cumulative effects on soils; however these contribute to a much lesser degree in terms of duration and extent. Each of these activities may result in direct soil loss, compaction, and loss of productivity.

<u>RFFAs</u>
Sources of potential cumulative impacts to soils include activities that could result in the surface disturbance or otherwise produce a loss of soil productivity. Activities in the area that could cause such changes include fuels treatments, transportation networks, construction in ROWs, and wildland fires. As noted above, dispersed recreation and livestock grazing could also contribute to cumulative effects on soils to a limited extent.

5.4.4.1 Cumulative Impacts from Alternative A

Alternative A would result in no additional impacts within the Biology CESA beyond those that have occurred as a result of past and present actions, which include 4,689[1] acres resulting from past and present mining operations). The contribution to long-term potential impacts from Alternative A would be minimized due to the implementation of the reclamation and

[1] The entire Florida Canyon, Standard, Rochester and Nevada Packard mines are considered within the Biology CESA although only a portion (pit and waste rock dumps) of the Relief Canyon Mine is included.

revegetation procedures that have been ongoing at the Mine. Similar reclamation activities at the other mining operations would likewise limit the extent of long-term effects on soils. Wildland fires would have the potential to affect large amounts of land within the Biology CESA, which could contribute substantially to soil disturbances. Cumulative effects contributed by wildland fires could persist over the short- (less than 2 years) to medium-term (5 to 10 years) depending on the extent and severity of the fire and the degree to which the soils were stabilized by natural revegetation or anthropogenic activities. Cumulative effects on soils from other past and present sources and RRFAs would tend to be short-term and of limited areal extent. As a result, Alternative A is expected to have no incremental impact to soils in the Biology CESA.

5.4.4.2 Cumulative Impacts from Alternatives B–D

There are currently an estimated 4,689 acres of mining-related soils surface disturbance within the 243,733 acre Biology CESA. This current disturbance equates to 1.92 percent of the total soil area within the CESA. Under alternatives B–D approximately 162.0 additional acres (4,851.1 acres total) of additional soil disturbance would be created. The overall mining related soil disturbance within the CESA would increase to approximately 1.99 percent, an increase of 0.07 percent.

While the proposed reclamation of most of the mining-related disturbances would limit the duration of cumulative effects; it could take time (decades) for the soil structure to redevelop and return to pre-disturbance productivity levels. As noted above, a wildland fire within the CESA could contribute varying degrees of cumulative effects depending on its location, timing, severity, and extent. Ultimately, the contribution to cumulative effects by the incremental impact to soils in the Biology CESA as a result of alternatives B–D would be low.

5.4.5 Vegetation

The CESA for vegetation is the Biology CESA, which covers 243,733 acres.

Past and Present Actions
Present actions within the Biology CESA that are likely to be contributing to impacts include wildland fire, dispersed recreation, minerals exploration and development, livestock grazing, and transportation networks. These activities are principally contributing to physical removal or damage of existing vegetation and changes in community structure.

RFFAs
RFFAs within the Biology CESA that may contribute to affect vegetation include dispersed recreation, mineral exploration and development, livestock grazing, transportation, and wildland fires. These impacts result in the direct loss if vegetation and to a lesser extent, changes in community structure.

5.4.5.1 Cumulative Impacts from Alternative A

Cumulative impacts to vegetation within the Biology CESA would result from the past and present actions and RFFAs when considered with Alternative A. Mining operations within the Biology CESA have cumulatively affected 4,689 acres (1.92 percent) to date, although some of the disturbances have been reclaimed. Continued mining operations within the Biology CESA will continue to create additional disturbances, most of which will be reclaimed over the short- to long-term. Wildland fires have eliminated vegetation within portions of the Biology CESA and will continue to do so in the future. Natural plant re-establishment along with reseeding efforts would lessen the duration of effects, which would include the loss of wildlife habitat and a reduction in species diversity. Other activities, including livestock grazing, dispersed recreation, mineral exploration, and transportation could also contribute cumulative effects within the Biology CESA. The reclamation and revegetation processes underway (and to be taken in the future) would reduce the extent of disturbed vegetation, although it may take decades for shrub communities to become reestablished. These mid- to long-term impacts would occur over a very limited area compared to the entire Biology CESA (to date less than 2 percent of the area has been affected by mining activity, with portions of that reclaimed). Based on the above analysis and findings from Section 4.12–*Vegetation*, the incremental impacts to vegetation as a result of Alternative A, when added to the past and present actions and RFFAs, are expected to be low.

5.4.5.2 Cumulative Impacts from Alternatives B–D

Cumulative impacts to vegetation within the Biology CESA would result from the past and present actions and RFFAs when combined with alternatives B–D. Mining operations within the Biology CESA have cumulatively affected 4,689 acres to date (1.92 percent) although some of the disturbances have been reclaimed. Under alternatives B–D, approximately 145.7 additional acres (4,851.1 acres total) of vegetation disturbance would be created by construction of the Stage III Heap Leach Facility. In the 16.4-acre ancillary facility area, vegetation has already been impacted by previous operations. The overall mining related vegetation disturbance within the CESA would total approximately 1.99 percent, an increase of 0.07 percent.

Continued mining operations within the Biology CESA will continue to create additional disturbances, most of which will be reclaimed over the short- to long-term. Wildland fires have eliminated vegetation within portions of the Biology CESA and will continue to do so in the future. Natural plant re-establishment along with reseeding efforts would lessen the duration of such effects, which would include the loss of wildlife habitat and a reduction in species diversity. Other activities, including livestock grazing, dispersed recreation, mineral exploration, and transportation could also contribute cumulative effects within the Biology CESA. The incremental contribution of the disturbance that would occur under alternatives B–D would be relatively small, particularly over the long-term and the cumulative disturbances are generally dispersed. The relatively long time (estimated at 20 years) for shrub communities to become reestablished would result in mid- to long-term impacts although on a very limited and localized basis compared to the entire Biology CESA. Based on the above analysis and findings from Section 4.12–*Vegetation*, the incremental impacts to vegetation as a result of alternatives B–D, when added to the past and present actions and RFFAs, would be considered low.

5.4.6 Invasive Nonnative Species

The CESA for invasive, nonnative species is the Biology CESA, which covers 243,733 acres.

Past and Present Actions
Present actions within the Biology CESA that are likely to be contributing to the establishment and spread of invasive, nonnative species include wildland fire, dispersed recreation, minerals exploration and development, and livestock grazing.

RFFAs
RFFAs within the Biology CESA that may contribute to the spread of invasive, nonnative species include wildland fire, fuels treatment, dispersed recreation, minerals exploration and development, and livestock grazing.

5.4.6.1 Cumulative Impacts from Alternative A

The discussion of cumulative impacts and invasive, nonnative species is closely tied to the effects on vegetation and soils, where disturbances may promote the establishment and spread of noxious weeds. Past and present actions and RRFAs, in particular wildland fire and livestock grazing have the potential to contribute cumulatively to the increasing the presence of invasive, nonnative species. However, Alternative A would not result in additional disturbances to soils or vegetation and therefore would not contribute cumulatively to the establishment or propagation of noxious weeds. The Mine's noxious weed control program combined with the reclamation and revegetation processes currently underway (and to be continued in the future) would reduce the extent of disturbed vegetation and limit the opportunity for the establishment of invasive, nonnative species. Therefore, the establishment and spread of invasive, nonnative species as a result of Alternative A, when added to the past and present actions and RFFAs, are expected to be minimal.

5.4.6.2 Cumulative Impacts from Alternatives B–D

As noted in the preceding discussion, cumulative disturbances to soils and vegetation present a greater opportunity for the establishment and spread of noxious weeds. A number of past and present actions and RFFAs have the potential to create disturbances that could cumulatively contribute to the presence of invasive, nonnative species. The potential for alternatives B–D to contribute cumulatively to increases in invasive, nonnative species is limited by the relatively small size of the vegetation disturbance (145.7 acres or 0.06 percent of the Biology CESA) and the noxious weed control program implemented by the Mine. The size of the disturbance and its relatively isolated nature (within the confines of the operational area) would facilitate implementation of the control program. The cumulative nature of the spread of invasive, nonnative species would be of greater concern in association with disturbances such as those induced by wildland fire, particularly where seeding efforts were not implemented. Therefore, the establishment and spread of invasive, nonnative species as result of alternatives B–D, when added to the past and present actions and RFFAs, are expected to be limited in extent and duration, and would result in a low cumulative impact.

5.4.7 Wildlife, Migratory Birds, and Special Status Species

The CESA for wildlife and special status species is the Biology CESA which covers 243,733 acres.

Past and Present Actions

Past and present actions with the potential to impact wildlife, special status species, and migratory birds include mineral exploration and development, livestock grazing, ROWs, land exchange, fuels treatments, wildland fire, transportation networks, and dispersed recreation. These activities are likely to have impacts to migratory birds, special status species, and wildlife habitat, or result in direct impacts to individuals in travel routes. Approximately 59,300 acres within the Biology CESA have been disturbed by wildland fires between 1985 and 2007, which is approximately 25 percent of the CESA. Nearly 12,250 acres (21 percent of the burned areas) have been seeded.

Past and present minerals surface disturbance in the Biology CESA totals approximately 4,689 acres (or approximately 1.9 percent of the CESA). There are no data on the number of acres reclaimed. State and federal regulations require reclamation; therefore, it reasonable to assume that some areas have been reclaimed and some areas have become naturally stabilized, and/or naturally revegetated over time. Improvements to habitat associated with exclosures have occurred in the Biology CESA.

The Biology CESA encompasses portions of 8 allotments. Grazing has modified vegetation, and thus modified the habitat of wildlife and special status species throughout the CESA.

RFFAs

Potential impacts to wildlife and special status species from mineral exploration and development, livestock grazing, fuels treatments, transportation networks, ROWs, dispersed recreation, or loss of habitat associated with potential wildland fires and fuels treatments could occur. Noise could also affect wildlife and special status species.

5.4.7.1 Cumulative Impacts from Alternative A

Alternative A would result in the formation of a lake within the Rochester Pit. The SLERA found that the pit lake could expose a number of species to constituents of potential concern, including antimony, boron, cadmium, and fluoride. These effects would be combined with impacts described as part of the past and present actions including a loss of habitat from wildland fires and other mining activity. The extent of disturbance to wildlife habitat would not increase and, as revegetation and reclamation progress, the effects of existing disturbances associated with the Mine and other mining projects would decrease. Grazing uses within the Biology CESA would have varying effects on wildlife, migratory birds, and special status species depending on the grazing system implemented in each allotment. These impacts would be localized. Based on the above analysis and findings from Sections 4.5–*Migratory Birds*, 4.11–*Special Status Species*, and 4.14–*Wildlife* of this EA, the incremental impacts to migratory birds, special status species, and wildlife, respectively, as a result of Alternative A, when added to the past and present actions and RFFAs, are expected to be localized and minimal, and would be considered a low cumulative impact.

5.4.7.2 Cumulative Impacts from Alternatives B–D

Grazing uses within the Biology CESA would have varying effects on wildlife, migratory birds, and special status species based on the grazing system implemented in each allotment. The extent of wildland fires that have already occurred within the CESA contribute cumulatively to the loss of habitat for all species. Impacts from the Project would be limited to removal of vegetation, alteration of habitat, noise associated with development of the heap leach facility, and vehicular collisions. Alternatives B–D would impact approximately 145.7 additional acres or 0.06 percent of the Biology CESA (243,733 acres). These impacts would be localized and occur within a general area of the Mine site that has already been subject to noise, traffic, and varying levels of human activity. Based on the above analysis and findings from Sections 4.5–*Migratory Birds*, 4.11–*Special Status Species*, and 4.14–*Wildlife*, the incremental impacts to migratory birds, special status species, and wildlife, respectively, as a result of alternatives B–D, when added to the past and present actions and RFFAs, are expected to be localized and minimal, and would be considered a low cumulative impact.

5.4.8 Economics and Social Values

The Socioeconomics CESA consists of Pershing and Humboldt counties. These are the 2 counties that would be most affected by alternatives B–D.

Past and Present Actions

Past and present actions that affect socioeconomic impacts in the CESA are related to agriculture activities including ranching and farming; mineral exploration for precious metals and industrial minerals; mining for precious metals and industrial minerals; tourism including dispersed outdoor recreation activities; development and maintenance of transportation facilities including rail along with county, state, and federal roadways and highways; and the development and maintenance of utility corridors and alternative power sources. Over the years these activities have contributed to temporary, short-term, and long-term impacts within the CESA due to needs for various services including, but not limited to, permanent and rental housing and accommodations; a labor pool; sources for fuel, supplies and other support equipment and services; and public services including schools, public safety and medical services. Mining activities in particular have a tendency to contribute to the economic “boom and bust” cycles in response to commodity prices and demand.

The impacts from past and present socioeconomic actions within the CESA have been both positive and negative. During economic growth periods, the increased demand for services resulted in positive impacts within the CESA due to increases in revenue from improved employment opportunities, increased labor wages, increased spending for various services and the overall county and local tax revenues generated. However, during periods of economic downturns, decreases in employment opportunities and wages, along with reductions in spending for local and regional services, all resulted in decreased revenue to businesses within the CESA, and decreased overall county and local tax revenues.

RFFAs

RFFAs within the CESA that could contribute to socioeconomic impacts include, but are not limited to, the following: continued agriculture activities including ranching and farming; continued exploration and mining for precious metals and industrial minerals; tourism including dispersed outdoor recreation activities; development and maintenance of transportation facilities including rail along with county, state, and federal roadways and highways; and the development and maintenance of utility corridors and alternative power sources. These RFFAs are widespread and not localized within the socioeconomic CESA.

5.4.8.1 Cumulative Impacts from Alternative A

Under Alternative A, Coeur would continue to operate and close the Mine under the currently approved Plan of Operations. No additional mining, backfilling, and ore processing would occur. Current activities at the Mine include the on-going residual leaching program, concurrent reclamation where appropriate, and maintenance activities. The current number of employees used to complete these tasks includes 33 full-time jobs and one part-time job, as well as 4 full-time contractors and 2 part-time contractors. Under Alternative A there would be no increase in employment. The anticipated hiring of between 200 and 300 employees would not occur. Current Mine activities would remain the same, as would employment. Upon the cessation of the residual leaching activities, there would be a decrease in employment, as the Mine shifts into reclamation and closure operations.

There would be no positive economic impact within the CESA as the anticipated employee hiring, the associated employee spending, and Mine expenditures for support services would not occur. Pershing County and Humboldt County would not benefit from increased taxes, but would most likely see a drop in tax revenue due to the decrease of Mine activities associated with reclamation and closure. Alternative A would result in a substantial, negative impact to socioeconomic resources within the CESA.

5.4.8.2 Cumulative Impacts from Alternatives B–D

Cumulative impacts to socioeconomic values within the CESA would be a result of the past and present actions, and RFFAs, when combined with alternatives B–D. There would be minimal impacts to housing and accommodations from alternatives B–D within the Socioeconomics CESA, as the employees required are expected to be hired from the current CESA population base. It is expected that many former employees of the Rochester and Nevada Packard Mines would be hired back, and these individuals already live within the greater Lovelock and Winnemucca area.

There would be minimal impact to public services including schools, public safety, and medical services as this infrastructure is already in place within the CESA and the majority of the employee base already resides within the CESA. Increases to these services from the implementation of the alternatives B–D are not anticipated.

There would be a positive impact from the increase in employment and the associated increases in employee spending within the CESA. Alternatives B–D would result in an increase in spending by the Mine for various support services including fuel, supplies, and support equipment. These purchases would be made within the CESA to the extent possible. The impacts to Humboldt County would be considerable, as the City of Winnemucca provides many of these employee required services within the CESA.

As the home county for the Mine, there would be a direct, positive increase in the Pershing County tax base that would result from the implementation of alternatives B–D.

Alternatives B–D would have an overall positive socio-economic impact within the CESA.

Left Blank Intentionally

6 MITIGATION AND MONITORING

No mitigation or monitoring measures beyond those incorporated into the Proposed Action and alternatives are recommended. See Section 2.2.

Left Blank Intentionally

7 LIST OF PREPARERS

Bureau of Land Management

Bob Edwards	Project Manager, Social Values and Economics
Peggy McGuckian	Cultural Resources, Native American Religious Concerns, Paleontology
Joey Carmosino	Recreation, Visual Resource Management
Ron Pearson	Rangeland Management
Janet Hook	Technical Lead, Minerals, Water Resources
Derek Messmer	Invasive, Non-Native Species
Mike Zielinski	Vegetation, Soils
Gabriel Venegas	Water Resources
Ken Detweiler	Wildlife, Migratory Birds, Special Status Species
Celeste Mimnaugh	Wildlife, Migratory Birds, Special Status Species
Jerome Fox	Wild Horses and Burros
Daniel Atkinson	Engineering
Terri Barton	GIS
Tom Olsen	Geochemistry
Lynn Ricci	NEPA Compliance

Nevada Department of Wildlife

Kenny Pirkle	Wildlife, Special Status Species

Tetra Tech

Ron Rimelman	Project Lead, Water Quality
Bill Reich	Deputy Project Lead
Steve Osterberg	Hydrology, Hydrogeology
Mark Williamson	Geochemistry
Elaine Porter	Wildlife, Special Status Species, Migratory Birds, Visuals
Greg Hildebrand	Air Quality
Dan Morta	Vegetation, Noxious Weeds, Soils
Kevin Doyle	Cultural Resources, Native American Concerns, Paleontology
Nikki Scheinost	Economics and Social Values
Gene Weglinski	Cumulative Effects

Left Blank Intentionally

8 CONSULTATION AND COORDINATION

Tribal Consultation

Section 3.6–*Native American Religious Concerns* notes that Executive Order 13175–Consultation and Coordination with Tribal Governments–addressed the consideration of Native American concerns in undertakings by the federal government. In compliance with the order, BLM contacted the Lovelock Paiute Tribe regarding the proposed project by letter on February 3, 2010. In a telephone conversation with BLM archaeologist Peggy McGuckian on April 7, 2010, Lovelock Paiute Tribal Chairman, Victor Mann, stated that the Tribe had no concerns about the proposed project.

Left Blank Intentionally

9 PUBLIC INVOLVEMENT

A scoping letter describing Alternative B and soliciting comments was sent by BLM to interested parties on November 12, 2009. These parties included local, state, and federal agencies; NGOs; and the general public. BLM subsequently held 2 public meetings, one in Winnemucca, Nevada on November 30, 2009, and one in Lovelock, Nevada on December 1, 2009. All project notifications and information were made available on the Winnemucca District's NEPA webpage. Additional information on public involvement can be found in Chapter 1. The public comment period for scoping closed on December 11, 2009.

The PEA was released for a 30-day public review in July 2010. Comment documents, including letters and emails, were received from government agencies, organizations, and individuals during the comment period. The BLM considered all public comments in finalizing the EA. The following revisions were made to the EA to reflect substantive technical comments:

- Additional information was provided on the fugitive mercury emissions from each alternative.
- The salvage and use of all suitable growth media from the disturbance footprint for site reclamation was clarified.
- The ground water impacts from existing facilities at the mine were described in greater detail, along with information on specific sources, response actions, and their relationship to proposed action.
- The wildlife discussion was updated concerning several sensitive species. No additional impacts were identified.
- More descriptive information was provided on the handling of PAG material, including new figures showing locations of PAG management areas.
- The cumulative discussions were modified to describe the scale of projected impacts.
- Additional information and clarification was included in the ground water model description.
- All proposed and required mitigation and monitoring was clarified.
- Other technical information was provided in response to specific comments.

Left Blank Intentionally

10 REFERENCES

AGRA Earth & Environmental, Inc. (AEE). 2000a. *Vegetation Report Nevada Packard Baseline Studies.* Coeur Rochester, Inc., Pershing County, Nevada. July 2000.

—. 2000b. Wildlife Survey. *Nevada Packard Baseline Studies*. Pershing County, Nevada. August 2000.

Arizona Game and Fish Department (AZGFD). 2009. Burrowing Owl Project Clearance Guidance for Landowners. Arizona Burrowing Owl Working Group. January.

Beck, J. L., J. W. Connelly, K. P. Reese. 2009. *Recovery of Greater Sage-Grouse Habitat Features in Wyoming Big Sagebrush Following Prescribed Fire*. Restoration Ecology Vol. 17:3. pp. 393-403.

Bureau of Economic Analysis (BEA). 2009a. *Total full-time and part-time employment by NAICS industry (CA25N)*. Available online at: http://www.bea.gov/regional/reis/default.cfm#step3. Accessed March 16, 2010.

—. 2009b. *Personal income by major source and earnings by NAICS industry (CA25N), Regional Economic Accounts*. Available online at: http://www.bea.gov/regional/reis/default.cfm#step3. Accessed March 16, 2010.

Bureau of Land Management (BLM). 1982. *Sonoma-Gerlach Management Framework Plan*.

—. 1984. BLM Manual 8400. *Visual Resources Management*.

—. 1986. *Visual Resource Inventory*. BLM Manual Handbook 8410-1.

—. 1990. *BLM Manual 9014 - Use of Biological Control Agents of Pests on Public Lands*. Available online at: http://www.blm.gov/ca/st/en/prog/weeds/9014.html. Accessed March 2010.

—. 1994. *Chemical Pest Control*. BLM Handbook H-9011-1. Bureau of Land Management, Washington, D.C.

—. 1996. *Instruction memorandum 96–79*. Bureau of Land Management, Washington, DC, USA, 6 pp. April 1996

—. 2000. *43 C.F.R. Subpart 3809 - Surface Management*. Available online at: http://law.justia.com/us/cfr/title43/43-2.1.1.3.73.3.html. Accessed March 2010.

—. 2003. *Coeur Rochester and Nevada Packard Mines Expansion Project Environmental Assessment*. Winnemucca Field Office, Winnemucca, Nevada. June 2003.

—. 2005. BLM Nevada State Office - Mapping Sciences. *Geospatial Data: Grazing Allotments*. Created March 2005. Available at: http://www.blm.gov/nv/st/en/prog/more_programs/geographic_sciences/gis/geospatial_data.html. Accessed April 2010.

—. 2007a. *RAC Standards & Guidelines for Rangeland Health: Sierra Front-Northwestern Great Basin Area.* Available online at:

http://www.blm.gov/nv/st/en/res/resource_advisory/sierra_front-northwestern/standards_and_guideline.html. Accessed March 2010.

—. 2007b. *BLM Manual 9011 - Chemical Pest Control.* Available online at: http://www.blm.gov/ca/st/en/prog/weeds/9011.html. Accessed March 2010.

—. 2007c. *Potential Fossil Yield Classification (PFYC) System for paleontological resources on public lands*. Instruction Memorandum No. 2008-009.

—. 2007d. BLM Vegetation Treatments Using Herbicides. Final Programmatic EIS. Available online at: http://www.blm.gov/wo/st/en/prog/more/veg_eis.html. Accessed June 2010.

—. 2008. *Assessment and Mitigation of Potential Impacts to Paleontological Resources*. Instruction Memorandum No. 2009-011.

—. 2010a. *Potential Fossil Yield Classifications for the Winnemucca District Office.* Confidential GIS mapping on file at BLM Humboldt River Field Office, Winnemucca District, Nevada.

—. 2010b. *Final Environmental Assessment.* Standard Gold Mining Inc. Standard Mine Project Expansion. Pershing County, Nevada. February 2010.

Bradley, P.V., M.J. O'Farrell, J.A. Williams, and J.E. Newmark. Editors. 2006. *The Revised Nevada Bat Conservation Plan.* Nevada Bat Working Group. Reno, Nevada. 216 pp.

Burke, T. D., and M. L. Hemphill. 1986. *Coeur Explorations, Inc. Rochester Mining Development Project Parcel Inventory.* Archaeological Research Services, Virginia City, Nevada. Prepared for Coeur Explorations, Sparks, Nevada. Submitted to USDI Bureau of Land Management, Winnemucca District Office, Winnemucca, Nevada, Report No. CR2-2024a(P).

Burkholder G. L. and J. M. Walker. 1973. *Habitat and Reproduction of the Desert Whiptail Lizard, Cnemidophorus tigris Baird and Girard in Southwestern Idaho at the Northern Part of its Range.* Available online at: http://www.jstor.org/pss/3891208. Accessed April 2010.

Busby, C. I., D. M. Garaventa, M. Babal, S. A. Guedon, and M. E. Tannam, 1993. *Proposed Boundaries, Property Types and Contributing Elements for the Rochester Cultural District, Vicinity of the Coeur Rochester Mine, Pershing County, Nevada.* Basin Research, San Leandro, California. Prepared for Coeur Rochester, Lovelock, Nevada. Submitted to USDI Bureau of Land Management, Winnemucca District Office, Winnemucca, Nevada, Report No. CR2-2490(P).

Carter Lake Consulting. 2009. *Regulatory Review: 40 CFR 98 Mandatory Reporting of Greenhouse Gases.* Provision of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule. Prepared for Coeur Rochester, Inc. December 28, 2009.

Clay, V. L., and T. D. Burke. 1986. *Coeur Explorations, Inc., Rochester Mining Development Project Parcel Inventory, Addendum.* Archaeological Research Services, Virginia City, Nevada. Prepared for Coeur Explorations, Sparks, Nevada. Submitted to USDI Bureau of Land Management, Winnemucca District Office, Winnemucca, Nevada, Report No.

CR2-2024b(P). On file, Nevada State Museum Indian Hills Curatorial Center, Carson City, Report No. 14-133.

Coeur Rochester, Inc. (Coeur). 2007. *Coeur Rochester Precipitation Summary database file*.

—. 2008. *Stormwater Pollution Prevention Plan.* August 2008.

—. 2009a. *Revised Amendment #8 To The Plan Of Operations/Reclamation Permit 0087.* August 2009.

—. 2009b. *Rochester Water Quality Database.* Compiled by Telesto Solutions, Inc. 2009.

—. 2010a. *April 28, 2010 data request to Coeur from Tetra Tech: Coeur Rochester Mine EA Socioeconomic Questions.*

—. 2010b. *Water Pollution Control Permit Application Major Modification: Stage III Heap Leach Facility*. NEV0050037. Submitted to the Nevada Division of Environmental Protection (NDEP), June, 2010.

Colorado Division of Wildlife. 2008. *Little Brown Bat (Myotis lucifugus).* Available online at: http://wildlife.state.co.us/WildlifeSpecies/Profiles/Mammals/BatsofColorado/LittleBrownBat.htm. Accessed May 21, 2010.

Cornell Lab of Ornithology. 2010. *All About Birds.* Available online at: http://www.allaboutbirds.org/NetCommunity/Page.aspx?pid=1189. Accessed May 21, 2010.

Crafford, A.E.J. 2007. *Geologic Map of Nevada: U.S. Geological Survey Data Series 249*, 1 CD-ROM, 46 p., 1 plate. Available online at: http://pubs.usgs.gov/ds/2007/249/. Accessed April 2010.

Cronquist, A., A.H. Holmgren, N.H. Holmgren, and J.A. Reveal. 1972. *Intermountain Flora.* Vol. 1. Hafner Publ. Co., Inc., N.Y. 269 p.

EnviroData Solutions, Inc. 1998. *Lamefoot Mine 1997 Cumulative Trend Analysis Report of Water Quality*. Prepared for Echo Bay Minerals Company, Kettle River Operations.

Environmental Management Associates, Inc. (EMA). 2000. *Noxious Weed Inventory of the Rochester Mine and Access Roads.* Pershing County, Nevada. September 20, 2000.

Enviroscientists. 2010. *Air Quality Impacts Assessment Report.* January 2010.

Epstein, B.J. 2004. *Development and Uncertainty Analysis of Empirical Recharge Prediction Models for Nevada's Desert Basins* (Master's Thesis). December 2004.

Flint, A.L., L.E. Flint, and J.A. Hevesi. 2004. *Fundamental Concepts of Recharge in the Desert Southwest: A Regional Modeling Perspective.* In: Groundwater Recharge in a Desert Environment: The Southwestern United States, Water Science and Application 9, American Geophysical Union.

Firstgold. 2010. *Relief Canyon Mine Information*. Available online at: http://www.firstgoldcorp.com/relief_canyon.asp. Accessed June 2010.

Griffith, Randy S. 1993. *Accipiter gentilis.* In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available online at: http://www.fs.fed.us/database/feis/. Accessed April 2010.

Gruver, J. C. and D. A. Keinath. 2006. *Townsend's Big-Eared Bat (Corynorhinus townsendii): A Technical Conservation Assessment.* Prepared for the USDA Forest Service. Rocky Mountain Region. Species Conservation Project. Available online at: http://www.cnhp.colostate.edu/RASwebpage/cbwg_website/USFS_townsendsbigearedbat.pdf. Accessed April 2010.

Hardman, G. 1936. *Precipitation Map of Nevada*, In: Nevada Agricultural Experiment Station.

Harris, Thomas R. 2010. *Addendum to: The Economic Impacts of Reopening the Coeur Rochester Mine in Pershing County, Nevada.* University Center for Economic Development and Natural Resource Industry Institute, University of Nevada, Reno. June 30, 2010.

Harris, Thomas R. and John L Dobra. 2009. *The Economic Impacts of Reopening the Coeur Rochester Mine in Pershing County, Nevada.* University Center for Economic Development and Natural Resource Industry Institute, University of Nevada, Reno. November 24, 2009.

Howard, Janet L. 1995. *Lepus californicus.* In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available online at: http://www.fs.fed.us/database/feis/. Accessed April 2010.

Huntington, J. 2007. *E-mail correspondence on the 1971 State Engineer's Nevada Precipitation Map*. From the office of the State Engineer. January 2007.

Hydro-Geo Consultants, Inc. (Hydrogeo). 1991a. *Hydrologic Study for the Rochester Heap Leach Operation*. Prepared for Coeur d'Alene Mines Corp.

—. 1991b. *Preliminary Results, Installation and Testing of New Monitoring Wells, Rochester Mine Processing Facility Area, Nevada*. Prepared for Coeur d'Alene Mines Corp.

—. 1992. *Hydrogeologic Site Investigation, Rochester Heap Leach Operation*. Prepared for Coeur Rochester, Inc.

—. 1994. *Hydrogeologic Assessment, Rochester Stage I Heap Leach Operation*. Prepared for Coeur Rochester, Inc., October 1994.

—. 2003a. *Plan of Corrective Action and Modification to the Fluid Management System, Rochester Mine*. Prepared for Coeur Rochester Inc., May 8, 2003.

—. 2003b. *Plan of Corrective Action Phase III Report*. Prepared for Coeur Rochester Inc., August 7, 2003.

—. 2003c. *Technical Memo, New Pumping Scenario, Corrective Action Plan*. Prepared for Coeur Rochester Inc., August 27, 2003.

—. 2003d. *Corrective Action Plan Interim Report*. Prepared for Coeur Rochester Inc., October 20, 2003.

—. 2003e. *Plan of Corrective Action Phase V Report*. Prepared for Coeur Rochester Inc., November 2003.

—. 2004. *Technical Memorandum, Response to NDEP Letter Dated February 19, 2004 – Monitoring Well MW-30 and Catch Basin North, Rochester Mine*. Submitted to NDEP, March 16, 2004.

—.2010a. *Final MW-30 CAP Phase I Report*. Prepared for Coeur Rochester. April 2010.

—.2010b. *Interim CAP Report MW-30.* Prepared for Coeur Rochester. July 2010.

—. 2010c. *Hydrogeologic and Geochemical Technical Report*. Prepared for Coeur Rochester. February 2010.

IME. 1992. *Vegetation Characteristics of the Coeur Rochester Mine Area*. Yampa, Colorado. July 2, 1992.

JBR Environmental Consultants, Inc. 2010. April 29 letter from Catherine Clark, JBR Environmental Consultants, Inc., to Ms. Dana Sue Kimbal, Coeur Rochester, Inc., regarding *Environmental Survey Summary*.

Kautz, R. R. 1990. *A Class III Cultural Resources Survey of the Packard Ridge, Humboldt Range, Pershing County, Nevada*. Mariah Associates, Reno, Nevada. Prepared for Coeur-Rochester, Lovelock, Nevada. Submitted to USDI Bureau of Land Management, Winnemucca District Office, Winnemucca, Nevada, Report No. CR2-2367(P). On file, Nevada State Museum Indian Hills Curatorial Center, Carson City, Report No. 14-222.

Knight Piesold. 2008. *Rochester Mine Stage III Heap Leach Expansion Draft Prefeasibility Report*. Prepared for Coeur Rochester. September 23, 2008.

—. 2010. *Technical Memorandum from Knight Piesold Consulting to Coeur Rochester, Inc., on Contingency Closure Design.* May 4, 2010.

Laudenslayer, W. F., and J. R. Boggs. 2010. *Pinyon-Juniper.* Written for California Wildlife Habitat Relationships System, California Department of Fish and Game, California Interagency Wildlife Task Group. Available online at: http://www.dfg.ca.gov/biogeodata/cwhr/pdfs/PJN.pdf. Accessed March 2010.

Lennon, T. J., S. Mehls, and P. Green. 1989. *A Cultural Resource Inventory of the Coeur-Rochester Weaver Saddle Area, Pershing County, Nevada*. Western Cultural Resource Management, Sparks, Nevada. Prepared for Coeur-Rochester, Lovelock, Nevada. Submitted to USDI Bureau of Land Management, Winnemucca District Office, Winnemucca, Nevada, Report No. CR2-2321(P). On file, Nevada State Museum Indian Hills Curatorial Center, Carson City, Report No. 14-134.

Maxell, B. A., J. K. Werner, P. Hendricks, and D. L. Flath. 2003. *Herpetology in Montana: a history, status summary, checklists, dichotomous keys, accounts for native, potentially native, and exotic species, and indexed bibliography*. Northwest Fauna Number 5. 138 p.

Available online at: http://fieldguide.mt.gov/detail_ARADB26020.aspx. Accessed April 2010.

Maxey, G.B. and T.E. Eakin, 1949. *Ground Water in the White River Valley, White Pine, Nye, and Lincoln Counties, Nevada,* State of Nevada, Office of the Sate Engineer, Water Resources Bulletin No. 8.

Maxim Technologies, Inc. (Maxim), 1998. *Interim Report: Coeur Rochester Phase I Geochemistry.* November 1998.

—. 2000. *Coeur Rochester Non-Ore Management Plan*. August 2000.

Meaney, C.A., M. Reed-Eckert, and G.P. Beauvais. 2006. *Kit Fox (Vulpes macrotis): a technical conservation assessment*. USDA Forest Service, Rocky Mountain Region. Available online at: http://www.fs.fed.us/r2/projects/scp/assessments/kitfox.pdf. Accessed April 2010.

Nichols, W.D., 2000. *Regional Ground-Water Evapotranspiration and Ground-Water Budgets, Great Basin, Nevada*. U.S. Geological Survey Professional Paper 1628.

National Park Service (NPS). 2009. *Dark Night Sky*. Available online at: http://www.nps.gov/yose/naturescience/dark-night-sky.htm. Last updated on March 29, 2009. Accessed April 7, 2010.

Natural Resources Conservation Service (NRCS). 1994. *Soil Survey of Pershing County, Nevada, East Part*. U.S. Department of Agriculture. Reno, Nevada.

NatureServe. 2009. *NatureServe Explorer: An online encyclopedia of life [web application]*. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. Accessed March 2010.

Nevada Department of Agriculture. 2005. *Nevada Revised Statute (NRS) and Nevada Administrative Code (NAC) Chapter 555 - Control of Insects, Pests and Noxious Weeds*. Amended March 24, 2005. Available online at: http://www.leg.state.nv.us/NRS/NRS-555.html and http://www.leg.state.nv.us/NAC/NAC-555.html. Accessed March 2010.

—. 2008. *Nevada Noxious Weed List*. Updated 2008. Available online at: http://agri.nv.gov/nwac/PLANT_NO$_X$WeedList.htm. Accessed March 2010.

Nevada Department of Employment, Training & Rehabilitation. 2009. *Occupational Employment and Wages*. Updated May 2009. Available online at: http://detr.state.nv.us/lmi/data/wages/TOC000.htm. Accessed March 18, 2010.

Nevada Department of Environmental Protection, BLM, and U.S. Forest Service. 1988. *Nevada Guidelines for Successful Revegetation for the Nevada Division of Environmental Protection, the Bureau of Land Management, and the U.S.D.A. Forest Service*. Available online at: http://ndep.nv.gov/bmrr/reveg.pdf. Accessed March 2010.

Nevada Division of Environmental Protection, Bureau of Mining Regulation and Reclamation (NDEP), 2010a. *Response to the April 15, 2010, Phase I CAP Rochester Mine*. July 2010.

—. 2010b. *WPCP Compliance Inspection Rochester Mine Pershing County Nevada WPCP NEV0050037*. July 2010.

—. 1989. *Nevada Revised Statute (NRS) 519A Mining Reclamation, and Nevada Administrative Code (NAC) 519A Regulation of Mining Operations and Exploration Projects*. Available online at: http://ndep.nv.gov/admin/nrs519a.htm and http://www.leg.state.nv.us/NAC/NAC-519A.html. Accessed March 2010.

—. 2003. Finding of Alleged Violation and Order, April 15, 2003.

—. 2005. Comments and Approval of the Corrective Action Plan.

Nevada Department of Taxation. 2009. *Annual Report, Fiscal Year 2008-2009*. Available online at: http://tax.state.nv.us/documents/AnnualReport_FY09_final.pdf. Accessed March 16, 2010.

Nevada Department of Wildlife (NDOW). 2007a. *Coeur Rochester Mine Heap Leach Project - Industrial Artificial Pond Permit - Quarterly Wildlife Mortality Reports 1st quarter 2007*. Nevada Division of Wildlife–Habitat Bureau.

—. 2007b. *Coeur Rochester Mine Heap Leach Project - Industrial Artificial Pond Permit - Quarterly Wildlife Mortality Reports 2nd quarter 2007*. Nevada Division of Wildlife–Habitat Bureau.

—. 2007c. *Coeur Rochester Mine Heap Leach Project - Industrial Artificial Pond Permit - Quarterly Wildlife Mortality Reports 3rd quarter 2007*. Nevada Division of Wildlife–Habitat Bureau.

—. 2007d. *Coeur Rochester Mine Heap Leach Project - Industrial Artificial Pond Permit - Quarterly Wildlife Mortality Reports 4th quarter 2007*. Nevada Division of Wildlife–Habitat Bureau.

—. 2008a. *Coeur Rochester Mine Heap Leach Project - Industrial Artificial Pond Permit - Quarterly Wildlife Mortality Reports 1st quarter 2008*. Nevada Division of Wildlife–Habitat Bureau.

—. 2008b. *Coeur Rochester Mine Heap Leach Project - Industrial Artificial Pond Permit - Quarterly Wildlife Mortality Reports 2nd quarter 2008*. Nevada Division of Wildlife–Habitat Bureau.

—. 2008c. *Coeur Rochester Mine Heap Leach Project - Industrial Artificial Pond Permit - Quarterly Wildlife Mortality Reports 3rd quarter 2008*. Nevada Division of Wildlife–Habitat Bureau.

—. 2008d. *Coeur Rochester Mine Heap Leach Project - Industrial Artificial Pond Permit - Quarterly Wildlife Mortality Reports 4th quarter 2008*. Nevada Division of Wildlife–Habitat Bureau.

—. 2009. *Nevada Department of Wildlife 2009 Upland and Migratory Game Bird, Rabbit and Furbearing Mammals Harvest Data and Population Status Reports.* Available online at:

http://www.ndow.org/hunt/resources/population/09_small_game_book.pdf. Accessed April 2010.

—. 2009a. *Coeur Rochester Mine Heap Leach Project - Industrial Artificial Pond Permit - Quarterly Wildlife Mortality Reports 1st Quarter 2009*. Nevada Division of Wildlife–Habitat Bureau.

—. 2009b. *Coeur Rochester Mine Heap Leach Project - Industrial Artificial Pond Permit - Quarterly Wildlife Mortality Reports 2nd Quarter 2009*. Nevada Division of Wildlife–Habitat Bureau.

—. 2009c. *Coeur Rochester Mine Heap Leach Project - Industrial Artificial Pond Permit - Quarterly Wildlife Mortality Reports 3rd Quarter 2009*. Nevada Division of Wildlife–Habitat Bureau.

—. 2010a. March 29 letter from Tim Herrick, State of Nevada Department of Wildlife, to Chris Ansari, Tetra Tech, regarding Coeur Rochester Mine Project.

—. 2010b. *NDOW Internet Map Service*. Available online at: http://www.ndow.org/learn/map_project/index.shtm. Accessed March 2010.

—. 2010c. *Wildlife and Habitat. Nevada Wildlife - Fact Sheets. Coyote.* Available online at: http://www.ndow.org/wild/animals/facts/coyote.shtm. Accessed April 2010.

—. 2010d. July 1 email from Kenny Pirkle, NDOW, to Janet Hook, BLM Winnemucca District, regarding Sage Grouse PMU and Pronghorn Antelope.

Nevada Legislature. 2010a. *NAC: Chapter 527 - Protection and Preservation of Timbered Lands, Trees, and Flora. NAC 527.010*. Available online at: http://www.leg.state.nv.us/NAC/NAC-527.html. Accessed April 2010.

—. 2010b. *NAC: Chapter 503 - Protected, threatened, and sensitive mammals. NAC 503.030.* Available online at: http://www.leg.state.nv.us/nac/nac-503.html#NAC503Sec030. Accessed April 2010.

Nevada Natural Heritage Program (NNHP). 2001. *Rare Plant Fact Sheet, Lahontan milkvetch, Astragalus porrectus.* Compiled June 25, 2001. Available online at: http://heritage.nv.gov/atlas/astraporre.pdf. Accessed May 2010.

—. 2009. *Nevada Natural Heritage Program Plant and Animal At-Risk Watch List*. Available online at: http://heritage.nv.gov/lists/track.pdf. Accessed April 2010.

—. 2010. March 18 letter from Eric S. Miskow, State of Nevada, Department of Conservation and Natural Resources, Nevada Natural Heritage Program, to Chris Ansari, Tetra Tech, regarding Data request received 10 March 2010.

Nevada State Demographer's Office. 2010. *2009 Estimates by County*. Available online at: http://www.nsbdc.org/what/data_statistics/demographer/pubs/pop_increase/. Accessed March 16, 2010.

Nevada Workforce Informer. 2009. *Labor Force.* Available online at: http://www.nevadaworkforce.com. Accessed March 16, 2010.

Nevada, State of. Bureau of Air Pollution Control (BAPC). 2010. *Class II Air Quality Operating Permit No. AP1044-0063.02*. Carson City, NV.

Owling. 2001. Barn Owl Biology. Available online at: http://owling.com/Barn_nh.htm. Accessed September 27, 2010.

Robison Engineering. 2009. *Pit Pond Monitoring Plan.* Technical Memorandum, June 10, 2009.

—. 2010. *Technical Memorandum from Robison Engineering Company to Coeur Rochester, Inc., on State III Heap Leach Facility Alternative Configuration: Free-Draining.* January 26, 2010.

Roberts, H. B. 2003. *Status of the Pygmy Rabbit (Brachylagus idahoensis) in Idaho*. Technical Bulletin No. 03-6. Idaho Bureau of Land Management, Boise, Idaho. April 2003.

Schafer and Associates (Schafer). 1995. *Rock Characterization Study of the Coeur Rochester Mine.* Prepared for Coeur Rochester, Inc. October 1995.

Schlumberger Water Services (SWS). 2010a. *Groundwater Quantity and Quality Impact Analysis.* Prepared for Coeur Rochester, Inc. April 2010.

—. 2010b. *Memo from John Rupp and Brent Johnson (SWS) to Luke Russell, Casey Kiel, and Cindy Jones (Coeur).* January 19, 2010.

Sherwin, R. E., Gannon, W. 2000a. *Results of Cold-Season Bat Surveys Conducted to Find Mitigation Sites for the Nevada Packard Mine Expansion Project*. May 12, 2000.

—. 2000b. *Results of Cold-Season Bat Surveys Conducted at the Nevada Packard Mine Expansion Project*. May 12, 2000.

Sherwin. R. E., S. Haymond, and Holistic Wildlife Services. 2000. *Results of Warm-Season Bat Surveys Conducted to Find Mitigation Sites for the Nevada Packard Mine Expansion Project.* Coeur Rochester Mine, Pershing County, Nevada. August 16, 2000.

—. 2002. *Bat Habitat Mitigation Plan*. Coeur Rochester Mine, Pershing County, Nevada. August 13, 2002.

Silberling. N.J. ,1962. *Stratigraphic Distribution of Middle Triassic Ammonites at Fossil Hill, Humboldt Range, Nevada*. In Journal of Paleontology, v. 36, No. 1. January 1962. pp. 153-160.

Simons, D. D., R.R. Kautz and M. E. Kimball. 2008. *A Cultural Resources Inventory for the Coeur Rochester Mineral Exploration Program 2008, Pershing County, Nevada*. Prepared for Coeur Rochester Mine, Lovelock, Nevada by Kautz Environmental Consultants, Reno Nevada, 89502. Submitted to USDI Bureau of Land Management, Winnemucca District Office, Winnemucca, Nevada, Report No. CR2-3005(P).

Smith, R.C., P. McGuckian-Jones, J.R. Roney and K.F. Padrick. 1983. *Prehistory and History of the Winnemucca District: A Cultural Resource Literature Overview*. Cultural Resource Series, Monograph Number 6. Published by the USDI Bureau of Land Management Nevada State Office, Reno.

Snyder, S. A. 1991. *Falco peregrinus*. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available online at: http://www.fs.fed.us/database/feis/. Accessed April 2010.

SRK Consulting (US), Inc. (SRK). 2002. Vegetation *Monitoring of Coeur Rochester Waste Rock Disposal Sites.* Coeur Rochester, Inc. September 2002.

Sullivan, Janet. 1994. *Alectoris chukar*. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available online at: http://www.fs.fed.us/database/feis/animals/bird/alch/all.htm. Accessed April 2010.

Telesto Solutions, Inc. (Telesto). 2005. *Stage I Hydraulic and Chemical Evaluation, Coeur Rochester Mine, Pershing County, Nevada*. Prepared for Coeur Rochester, Inc., April 2005.

—. 2006. *Interim Report, Stage I Evaluation, Coeur Rochester Mine, Pershing County, Nevada.* Prepared for Coeur Rochester, Inc., March 2006.

—. 2007. *Fate and Transport Evaluation for the Stage I Area Coeur Rochester Mine,* Pershing County, Nevada.

Tesky, Julie L. 1993. *Zenaida macroura*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available online at: http://www.fs.fed.us/database/feis/animals/bird/zema/all.html. Accessed April 2010.

—. 1994a. *Aquila chrysaetos*. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available online at: http://www.fs.fed.us/database/feis/. Accessed April 2010.

—. 1994b. *Buteo swainsoni*. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available online at: http://www.fs.fed.us/database/feis/. Accessed June 2010.

—. 1994c. *Falco mexicanus*. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available: http://www.fs.fed.us/database/feis. Accessed June 2010.

Tetra Tech. 2010a. March 25 communication log between Mr. Chris Ansari, Tetra Tech, and Mr. Shawn Espinoza and Mr. Kyle Neil, Nevada Department of Wildlife, regarding Special Status Species (Sage Grouse and Pygmy Rabbit).

—. 2010b. March 29 communication log between Mr. Chris Ansari, Tetra Tech, and Mr. Kenny Pirkle, Nevada Department of Wildlife, regarding existing habitat for wildlife species in and around the Coeur Rochester Mine.

TRC Hydro-Geo Consultants (TRC). 1998. *Stage I Heap Leach Pad Area Fate and Transport Modeling Rochester Mine.* Prepared for Coeur Rochester Precious Metals Company, Rochester Group.

U.S. Census Bureau. 2000a. 2000 Census, Summary File 1, Table DP-1, Profile of General Demographic Characteristics. Available online at: http://factfinder.census.gov/home/saff/main.html?_lang=en. Accessed March 16, 2010.

U.S. Department of Agriculture Forest Service (USFS). 2000. Redwood Sciences Laboratory. California Myotis. M015. *Myotis californicus*. Available online at: http://www.fs.fed.us/psw/rsl/projects/wild/verner/mammals/m015.pdf. Accessed June 2010.

U.S. Environmental Protection Agency (EPA). 2009. *National Primary and Secondary Drinking Water Regulations.* Environmental Protection Agency Office of Water. 816-F-09-0004, May 2009. Available On-line: http://www.epa.gov/safewater/consumer/pdf/mcl.pdf.

EPA. 2010a. *National Ambient Air Quality Standards (NAAQS).* Available at http://www.epa.gov/air/criteria.html.

—. 2010b. *2008 TRI Data Release.* Available at http://www.epa.gov/tri/tridata/tri03/index.htm.

—. 2010c. *The Green Book Nonattainment Areas for Criteria Pollutants*. www.epa.gov/oar/aoqps/greenbook/ancl2.html. Accessed March 29, 2010.

U.S. Fish and Wildlife Service (USFWS). 1995. *U.S. Department of the Interior Departmental Manual Part 609: Weed Control Program.* June 26, 1995. Available online at: http://elips.doi.gov/app_DM/act_getfiles.cfm?relnum=3042. Accessed March 2010.

—. 2007. *Protecting Burrowing Owls at Construction Sites in Nevada's Mojave Desert Region.* June 2007.

—. 2008. *Federal Register Vol. 73, No. 5, Proposed Rules. Endangered and Threatened Wildlife and Plants; 90-Day Finding on a Petition To List the Pygmy Rabbit (Brachylagus idahoensis) as Threatened or Endangered*. January 8. Pages 1312-1313. Available online at: http://www.USFWS.gov/nevada/nv_species/documents/pygmy_rabbit/01082008_fed_reg.pdf. Accessed April 2010.

—. 2010. *Federal Register Vol. 75, No. 39. General Provisions; Revised List of Migratory Birds; Final Rule*. March 1. Pages 9282-9314.

—. 2010a. April 14 letter from Robert D. Williams, USFWS, Reno, Nevada, to Chris Ansari, Tetra Tech, regarding species list request for the Rochester Mine Environmental Assessment, Pershing County, Nevada.

—. 2010b. *Nevada's Protected Species by County*. Updated March 5, 2010. Available online at: http://www.USFWS.gov/Nevada/protected_species/species_by_county.html. Accessed April 2010.

—. 2010c. *Species Profile for pygmy rabbit (Brachylagus idahoensis).* Available online at: http://www.USFWS.gov/ecos/ajax/speciesProfile/profile/speciesProfile.action?spcode=A0GG. Accessed April 2010.

—. 2010d. *Endangered and Threatened Wildlife and Plants; 12-Month Findings for Petitions to List the Greater Sage-Grouse (Centrocercus urophasianus) as Threatened or*

Endangered; Proposed Rule. March 23, 2010 (Volume 75, Number 55, Page 13910). Available online at: http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2010_register&docid=fr23mr10-37. Accessed April 2010.

U.S. Geological Survey (USGS). 1999. Field Manual of Wildlife Diseases. General Field Procedures and Diseases of Birds. Available online at: http://www.nwhc.usgs.gov/publications/field_manual/. Accessed June 2010.

—. 2004. National Gap Analysis Program (GAP). *Provisional Digital Land Cover Map for the Southwestern United States.* Version 1.0. RS/GIS Laboratory, College of Natural Resources, Utah State University. Available online at: http://earth.gis.usu.edu/swgap/landcover_nv.php. Accessed March 2010.

Water Management Consultants, Inc. (WMC) 2009a. *Revised Rochester Pit Pond Assessment*. Technical Memo to Coeur d'Alene Mine, Corp. August 5, 2009.

—. 2009b. *Coeur Rochester Backfill Management Plan*. Prepared for Coeur d'Alene Mine, Corp. August 2009.

Western Regional Climate Center (WRCC). 2010. *Lovelock, Nevada period of Record Monthly Climate Summary*. http://www.wrcc.dri.edu.

Wyoming Department of Fish and Game (WYGF). 2005. Comprehensive Wildlife Conservation Strategy. Available online at: http://gf.state.wy.us/wildlife/CompConvStrategy/. Accessed June 2010.

Zouhar, Kris. 2003. *Bromus tectorum*. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available online at: http://www.fs.fed.us/database/feis. Accessed March 2010.

APPENDIX A: SLERA

Final Screening Level Ecological Risk Assessment

Coeur Rochester Mine

Prepared for:

Coeur Rochester, Inc.

P.O. Box 1057
Lovelock, Nevada 89419
(775) 273-7995
Fax (775) 273-7423

Prepared by:

TETRA TECH

639 Isbell Road, Suite 390
Reno, Nevada 89509
Phone (775) 322-0555
Fax (775) 322-3987

Tetra Tech Project No. 114-780103

June 3, 2010

EXECUTIVE SUMMARY

This report presents the findings of the June 2010 Screening Level Ecological Risk Assessment (SLERA) conducted for Coeur Rochester Mine, Inc.'s (CRI) Rochester Mine. Completion of the SLERA was requested by the Winnemucca District Office of the Bureau of Land Management (BLM) to evaluate potential ecological risks associated with the three post-mining closure alternatives for the Rochester Pit. These alternatives are being assessed as part of the Environmental Assessment process that is being completed under the requirements of the National Environmental Policy Act of 1969 (NEPA), to assess the implementation of Plan of Operations Amendment No. 8 (POA 8) for the Rochester Mine. The three pit closure alternatives include the following:

- A post-mining pit lake;
- Partial backfill of the pit to 6,150 feet above mean sea level (amsl), which would maintain the pit as a hydrologic sink; and
- Partial backfill of the pit to the 6,175-foot amsl elevation to preclude the formation of a post-mining pit lake or a hydrologic sink.

A SLERA utilizes conservative assumptions of exposure and potential toxicity to provide an initial screening of potential risk. The Rochester Mine SLERA was completed in accordance with guidelines contained in BLM Instruction Memorandum No. NV-IM-2008-034 (BLM, 2008); BLM Technical Note 390 revised; and U.S. Environmental Protection Agency (EPA) guidelines for the completion of ecological risk assessments. The SLERA calculated the potential risk factors associated with the three pit closure alternatives as related to identified receptor organisms specific to the regional ecology and site-specific habitats. Exposure pathways are also specific to each of the pit alternatives and life history of the receptors. Constituents of Potential Concern (COPC) were identified by comparing predicted water chemistry for each of the pit alternatives.

For each of the pit alternatives, potential risk was characterized by comparing predicted doses of COPCs to conservative Toxicity Reference Values (TRVs). The calculated risks are presented as a Hazard Quotient (HQ). Due to the conservative nature of the SLERA, if the calculated HQ is less than one (<1), there is a very low possibility of toxicity and additional risk assessment is not required. Conversely, a calculated HQ of greater than one (>1) does not indicate that toxicity is expected, but only that additional risk characterization using more realistic assumptions of exposure and toxicity would be required to quantify the risk potential.

The Rochester Mine SLERA indicates that open water provides the greatest potential of risk to environmental receptors. Since the post-mining pit lake alternative is the only alternative with a large area of permanent open water, this alternative presents a greater risk than the other alternatives. The calculated HQ values >1 indicate that risk cannot be ruled out for the pit lake alternative, under the conservative assumptions of exposure and toxicity, for direct ingestion of water by mule deer, rough-winged swallow, and humans for the following COPCs: antimony, boron, cadmium, fluoride, lead, manganese, selenium, thallium, and zinc. The presence of open water in the pit lake alternative also allows for exposure via COPC uptake into aquatic plants. The calculated HQ values that are >1 indicate risk cannot not be ruled out for the exposure pathway for mule deer (boron). The presence of the pit lake water also allows for uptake of COPCs through soil transfer into plants. For this exposure pathway, the calculated HQ value >1 indicates the risk potential cannot be eliminated for mule deer (boron and cadmium). As noted earlier, the calculation of an HQ >1 does not indicate that toxicity is expected, only that the potential risk cannot be eliminated under the conservative assumptions of the SLERA.

The SLERA indicates the 6,150-foot elevation backfill alternative has less risk potential than the pit lake alternative. Groundwater modeling for this alternative indicates backfilling to the 6,150-foot level will prevent exposures to open water by eliminating the formation of a pit lake. The modeling further indicates this backfill level would maintain the pit as an evaporative/hydrologic sink with fluctuating, near surface groundwater. Small "puddles" of water could develop on certain areas of the backfilled pit surface under unusually wet seasonal conditions. These areas, however, would be localized and temporary. Under this alternative, there is the potential to create emergent wetland vegetation communities during wetter than normal years, or seasonally after storm events and associated periods of run-off. The SLERA assumes the creation of these vegetation communities would occur 25 percent of the time per year. When this occurs, exposure pathways via transfer of COPCs from pit water to the soil, and soil to plants can occur. The SLERA calculated HQs >1 for the uptake of boron to mule deer via the soil to plant exposure pathway. Although this toxicity potential cannot be eliminated, it is considered a low risk. The SLERA assumes these species will source 100 percent of their forage from the vegetation communities, which is not considered realistic. In addition, these communities are expected to occur only 25 percent of the time each season, which would require the species to find other forage sources.

As discussed in the SLERA, there is no risk potential associated with the 6,175-foot backfill alternative. For this alternative, groundwater modeling indicates there will be no surface water expressions on the final backfilled pit surface. However, during 10 percent of the year it is estimated that groundwater levels will be at elevations, while still below the final pit surface, sufficient to allow deep rooted vegetation to uptake pit influenced groundwater. The calculated HQ for this soil to plant exposure pathway is <1 for all receptors, indicating no further assessment of risk is necessary for this alternative.

The findings of this SLERA indicate there is potential risk associated with both the pit lake alternative and the 6,150-foot elevation backfill alternative. Both of these alternatives could require additional review during the Rochester Mine closure planning process. There is no risk, as determined by calculated HQs of <1 for all receptors, associated with the 6,175-foot elevation partial backfill alternative.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

1.0 INTRODUCTION

To support the ongoing Environmental Assessment (EA) for Plan of Operations Amendment 8 (POA 8) at the Coeur Rochester Mine, the Winnemucca District office of the Bureau of Land Management (BLM) has requested the completion of a Screening Level Ecological Risk Assessment (SLERA) to identify potential ecological risks associated with the closure of the Rochester open pit. The SLERA process analyzes the likelihood that adverse ecological effects (risks) may occur as a result of exposure to one or more stressors (BLM, 2008). For POA 8, this assessment focuses on potential ecological risks associated with the creation of a post-mining pit lake; partial pit backfill to the 6,150-foot elevation (amsl) which would create a groundwater hydrologic sink; and partial pit backfill to the 6,175-foot elevation (amsl) elevation which would preclude the creation of a post-mining pit lake, and create a potential groundwater flow through conduction within the Rochester open pit. The following sections describe the background and purpose, procedures, and findings of the SLERA process.

1.1 Background and Purpose

The EA considers three open pit closure alternatives under the BLM's evaluation of POA 8:

(1) The No Action alternative that will result in the establishment of a post-mining pit lake.

(2) Backfilling to the 6,150-foot elevation which would be slightly below the modeled pre-mining water table level and which would create a groundwater hydrologic sink. Under this alternative emergent wetland vegetation communities could develop on the final backfill surface depending on seasonal precipitation conditions.

(3) Backfilling above the modeled pre-mining water table to the 6,175-foot elevation, which would preclude the formation of a pit lake; provide for a limited groundwater flow through condition; and develop an upland community with limited diversity on the final backfill surface.

1.1.1 Post-Mining Pit Lake

The post-mining pit lake will be a deep, freshwater feature. The bank relief will be steep and the substrate will be relatively homogenous. As a result, littoral/hyporheic/riparian (collectively referring to the interface area between the aquatic and upland communities, with respect to this SLERA) and deepwater habitat are expected to be limited. The pit lake will gradually fill over time as demonstrated by Coeur's geochemical pit lake model (SWS, 2010).

1.1.2 6,150-Foot Backfill Alternative

Under this alternative, the pit will be backfilled to the 6,150-foot elevation or slightly below the modeled pre-mining groundwater elevation. Hydrologically, the backfilled pit is expected to have pit water near the backfill surface only during the early spring months, or after heavy precipitation events; and slowly dry out during the warmer late spring, summer and early fall months. Based on the work completed by Schlumberger Water Services (SWS, 2010), the pit will remain as a hydrologic sink, with minimal discharge to groundwater. This discharge is expected to decrease over time. Seasonal wetland vegetation communities could emerge over time on the final backfilled surface if the pit water is close enough to the surface. Small "puddles" of water could also develop on certain areas of the backfilled pit surface under unusually wet seasonal conditions. These areas, however, would be localized and temporary.

1.1.3 6,175-Foot Backfill Alternative

This alternative backfills the pit to the 6,175-foot elevation, which precludes the formation of a post-mining pit lake, and would create a limited groundwater flow through condition. The 6,175-foot backfill elevation may result in minor (a few gallons per minutes) discharge from the pit to groundwater (SWS, 2010). Moisture in the backfill material due to seasonal precipitation events; groundwater moving through the material as a result of natural flow; and the evapotranspiration process could create conditions that support plant communities that grade from mesic (plant species that require increased soil moisture but are intolerant to prolonged soil saturation) to xeric (upland plant species of arid environments with minimal groundwater interaction) over time. Under this alternative, there would be no surface water expression on the final backfilled pit surface. However, during 10 percent of the year it is estimated that groundwater levels will be at elevations, while still below the final pit surface, sufficient to allow for some uptake of this water by deep rooted species that are part of the upland plant community.

1.2 Approach

Risk assessment is a tool that can be used to establish the potential for harmful impacts from environmental stressors and help to identify if mitigation measures or other controls are needed. A SLERA is useful for screening a wide range of potential stressors to evaluate if any additional risk assessment is warranted. As a screening level assessment, conservative assumptions of exposure and risk are utilized.

1.2.1 Process

This SLERA was completed in accordance with BLM Instruction Memorandum No. NV-IM-2008-034 (BLM, 2008); BLM Technical Note 390, revised (BLM, 2004); as well as, U.S. Environmental Protection Agency (EPA) guidelines for the completion of Ecological Risk Assessments (ERA) (EPA, 1998). The EPA guidelines discuss problem formulation, exposure analysis, and ecological risk calculation. Ultimately, the likelihood that specific receptor organisms may be at risk from exposure to identified COPCs under a given set of conditions was evaluated. SLERAs are designed to evaluate, measure, and/or predict environmental media concentrations using conservative assumptions and exposure parameters. Risk is a function of hazard and the likelihood that the hazard will occur. A potential for risk and the need for further assessment is determined by the SLERA approach, rather than a quantified estimate of actual risk.

1.3 Other Water Features

This SLERA does not assess the risk potential for other mine site facilities that hold or contain meteoric waters or process solutions. These facilities include the two original pregnant solution ponds; the original barren solution pond; and the original storage pond; which are now emergency management ponds. They also include the existing Stages I, II, and IV heap leach facilities. The SLERA also does not assess the risk potential associated with the proposed Stage III heap leach facility, and the two proposed evaporation ponds that will be constructed for closure operations.

When Coeur implemented the heap leach facility counter current fluid management system in 1991, the four existing process solution ponds were removed from regular process solution management operations. However, the ponds are still maintained as part of the process fluid emergency management system, and can be used to store process fluids in an emergency event. These ponds are permitted and managed for risk in accordance with the requirements of Nevada Administrative Code (NAC) 502.460 through NAC 502.495, the Industrial Artificial Pond

Permit Program. This program acknowledges that solutions in these ponds can contain constituents that are harmful or lethal to wildlife. In accordance with this permit, the pond areas are fenced to exclude access by larger wildlife species. This fencing also restricts pond site access to mine personnel. The ponds are normally dry with the exception of holding meteoric water following a storm event, after which Coeur must remove any accumulated waters within twenty days as required by their State of Nevada Water Pollution Control Permit that governs mine and process facility operations. In consultation with the BLM, it was determined that potential risk associated with these four ponds is managed through routine operation controls and the Industrial Artificial Pond Permit Program. These ponds will be assessed for potential risk during the closure planning process for the mine site.

At closure, Coeur will construct and actively maintain evaporation ponds for Stage I, II, and IV heap leach drainage for as long as necessary to meet water quality requirements. Similar to the process ponds during operations, these ponds will be permitted and managed for risk in accordance with the requirements of NAC 502.460 through NAC 502.495, the Industrial Artificial Pond Permit Program. Controlled access and other mitigation measures, as further defined through the closure planning process, will be implemented as long as the ponds remain operational.

The closed Stage I Heap Leach Facility, along with the active Stages II and IV heap facilities are managed for risk under the Industrial Artificial Pond Permit Program and through normal operations. The heap facilities are fenced to prevent access by larger wildlife species. The Stage I Heap Leach Facility is closed and does not have any process solution applied to it. The Stage II and Stage IV heaps undergo active leaching. Process solution is applied to the heap surfaces via buried emitters, which eliminates ponding on the heap surfaces. Pregnant leach solution is collected in the underdrain collection system and is pumped via pipelines to the Merrill Crowe Plant for processing. The valley fill design of the Stage II and IV leach heaps provides for solution storage within the heaps. The design and routine operation of the heap leach system does not provide open process solution that poses a potential risk. As discussed with the BLM, the heap leach system did not require assessment in this SLERA. The heap leach system will be assessed for potential risk during the closure planning process for the mine site.

The proposed Stage III Heap Leach Facility will be managed during operations in accordance with the routine operations and Industrial Artificial Pond Permit requirements currently in place. These management procedures and permit requirements mitigate any risk associated with the Stage III heap. The Proposed Action in the EA for POA 8 includes separate, new evaporation ponds that are intended for closure use only. Alternative D in the EA includes two ponds outside of the Stage III heap footprint that would provide for excess process solution management during operations that would become the evaporation ponds after closure. These ponds have not been addressed in the SLERA for the same reasons as discussed above for the existing ponds at the site. Consultation with the BLM determined that any risk associated with these facilities would be further addressed during the mine site closure planning process.

In addition, annual or perennial surface water resources are limited in the general mine site area, and routine surface water monitoring has provided no indication of elevated levels for COPCs in these limited resources. Consultation with the BLM determined these water resources do not require risk assessment in this SLERA.

2.0 PROBLEM FORMULATION

Problem formulation establishes the basis for exposure analysis and risk characterization. It includes a description of the exposure setting identification of potentially exposed habitats, development of a conceptual site model describing potential exposure mechanisms and pathways, selection of assessment endpoints and measurement receptors, and identification of COPCs.

SLERAs are designed to evaluate measured or predicted environmental media concentrations using conservative assumptions and exposure parameters. Screening level assessments provide a streamlined evaluation in order to eliminate, with reasonable confidence, chemical constituents and exposure pathways not expected to result in risk to organisms.

2.1 Site History

Since 1985, Coeur Rochester, Inc. (Coeur) has operated the Rochester Mine, located approximately 28 miles northeast of Lovelock, in Pershing County, Nevada. The mine site is located on public lands managed by the Humboldt River Field Office of the BLM, and private (patented) lands owned by Coeur. On August 5, 2009, Coeur submitted POA 8 to the BLM to address proposed changes in the current operations. Under POA 8, Coeur proposes to extend the existing open pit into existing waste rock facilities located to the west and southwest of the pit, construct a layback to the north high wall of the open pit, backfill the pit to preclude formation of a pit lake, build and operate a Stage III Heap Leach Facility, and construct a buttress against the southeast pit wall to provide a conveyor/pipeline corridor from the Stage III Heap Leach Facility to the process plant.

2.2 Environmental Setting and Ecological Receptors

The environmental setting is important in the identification of habitats consisting of ecological receptors that may be impacted due to exposure to residual constituents in environmental media. Consideration of ecological receptors representative of the habitats provides the basis for selecting measurement receptors, and supports demonstration of the presence or absence of federal and state species of interest. The following classes of receptors have been identified as exhibiting the potential for exposure risk to any or all of the three primary exposure source alternatives.

2.2.1 Terrestrial Habitat and Wildlife

The terrestrial habitat evaluated in this SLERA includes the aquatic/upland interface situated along the margin of the reclaimed pit feature. This type of habitat would function as a gradient of hydrophytic (plant species that are relatively tolerant of soil saturation), mesic, and xeric plant species as distance from the surface water and soil saturation increases. The xeric habitat would be the least productive for wildlife cover and forage. As proximity to the pit feature decreases, the gradient will be reversed. The mesic and hydrophytic habitats are typically more productive than adjacent upland xeric habitat, and usually support greater wildlife forage and cover. The increased vegetation cover and structure normally exhibited by moister habitats also provide improved habitat for various smaller mammals and insects. These species serve as an attractive prey source for raptors and other predators.

2.2.2 Aquatic Habitat and Wildlife

The geochemical modeling completed to date indicates that the post-mining pit water quality should support aquatic life, though due to the limited photic or littoral zones available in the pit, the productivity of the lake will be limited. The steep relief of the pit sides along with the expected lack of substrate variability and vertical structure on the pit bottom surface would provide minimal habitat characteristics. The importation and accumulation of detritus, the primary foundation for a productive fishery, is expected to be relatively slow over time, thus providing a weak food supply for secondary producers in the trophic chain. The pit lake alternative is also expected to produce a minimal littoral, hyporheic, and/or riparian corridor (in this context these terms are used synonymously to define the interface area between uplands and wetlands) due to the steep bank profiles. Further, the mine site will be closed following applicable Nevada regulations, and as determined in discussions with BLM personnel, there is no expectation that fish will be introduced to the pit lake, though other aquatic organisms, such as macroinvertebrates will colonize the lake.

Under the 6,150-foot elevation backfill alternative, seasonal wetland vegetation communities could emerge over time on the final backfill surface. These seasonal vegetation communities would not support any aquatic habitat, however various terrestrial and avian wildlife species could concentrate in these areas, taking advantage of the seasonal increase in vegetation productivity and diversity. The creation of these vegetation communities would occur only during wetter than normal years, or seasonally after storm events and associated periods of run-off, which is estimated to be 25 percent of the time per year.

The 6,175-foot elevation backfill alternative is expected to support an upland community consistent with the majority of the surrounding landscape and not provide any unique habitat. It is assumed that 10 percent of the year, the upland vegetation may uptake pit-influenced groundwater, and subsequently, this vegetation may be grazed or browsed by upland wildlife and/or avian species. Therefore, aquatic habitat and wildlife species are not considered as an exposure scenario.

2.2.3 Special Status Species

According to previous survey and monitoring efforts, special status species have not been observed at the mine site (Henderson, 1986; IME, 1992; SRK, 2002). However, the following species have been observed in nearby areas: Townsend's big-eared bat, burrowing owls, and eight different species of raptors (AEE, 2000). After closure, conditions at the mine may become more conducive to wildlife, increasing the potential for habitat use. Therefore, these species will be considered as receptors warranting evaluation, primarily via consideration of surrogate species (e.g., little brown bat for Townsend's big ear bat and barn owl for burrowing owls). The evaluation of surrogates is necessary because exposure data is unavailable for the special status species of concern.

2.2.4 Human

The closed open pit will be constructed with berms and other administrative controls to limit access to the lake, though it is possible that humans could access the pit area in the future to a limited extent. Recognizing this potential, human exposure was evaluated, though the exposure alternative was not residential, but a more limited camper/hunter assessment. For this assessment, it was conservatively estimated that an individual could spend up to two weeks at the closed pit lake and during that time could ingest or have dermal contact with the pit lake water. The human exposure assumptions for contact with pit lake water are based on ingestion, to provide the most health protective levels for a screening level risk assessment. The toxicity reference values (TRVs) for human exposure are based on oral dose calculations, and the human exposure factors are based on ingestion of water, consistent with EPA guidance (EPA 1997). Because of the limited and temporary nature of the "small puddles" of water that could be formed on the backfill under the 6,150-foot backfill alternative, human exposure is very unlikely and has not been considered for this pit closure alternative.

2.2.5 Domestic Livestock

It is anticipated that a potential post-closure land-use will be livestock grazing. While the closed pit feature will be constructed with berms, which should largely exclude livestock access, it is possible that livestock could utilize the pit lake for isolated periods for drinking water. Under the 6150-foot backfill alternative, livestock could access wetland vegetation for grazing seasonally. Therefore, potential long-term risks to domestic livestock are evaluated. As discussed with the BLM, this exposure period has been assumed to be up to two weeks per year. This conservatively assumes that cattle would solely utilize vegetation from the reclaimed pit during this time period. Due to the limited and temporary nature of the "small puddles" of water that could be formed on the backfill under the 6,150-foot elevation backfill alternative, livestock exposure through drinking water is very unlikely and has not been considered for this alternative.

Under the 6,175-foot backfill alternative, livestock were also evaluated under the two-week grazing exposure period scenario. The lack of any surface water expression under the 6,175-foot alternative eliminated the exposure pathway to livestock through drinking water.

2.3 Receptors Selected for Analysis

Identification of ecological receptors was used to define the food webs specific to potentially impacted habitats that were evaluated in the SLERA. Consistent with the environmental settings and habitats discussed above, a list of potential receptors by habitat was developed specific to each alternative. Ultimately, receptor selection was based on habitat representation, exposure potential, social, and/or economic importance, and reasonable availability of relevant natural history data. Each receptor was evaluated for risk.

The BLM indicated the species most warranting consideration as receptors (BLM, 2010). This list includes: little brown bat, white-footed mouse, cottontail rabbit, coyote, mule deer, mountain quail, red-tailed hawk, mallard duck, chukar, common barn owl, and rough-winged swallow. Table 1 presents the receptors selected for the exposure analysis.

Table 1: Primary Exposure Pathways of Selected Receptors.

	Pit Lake	6,150-Foot Backfill Alternative	6,175-Foot Backfill Alternative
Ecological Receptors	*Ingestion Pathways*		
Little Brown Bat	Water and invertebrates	Invertebrates	NA
White-footed Mouse	Water, vegetation, and invertebrates	Vegetation and invertebrates	Vegetation
Desert Cottontail Rabbit	Water and vegetation	Vegetation	Vegetation
Coyote	Water	Mammals	Mammals
Mule Deer	Water and vegetation	Vegetation	Vegetation
Northern Bobwhite Quail	Water, vegetation, and invertebrates	Vegetation and invertebrates	Vegetation and invertebrates
Red-tailed Hawk	Water and mammals	Mammals	Mammals
Mallard	Water, vegetation, and	Vegetation and	NA

	invertebrates	invertebrates	
Common Barn Owl	Water and mammals	Mammals	Mammals
Rough-winged Swallow	Water and invertebrates	Invertebrates	Invertebrates
Human Receptors			
Camper/Hunter	Water ingestion	NA	NA
Livestock			
Livestock	Water and vegetation	Water and vegetation	Vegetation

NA = Not Applicable

Piscivorous waterfowl are typically considered in SLERAs addressing deepwater features. Examples of common piscivorous waterfowl include loons and mergansers. The pit lake is the only closure alternative that provides sufficient open water habitat for a fishery necessary to support piscivorous waterfowl. However, as determined in discussions with BLM personnel, the pit lake will not become a fishery. As a result, the use of the pit lake by piscivores would likely only be for resting; which would result in less exposure than the exposure modeled for mallards.

The northern bobwhite quail was selected as a receptor to function as a surrogate for mountain quail and chukar. This species is classified as an upland game bird as is the mountain quail and chukar. The use of a surrogate was necessary due to a lack of available TRV data for the mountain quail and chukar.

Regarding the long-term integrity of public exclusion from the closure area, humans and livestock are considered as receptors. It is reasonable to assume that any mechanisms to exclude livestock and humans (berms and signage) may not function in perpetuity. The human exposure presented in Table 1 is consistent with those recognized by the BLM (2004) and as agreed upon during scoping of the SLERA with the BLM.

2.4 Assessment Endpoints

An assessment endpoint is an expression of an ecological attribute that is to be protected (EPA, 1998). Assessment endpoints have been identified specific to habitat types associated with each respective alternative. Consideration was given to all trophic levels, expected diversity and volume of primary production, and habitat-specific food web structure and function.

2.5 Measurement Endpoints

Measurements of effects are used to evaluate “the response of the assessment endpoint to a stressor” (EPA, 1998). Selection of receptor endpoints was based on identification of measurement receptors representative of the assessment endpoint. For this SLERA, the endpoints are regarded as receptor-specific, chronic, no-observed adverse effects levels (NOAELs), and low-observed adverse effects levels (LOAELs). However, due to a lack of peer-reviewed LOAELs for the receptors and endpoints, only NOAEL values are considered. The use of only NOAEL values adds an additional degree of conservatism, since exposure is compared to dose levels that result in no effect, rather than those that result in a low level of effect.

2.6 Conceptual Site Model

Table 1 presents a narrative, conceptual site model (CSM) of potential exposures from environmental media, and is based on a more graphical CSM previously completed by ENSR (2005). The objective is to specify exposure alternatives to be evaluated in the SLERA. Exposure pathways specific to each alternative are presented in Table 1. Exposure pathways were determined based on a receptor's method of ingestion of potentially contaminated media. The exposure pathway illustrates the ecosystem complexities associated with risk exposure and biomagnification within a food chain.

2.7 Historical and Modeled Data

Consistent with BLM Instruction Memorandum No. NV-IM-2008-034 (BLM, 2008), the proposed pit closure alternatives and their associated, relative ecological risks were evaluated using the hydro-geochemical water quality model developed by SWS (SWS, 2010). The model's output spanned several intervals over 200 years. For purposes of this SLERA, the 200-year output data were used to determine potential risk. The model's resultant constituent levels are compared with the Nevada Division of Environmental Protection (NDEP) Profile 1 analytical parameter list and reference values. Further screening was conducted on additional constituents recognized by the EPA (2002) in the National Recommended Water Quality Criteria (NRWQC), and the Rule 57 values from the Michigan Department of Natural Resources (MDNR) in order to produce a more comprehensive assessment. The Rule 57 values are included as they utilize the same methodology as the NRWQC values, but are more frequently updated to reflect the latest scientific studies, than are the NRWQC.

2.8 Selection of Constituents of Potential Concern

Tetra Tech screened against relevant (NDEP, EPA, MDNR) criteria to identify which COPCs should be eliminated from further consideration. Only COPCs that exceed criteria and demonstrate the potential to cause risk were carried forward in the SLERA. Identification of relevant COPCs, specific to the identified receptors, was completed for each alternative. Table 2 provides selected COPCs and their relation to the standards recognized for comparison. The pit water quality model considered 43 total analytes. Due to the complexities and resulting variety of habitat shared by and unique to each of the three pit closure alternatives, COPCs specific to this SLERA were selected based solely on a contaminant's measureable occurrence within the 200 year projection. Chloride and sulfate were initially recognized as COPCs but, after considering their chemical nature as a common ion, and since their projected concentrations were below all standards compared against, they were not carried into the exposure and effects assessment.

Table 2: Constituents of Potential Concern Data (mg/L) Modeled for each Alternative over 200 Years Compared to the Appropriate Water Quality Standards.

Contaminants of Potential Concern	Reclamation Scenario†			Nevada Division of Env. Protection	U.S. Environmental Protection Agency				Michigan Department of Environmental Quality		State of Nevada
					National Recommended Water Quality Criteria				Rule 57 Water Quality Values		
	Pit Lake	6150	6175	Profile 1	Freshwater Criteria Maximum Conc. (Acute)	Freshwater Criteria Continuous Conc. (Chronic)	Human Health for the Cons. of Water and Organism	Maximum Cont. Level	Final Chronic Value	Final Acute Value	Standards for Watering of Livestock (NAC 445A.144)
Antimony	0.023	0.015	0.002	0.006	na	na	na	0.006	0.24	2.3	na
Arsenic	0.0035	**0.019**	0.0079	0.01	0.34	0.15	0.000018	0.01	0.15	0.68	0.2
Barium	0.012	0.018	0.052	0.2	na	na	1	2	11.0908*	1.8718*	na
Boron	0.9	2	0.4	na	na	na	na	na	5	55	na
Cadmium	0.033	**0.0077**	**0.0064**	0.005	0.01262*	0.00063*	na	0.005	1.6343*	0.0758*	5
Copper	0.014	0.14	0.05	1	0.0487*	0.0288*	na	na	0.0974*	0.0288*	0.5
Flouride	1.5	0.9	0.18	4	na	na	na	4	2.7	20	2
Lead	0.00019	0.00065	**0.027**	0.015	0.2753*	0.0107*	na	na	0.7816*	0.0439*	0.1
Manganese	**0.64**	0.061	**0.62**	0.1	na	na	0.05	na	27.6642*	6.4112*	na
Selenium	0.024	**0.083**	0.016	0.05	na	0.005	0.17	0.05	0.005	0.12	0.05
Thallium	0.0015	0.002	0.0003	0.002	na	na	0.0017	0.002	0.0072	0.094	na
Zinc	0.55	0.6	0.14	5	0.3731*	0.3762	0.74	na	0.7463*	0.3762*	25

†Exceedances of Nevada Division of Environmental Protection Profile 1 standards are boldfaced. Profile 1 standards were selected for comparison since they represent the most stringent thresholds for most contaminants of potential concern.

*Hardness dependent standards calculated with a hardness value of 392.33 based on Ca and Mg mean 200yr. concentration projections across all three scenarios.

na = not available

3.0 EXPOSURE AND EFFECTS ASSESSMENT

The exposure and effects assessment evaluates the exposure of a measurement receptor to a COPC, and the toxicity of that COPC to a measurement receptor. This analysis was conducted for each identified COPC and receptor, across each pit closure alternative.

3.1 Exposure Areas

An exposure area is the location where exposure is presumed to occur for the receptors. The three pit closure alternatives support four distinct hydrology-driven ecological communities to varying degrees: deepwater, emergent, mesic, and upland. The pit lake is composed predominantly of deepwater habitat with narrow occurrences of the remaining three communities. The upland component is likely to be minimally affected by pit related groundwater. The 6,150-foot backfill alternative is expected to exhibit seasonally emergent and mesic habitats along with upland communities. The 6,175-foot backfill alternative will consist of an upland community exhibiting minimal association with pit-influenced groundwater;

3.2 Assessing Exposure to Measurement Receptors

Exposure is assessed by quantifying the daily dose ingested of contaminated food items and environmental media. Exposure was calculated consistent with *Wildlife Exposure Factors Handbook* (EPA, 1993) as appropriate. Exposure was calculated using the following equation:

EDI = CC x BW x IR

Where:

EDI	**=**	**Exposure Dose Index**
CC	**=**	**Contaminant Concentration of Media**
BW	**=**	**Receptor Body Weight**
IR	**=**	**Ingestion Rate**

3.2.1 Calculation of Chemical Concentration in Food

This calculation provides a quantitative estimate of constituent concentrations in the primary production of each habitat type and class of receptors. The calculation was conducted for each pit closure alternative. Exposure factors for each class of receptors, including aquatic wildlife, terrestrial wildlife, domestic livestock, and humans have been determined for body weight, food ingestion rate, water ingestion rate, and dietary composition. Calculation equations are consistent with the *Wildlife Exposure Factors* Handbook (EPA, 1993) as appropriate. Table 3 presents exposure factors for the selected receptors.

Table 3: Exposure Factors for Selected Receptors.

Receptor	Body Weight (kg)	Food Ingestion Rate kg/kg/day	Water Ingestion Rate (L/kg/day)	Dietary Composition	Home Range Size (ha)	Seasonal Use Factor	Reference
Little Brown Bat	0.0071	0.0003	0.1600	100% invertebrates	45,239	1	Sample et al 1997
White-footed Mouse	0.0220	0.0034	0.0066	50% invertebrates; 50% vegetation	0.059	1	Sample and Suter 1994
Desert Cottontail Rabbit	0.8400	0.1590	0.0850	100% vegetation	8	1	Cal/Ecotox
Coyote	14.3800	0.0310	0.0770	100% mammals	2436	1	Cal/Ecotox
Mule Deer	66.5200	0.0219	0.0785	100% vegetation	301.15	1	Sample et al 1997
Northern Bobwhite Quail	0.1736	0.0778	0.1150	85% vegetation; 15% invertebrates	10.3	1	EPA 1993
Red-tailed Hawk	1.1300	0.0890	0.0570	100% mammals	742	1	EPA 1993
Mallard	1.1600	0.1400	0.0560	75% invertebrates; 25% vegetation	435	1	EPA 1993
Common Barn Owl	0.4660	0.1250	0.0350	100% mammals	250	1	Sample and Suter 1994
Rough-winged Swallow	0.0146	0.0002	0.2400	100% invertebrates	3.06	1	Sample et al 1997
Livestock (cattle)	483.2500	0.0160	0.0930	100% vegetation	na	0.038356	ANRC 1987 & OMAFRA 2007
Human	71.8000	na	0.0199	100% water	na	0.038356	EPA 1997

In order to be conservative in the initial SLERA, no consideration of the size of the home range has been considered. For the wildlife receptors, it has been assumed that all water and food is ingested from only the reclaimed pit area.

3.3 Effects Assessment

The effects assessment is a presentation of potential toxicity as a result of the identified exposure pathways. Potential toxicity has been assessed by identifying TRVs, as presented in the Technical Note 390 (BLM, 2004), and specific to COPCs and the receptors being evaluated. TRVs are typically gathered from peer-reviewed literature where the toxicity thresholds for receptors have been experimentally determined for specific contaminants. Where TRVs for selected receptors are not available, alternative sources of TRVs have been utilized. For instance, using generalized avian TRVs for all avian receptors lacking specific TRVs. TRVs are expressed as a COPC daily dose ingested value that results in a chronic exposure duration, as expressed in units of mass (mg) of COPC per kg body weight (wet weight) per day. TRVs for the selected receptors are provided in Table 4. The contaminant concentration values for each receptor, and the corresponding uptake factors (water to plant, soil to invertebrate, etc.) for estimations of biomagnification and trophic loading (accumulation of contaminants through the food chain) are presented in Table 5.

Table 4: Toxicity Reference Values (mg/kg/d) for Selected Receptors and COPCs.

Receptor	Antimony	Arsenic	Barium	Boron	Cadmium	Copper	Flouride	Lead	Manganese	Selenium	Thallium	Zinc
Little Brown Bat	0.059a	1.04a	51.8a	2.8a	0.770a	5.60a	3.14a	4.7a	51.5a	0.143a	0.48e	75.4a
White-footed Mouse	0.059a	1.25b	51.8a	2.8a	0.3b	17b	3.14a	3b	51.5a	0.143a	0.48e	26.7b
Desert Cottontail Rabbit	0.059a	0.86b	51.8a	2.8a	0.09b	3.44b	3.14a	0.515b	51.5a	0.143a	0.48e	8.6b
Coyote	0.059a	0.32e	51.8a	2.8a	0.770a	5.60a	3.14a	4.7a	51.5a	0.143a	0.48e	75.4a
Mule Deer	0.059a	0.24b	51.8a	2.8a	0.02b	0.47b	3.14a	0.142b	51.5a	0.143a	0.48e	2.36b
Northern Bobwhite Quail	0.006j	2.24a	20.8f	1a	1.47a	4.05a	3.2a	1.63a	179a	0.290a	0.35f	66.1a
Red-tailed Hawk	0.006j	2.24a	20.8f	1a	1.47a	4.05a	3.2a	1.63a	179a	0.290a	0.35f	66.1a
Mallard	0.006j	0.63b	20.8f	1a	0.06b	3.75b	3.2a	0.375b	179a	0.290a	0.35f	12.5b
Common Barn Owl	0.006j	2.24a	20.8f	1a	1.47a	4.05a	3.2a	1.63a	179a	0.290a	0.35f	66.1a
Rough-winged Swallow	0.006j	2.24a	20.8f	1a	1.47a	4.05a	3.2a	1.63a	179a	0.290a	0.35f	66.1a
Livestock	0.059a	0.7b	0.51f	2.8a	0.07b	1.41b	3.14a	0.425b	51.5a	0.143a	0.48e	7b
Human	0.0004g	0.005c	0.2c	0.2c	0.0005c	0.01c	0.05c	1.00E-07	0.0003c	0.005c	0.00008g	0.3c

Notes:

A: EPA Ecological Soil Screening Levels (website)

B: BLM 2004, Risk Management Criteria for Metals at BLM Mining Sites

C: Agency for Toxic Substances and Disease Registry - Minimum Risk Levels List (website)

D: Sasse and Baker 1974, borrowed from ENSR SLERA - they didn't provide the full citation

E: EPA Region 9 Biological Technical Assistance Group (BTAG) Recommended TRVs for Mammals 2002 (found on the internet)

F: EPA 1999, Screening Level Ecological Risk Assessment Protocol

G: EPA 2010, Integrated Risk Information System (IRIS) Database

H: An uncertainty factor of 1000 was applied to the mammal TRV - 10 for interspecies conversion, 10 to protect sensitive individuals, and 10 because the effect level was a LOAEL and no NOEL was established.

I: Not available, EPA 2010, IRIS Database Reference Dose discussion of Lead (Pb) - Current knowledge of lead pharmacokinetics indicates that risk values derived by standard procedures would not truly indicate the potential risk, because of the difficulty

J: An uncertainty factor of 10 for interspecies conversion was applied to the mammal TRV, due to a lack of avian data for Antimony.

Table 5: Summary of Trophic Level Concentrations Across Three Pit Closure Alternatives for the Selected COPCs.

COPC	Pit Lake	6150	6175	Water to Invertebrate Uptake Factor	Source	Pit Lake Estimated Water to Invert. Conc.	Water to Plant Uptake Factor	Source	Pit Lake Water to Plant Conc.	Soil to Plant Uptake Factor	Source	Pit Lake Soil to Plant Conc.	6150 Soil to Plant Conc.	6175 Soil to Plant Conc.	Soil to Earthworm Uptake Factor	Source	Pit Lake Soil to Earthworm Conc.	6150 Soil to Earthworm Conc.	Soil to Mammal Uptake Factor	Source	Pit Lake Soil to Mammal Conc.	6150 Soil to Mammal Conc.
Antimony	0.023	0.015	0.002	0.36	USEPA, Wildlife Exposures Handbook, Table 4-2	0.00828	0.037	USEPA 2005 ESSL	0.000851	0.037	USEPA 2005 ESSL	0.000851	0.000555	0.000074	0.16	USEPA, Wildlife Exposures Handbook, Table 4-2	0.00368	0.0024	0.01	Baes et el 1984	0.00023	0.00015
Arsenic	0.0035	0.019	0.0079	0.36	USEPA, Table 4-2	0.00126	0.022	Chen et al. 2009	0.000077	0.006	NV BLM	0.000021	0.000114	0.0000474	0.2224	Sample et al 1999	0.0007784	0.0042256	0.0025	Sample et al 1998	0.00000875	0.0000475
Barium	0.012	0.018	0.052	0.36	USEPA, Table 4-2	0.00432	0.213	Bechtel Jacobs 1998	0.002556	0.213	Bechtel Jacobs 1998	0.002556	0.003834	0.011076	0.16	USEPA, Table 4-2	0.00192	0.00288	0.36	USEPA, Table 4-2	0.00432	0.00648
Boron	0.9	2	0.4	0.36	USEPA, Table 4-2	0.324	4	Baes 1984	3.6	4	Baes 1984	3.6	8	1.6	0.16	USEPA, Table 4-2	0.144	0.32	0.36	USEPA, Table 4-2	0.324	0.72
Cadmium	0.033	0.0077	0.0064	0.36	USEPA, Table 4-2	0.01188	0.22	Chen et al. 2009	0.00726	0.65	USEPA, Table 4-2	0.02145	0.005005	0.00416	0.16	USEPA, Table 4-2	0.00528	0.001232	0.36	USEPA, Table 4-2	0.01188	0.002772
Copper	0.014	0.14	0.05	0.36	USEPA, Table 4-2	0.00504	0.08	NV BLM	0.00112	0.08	NV BLM	0.00112	0.0112	0.004	0.515	Sample et al 1999	0.00721	0.0721	0.1963	Sample et al 1998	0.0027482	0.027482
Flouride	1.5	0.9	0.18	0.36	USEPA, Table 4-2	0.54	0.65	USEPA, Table 4-2	0.975	0.65	USEPA, Table 4-2	0.975	0.585	0.117	0.16	USEPA, Table 4-2	0.24	0.144	0.36	USEPA, Table 4-2	0.54	0.324
Lead	0.00019	0.00065	0.027	0.36	USEPA, Table 4-2	0.0000684	0.084	Chen et al. 2009	0.00001596	0.65	USEPA, Table 4-2	0.0001235	0.0004225	0.01755	0.16	USEPA, Table 4-2	0.0000304	0.000104	0.36	USEPA, Table 4-2	0.0000684	0.000234
Manganese	0.64	0.061	0.62	0.36	USEPA, Table 4-2	0.2304	0.113	Bechtel Jacobs 1998	0.07232	0.113	Bechtel Jacobs 1998	0.07232	0.006893	0.07006	0.16	USEPA, Table 4-2	0.1024	0.00976	0.36	USEPA, Table 4-2	0.2304	0.02196
Selenium	0.024	0.083	0.016	0.36	USEPA, Table 4-2	0.00864	0.65	USEPA, Table 4-2	0.0156	0.65	USEPA, Table 4-2	0.0156	0.05395	0.0104	0.16	USEPA, Table 4-2	0.00384	0.01328	0.36	USEPA, Table 4-2	0.00864	0.02988
Thallium	0.0015	0.002	0.0003	0.36	USEPA, Table 4-2	0.00054	0.65	USEPA, Table 4-2	0.000975	0.65	USEPA, Table 4-2	0.000975	0.0013	0.000195	0.16	USEPA, Table 4-2	0.00024	0.00032	0.36	USEPA, Table 4-2	0.00054	0.00072
Zinc	0.55	0.6	0.14	0.36	USEPA, Table 4-2	0.198	0.21	NV BLM	0.1155	0.21	NV BLM	0.1155	0.126	0.0294	0.3201	Sample et al 1999	0.176055	0.19206	0.504	Sample et al 1998	0.2772	0.3024

dry weight to wet weight conversions
water to invertebrate = 0.36
soil to plant = 0.65
soil to earthworm = 0.16
soil to mammal = 0.36

4.0 RISK CHARACTERIZATION RESULTS

A characterization of the potential risk has been completed for each pit closure alternative. The characterization discusses potential risks of the identified COPCs on receptors for each of the three alternatives: post-mining pit lake, the 6,150-foot backfill alternative, and the 6,175-foot backfill alternative. Risk was characterized at year 200 post-closure is evaluated by calculating hazard quotients HQs for each receptor relative to each COPC across each pit closure alternative. Under the previously discussed conservative assumptions, if the HQs are <1, there is a very low potential of risk for that receptor-COPC-exposure pathway combination. Calculation of the HQs is detailed below:

HQ = EXPOSURE DOSE INDEX / TRV

The calculation of the EDI was discussed earlier in Section 3.2. TRVs are identified in peer-reviewed literature and federal and state guidance documents and databases.

As discussed earlier, the role of the SLERA is to provide a conservative screening of potential risk. Conservatism is due to assumptions such as: 1) the home range of the different species is not considered, 2) seasonality of habitat use (i.e., migration patterns or seasonal movements), and 3) the TRV values are all based on NOAELs rather than LOAELS. Essentially, assumptions 1 and 2 mean that wildlife (not including livestock) only drink water and consume food influenced by the reclaimed facilities for their entire lives, which is highly unlikely. The SLERA also assumes that there is risk to the population of a species if there is potential risk to a few individuals that could utilize the reclaimed facilities. With the exception of sensitive species, this too is unlikely. Therefore, an HQ >1 does not necessarily indicate that toxicity will occur, but only that additional evaluation using more refined exposure assumptions would be needed to better characterize the potential risk.

Exposure doses and subsequent HQs are provided in Appendix A for each receptor and the risk imposed by each respective COPC across all three closure alternatives.

4.1 Post-Mining Pit Lake Alternative

In terms of habitat, the post-mining pit lake alternative is predominantly characterized by perennial, open, deep-water habitat with narrow margins of emergent, mesic, and upland components that are likely to maintain a hydrologic connection with groundwater. All of these habitats were evaluated for their potential to exhibit exposure pathways, and exposure was calculated. However, the majority of actual exposure risk is associated with receptors dependent on open water habitat.

Based on the HQ values shown in Table 6, direct ingestion of pit lake water has the greatest potential for risk. This is particularly the case for mule deer, and humans. Generally, the HQs for soil to plant, and water to plant exposures are <1, with the exception of some higher HQ values for mule deer. The water to insect pathway resulted in no identified potential risk to any receptors. This pathway, consistent with the character of the habitat, is the source of risk exposure expected to be most frequently assimilated. The soil to worm and soil to mammal classifications, the exposure pathways most limited in spatial extent due their association with upland habitats, resulted in no potential risk to any of the receptor species.

Table 6: Receptors Exhibiting Hazard Quotients >1 in the Post-Mining Pit Lake Alternative

COPC	Exposure Pathway					
	Water to Insect	Water to Plant	Soil to Plant	Soil to Worm	Soil to Mammal	Direct Water
Antimony	-	-	-	-	-	Mule Deer (2.0) Human (3.2)
Arsenic	-	-	-	-	-	-
Barium	-	-	-	-	-	-
Boron	-	Mule Deer (1.9)	Mule Deer (1.9)	-	-	Mule Deer (1.7)
Cadmium	-	-	Mule Deer (1.6)	-	-	Mule Deer (8.6) Human (3.6)
Copper	-	-	-	-	-	-
Flouride	-	-	-	-	-	Mule Deer (2.5) Human (1.6)
Lead	-	-	-	-	-	Human (104.1)
Manganese	-	-	-	-	-	Human (116.9)
Selenium	-	-	-	-	-	-
Thallium	-	-	-	-	-	Human (1.0)
Zinc	-	-	-	-	-	Mule Deer (1.2) Rough-winged Swallow (3.5)

Potential risk for vegetation related exposure was associated with boron and cadmium for mule deer. The SLERA ruled out risk from the soil to terrestrial invertebrate (worm) pathway for all COPCs and receptors. The soil to mammal pathways were also eliminated in the SLERA.

Human exposure is expected with the direct ingestion of water. COPCs with an HQ >1 for humans include antimony, cadmium, fluoride, lead, and manganese. For thallium, HQ equals one. Potential risk to mule deer and rough-winged swallows were also not eliminated for some of the COPCs through direct water ingestion. It is important to note, however, that an HQ >1 only indicates additional risk analysis would be needed to characterize risk. This is in part due to the very conservative assumptions of exposure and toxicity discussed earlier.

4.2 6,150-Foot Backfill Alternative

Based on the work completed by SWS (2010), no tangible open water habitat is projected to occur under this alternative, even under abnormally wet conditions. However, during wetter than normal conditions, the water table could be close enough to the surface to support emergent wetland-type vegetation communities. Due to the lack of open water, the only exposure pathways are from soil, as summarized in Table 7. These results are based on the assumption that the water table will be close enough to the surface of the backfill 25 percent of the time on a yearly basis to influence the soil to plant, soil to worm, and soil to mammal pathways. The 25 percent assumption is estimated to be a realistic value to capture wetter than normal years, or short periods on an annual basis when the water table rises due to storm events or seasonal runoff.

Table 7: Receptors Exhibiting Potential Hazard Quotients >1 in the 6,150 Backfill Alternative

COPC	Exposure Pathway		
	Soil to Plant	Soil to Worm	Soil to Mammal
Antimony	-	-	-
Arsenic	-	-	-
Barium	-	-	-
Boron	Mule Deer (1.04)	-	-
Cadmium	-	-	-
Copper	-	-	-
Flouride	-	-	-
Lead	-	-	-
Manganese	-	-	-
Selenium	-	-	-
Thallium	-	-	-
Zinc	-	-	-

Because there are no open water exposure pathways, as exists for the pit lake alternative, the 6,150-foot backfill alternative shows demonstrably less potential for risk than the pit lake alternative. The only COPC that has a HQ >1 is boron for mule deer via the soil to plant pathway. These HQ values are calculated assuming that these receptors will only utilize the reclaimed pit for all of their consumption of vegetation, which is not likely.

4.3 6,175-Foot Backfill Alternative

The 6175-foot backfill alternative has one exposure pathway, soil to plant. For this alternative, groundwater modeling indicates there will be no surface water expressions on the final backfilled pit surface, which eliminates a pit lake. However, during 10 percent of the year it is estimated that groundwater levels will be at elevations, while still below the final pit surface, sufficient to allow deep-rooted vegetation to uptake pit influenced groundwater and develop an upland plant community with limited habitat diversity. For this alternative, the soil to plant exposure pathway was evaluated for the white-footed mouse, desert cottontail rabbit, mule deer, northern bobwhite, Mallard, and livestock. The calculated HQs for this exposure pathway are <1 for all receptors, indicating no further assessment of risk is necessary for this alternative

4.4 SLERA Assumptions and Uncertainty

The final determinations of this SLERA are based on the following primary assumptions:

- Modeled hydrology data are accurate and representative of the site;
- Reference values obtained in peer-reviewed literature are applicable to the alternatives evaluated in this SLERA;
- TRVs are based on NOAEL values rather than LOAEL values, which adds additional conservatism;
- Wildlife will consume 100 percent of their water (pit lake only) and food at the closed facility (i.e., no allowance for home range);

- Livestock are assumed to utilize the reclaimed pit as a drinking water source for two weeks each year; all food and water (pit lake only) in the two weeks is assumed to be from the closed facility;
- Human exposure was limited to two weeks and to use of open water (pit lake only) for drinking water;
- For the 6,150-foot backfill alternative, it was assumed that the exposure to COPCs from the source water (backfilled pit lake) was present 25 percent of the time, though only as a shallow water table and not as open water habitat; and
- For the 6,175-foot backfill alternative, it was assumed that the exposure to COPCs from the vegetation in association with pit-influenced groundwater was present 10 percent of the time.

There is uncertainty associated with the primary assumptions, which could influence the results of the SLERA. However, the high level of conservatism used for the SLERA reduces the potential that the SLERA will underestimate the potential risk due to the primary assumptions. Among the examples of conservatism in the SLERA, are the assumptions that:

- All food and water for wildlife is from the closed facility;
- TRVs based on no effect are similar to those based on a the lowest reported effect concentrations; and
- Risk to individuals at the facility poses a risk to the overall population.

5.0 SUMMARY AND CONCLUSIONS

The risk characterization in Section 4.0 shows that direct water exposure, as present in the pit lake alternative, presents the greatest potential for risk to wildlife, livestock, and humans. The SLERA indicates that risk cannot be ruled out, under the conservative assumptions of exposure and toxicity, for direct ingestion of water by mule deer, rough-winged swallow, and humans for the following COPCs: antimony, boron, cadmium, fluoride, lead, manganese, selenium, thallium, and zinc. The presence of open water in the pit lake alternative also allows for exposure via uptake into aquatic plants. Risk could not be ruled out for these exposure pathways for mule deer (boron). The presence of the pit lake water also allows for uptake through soil transfer into plants, terrestrial invertebrates, and mammals. For these exposure pathways, the risk potential could not be eliminated for mule deer (boron and cadmium). As stated earlier, the calculation of HQs >1 does not indicate that toxicity is expected, only that the potential risk cannot be eliminated under the conservative assumptions of the SLERA.

The 6,150-foot backfill alternative has less risk potential, primarily due to the lack of open water and the associated exposure pathways. Backfilling to this level is sufficient to prevent exposure to open water, beyond temporary and localized surface "puddles", but shallow enough to maintain an evaporative sink in the pit. Because the pit water can be near the surface of the backfill, there is the potential to create emergent wetland conditions during wetter than normal years, or seasonally during storm events or periods of heavy run-off. When this occurs (assumed to be 25 percent of the time), exposure pathways via transfer of COPCs from pit water to the soil can occur. The SLERA shows that in general, these exposure routes would be eliminated, with the exception of boron uptake into plants for mule deer. It is important to note the SLERA assumes these species will source 100 percent of their forage from the vegetation communities, which is not considered realistic, as mule deer would be expected to remain in the pit area full time. In addition, these communities are expected to occur only 25 percent of the time each year, which would require the species to find other forage sources.

The final alternative is the 6,175-foot backfill. Under this alternative groundwater modeling indicates there will be no surface water expressions on the final backfilled pit surface, which eliminates a pit lake. However, during 10 percent of the year it is estimated that groundwater levels will be at elevations, while still below the final pit surface, sufficient to allow deep rooted vegetation to uptake pit influenced groundwater and develop an upland plant community with limited habitat diversity. The SLERA shows that for this single soil to plant exposure pathway, the calculated HQ values for all receptors is <1, indicating no further assessment of risk is necessary for this alternative.

6.0 REFERENCES

AEE, 2000. *Wildlife Survey, Nevada Packard Baseline Studies, Pershing County, Nevada.* AGRA Earth and Environmental, Inc. August 2000. AEE Job No. 0-417-000402. Sparks, Nevada.

BLM, 2004, Risk Management Criteria for Metals at BLM Mining Sites. Technical Note 390. Revised October 2004.

BLM, 2008. Ecological Risk Assessment Guidelines for Open Pit Mine Lakes in Nevada. Instruction Memorandum No. NV-IM-2008-03. April 2008.

BLM, 2010. Personal Communication. Rochester SLERA Conference Call with BLM, Coeur, and Tetra Tech. April 22, 2010.

ENSR, 2005. Screening-Level Ecological Risk Assessment for Closure of the Stage 1 Heap Leach Facility, Coeur Rochester. Document No. 08714-072. November 2005.

EPA (US Environmental Protection Agency), 1993. Wildlife Exposure Factors Handbook. EPA/600/R-93/187. December 1993.

EPA, 1997. Exposure Factors Handbook.(Final Report). EPA/600/P-95/002F a-c.

EPA, 1998. Guidelines for Ecological Risk Assessment. EPA/630/R-95-002F. Washington, D.C.

EPA, 2002. National Recommended Water Quality Criteria- Correction. EPA-822-R-02-047. November 2002.

Henderson, P. L., 1986. Wildlife Survey in the Rochester Mining District. Report Prepared for Coeur Rochester, Inc. Reno, Nevada.

IME, 1992. Vegetation Characteristics of the Coeur Rochester Mine Area. Yampa, Colorado. July 2, 1992.

SRK, 2002. Vegetation Monitoring of Coeur Rochester Waste Rock Disposal Sites. Coeur Rochester, Inc. September 2002.

SWS, 2010. Geochemical Pit Lake Water Model (pending).

APPENDIX A

CALCULATED EXPOSURE DOSES AND HAZARD QUOTIENTS

Table A-1. Summary of Exposure Dose and Hazard Quotient Tables.	
Table	**Description of Content**
A-2	Pit Lake Aquatic Invertebrate Exposure.
A-3	Pit Lake Hydrophytic Plant Exposure.
A-4	Pit Lake Upland Plant Exposure.
A-5	6150 Backfill Upland Plant Exposure.
A-6	6175 Backfill Upland Plant Exposure
A-7	Pit Lake Terrestrial Invertebrate Exposure.
A-8	6150 Backfill Terrestrial Invertebrate Exposure.
A-9	Pit Lake Mammal Exposure.
A-10	6150 Backfill Mammal Exposure.
A-11	Pit Lake Water Exposure.

Table A-2. Calculated Exposure Doses and Hazard Quotients for Selected Receptors with Respect to Pit Lake Aquatic Invertebrate Exposure.											
COPC	Estimated Pit Lake Water Conc.	NOAEL Hazard Quotients for Receptors									
	Water to Insect	Little Brown Bat		White-footed Mouse		Northern Bobwhite		Mallard		Rough-winged Swallow	
		Exposure Dose	Hazard Quotient	Exposure Dose[1]	Hazard Quotient	Exposure Dose[2]	Hazard Quotient	Exposure Dose[3]	Hazard Quotient	Exposure Dose	Hazard Quotient
Antimony	0.0083	0.0000	0.0000	0.0000	0.0000	0.0000	0.0028	0.0010	0.1681	0.0000	0.0000
Arsenic	0.0013	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0002	0.0000	0.0000
Barium	0.0043	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005	0.0000	0.0000	0.0000
Boron	0.3240	0.0000	0.0000	0.0000	0.0000	0.0007	0.0007	0.0395	0.0395	0.0000	0.0000
Cadmium	0.0119	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0014	0.0241	0.0000	0.0000
Copper	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006	0.0002	0.0000	0.0000
Flouride	0.5400	0.0000	0.0000	0.0000	0.0000	0.0011	0.0003	0.0658	0.0206	0.0000	0.0000
Lead	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Manganese	0.2304	0.0000	0.0000	0.0000	0.0000	0.0005	0.0000	0.0281	0.0002	0.0000	0.0000
Selenium	0.0086	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0011	0.0036	0.0000	0.0000
Thallium	0.0005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0000	0.0000
Zinc	0.1980	0.0000	0.0000	0.0000	0.0000	0.0004	0.0000	0.0241	0.0019	1.5345	0.2192

[1]Diet of white-footed mouse consists of only 50% invertebrates; therefore exposure doses presented above only represents 50% of diet.

[2]Diet of northern bobwhite consists of only 15% invertebrates; therfore exposure doses presented above only represent 15% of diet.

[3]Diet of mallard consists of only 75% invertebrates; therefore exposure doses presented above only represents 75% of diet.

Table A-3. Calculated Exposure Doses and Hazard Quotients for Selected Receptors with Respect to the Pit Lake Hydrophytic Plant Exposure.													
COPC	Measured Pit Lake Conc.	NOAEL Hazard Quotients for Receptors											
	Water to Plant	White-footed Mouse		Desert Cottontail Rabbit		Mule Deer		Northern Bobwhite		Mallard		Livestock (cattle)	
		Exposure Dose[1]	Hazard Quotient	Exposure Dose	Hazard Quotient	Exposure Dose	Hazard Quotient	Exposure Dose[2]	Hazard Quotient	Exposure Dose[3]	Hazard Quotient	Exposure Dose	Hazard Quotient
Antimony	0.0009	0.0000	0.0000	0.0001	0.0019	0.0012	0.0210	0.0000	0.0016	0.0000	0.0058	0.0003	0.0043
Arsenic	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0.0005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Barium	0.0026	0.0000	0.0000	0.0003	0.0000	0.0037	0.0001	0.0000	0.0000	0.0001	0.0000	0.0008	0.0015
Boron	3.6000	0.0001	0.0000	0.4808	0.1717	5.2444	1.8730	0.0413	0.0413	0.1462	0.1462	1.0701	0.3822
Cadmium	0.0073	0.0000	0.0000	0.0010	0.0108	0.0106	0.5288	0.0001	0.0001	0.0003	0.0049	0.0022	0.0308
Copper	0.0011	0.0000	0.0000	0.0001	0.0000	0.0016	0.0005	0.0000	0.0000	0.0000	0.0000	0.0003	0.0002
Flouride	0.9750	0.0000	0.0000	0.1302	0.0415	1.4204	0.4523	0.0112	0.0035	0.0396	0.0124	0.2898	0.0923
Lead	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Manganese	0.0723	0.0000	0.0000	0.0097	0.0002	0.1054	0.0020	0.0008	0.0000	0.0029	0.0000	0.0215	0.0004
Selenium	0.0156	0.0000	0.0000	0.0021	0.0146	0.0227	0.1589	0.0002	0.0006	0.0006	0.0022	0.0046	0.0324
Thallium	0.0010	0.0000	0.0000	0.0001	0.0003	0.0014	0.0030	0.0000	0.0000	0.0000	0.0001	0.0003	0.0006
Zinc	0.1155	0.0000	0.0000	0.0154	0.0018	0.1683	0.0713	0.0013	0.0000	0.0047	0.0004	0.0343	0.0049

[1]Diet of white-footed mouse consists of only 50% vegetation; therefore exposure doses presented above only represents 50% of diet.

[2]Diet of northern bobwhite consists of only 85% vegetation; therefore exposure doses presented above only represent 85% of diet.

[3]Diet of mallard consists of only 25% vegetation; therefore exposure doses presented above only represents 25% of diet.

Table A-4. Calculated Exposure Doses and Hazard Quotients for Selected Receptors with Respect to the Pit Lake Upland Plant Exposure.													
COPC	Measured Pit Lake Conc.	NOAEL Hazard Quotients for Receptors											
	Soil to Plant	White-footed Mouse		Desert Cottontail Rabbit		Mule Deer		Northern Bobwhite		Mallard		Livestock (cattle)	
		Exposure Dose[1]	Hazard Quotient	Exposure Dose	Hazard Quotient	Exposure Dose	Hazard Quotient	Exposure Dose[2]	Hazard Quotient	Exposure Dose[3]	Hazard Quotient	Exposure Dose[4]	Hazard Quotient
Antimony	0.0009	0.0000	0.0000	0.0001	0.0019	0.0012	0.0210	0.0000	0.0016	0.0000	0.0058	0.0003	0.0043
Arsenic	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Barium	0.0026	0.0000	0.0000	0.0003	0.0000	0.0037	0.0001	0.0000	0.0000	0.0001	0.0000	0.0008	0.0015
Boron	3.6000	0.0001	0.0000	0.4808	0.1717	5.2444	1.8730	0.0413	0.0413	0.1462	0.1462	1.0701	0.3822
Cadmium	0.0215	0.0000	0.0000	0.0029	0.0318	0.0312	1.5624	0.0002	0.0002	0.0009	0.0145	0.0064	0.0911
Copper	0.0011	0.0000	0.0000	0.0001	0.0000	0.0016	0.0005	0.0000	0.0000	0.0000	0.0000	0.0003	0.0002
Flouride	0.9750	0.0000	0.0000	0.1302	0.0415	1.4204	0.4523	0.0112	0.0035	0.0396	0.0124	0.2898	0.0923
Lead	0.0001	0.0000	0.0000	0.0000	0.0000	0.0002	0.0013	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Manganese	0.0723	0.0000	0.0000	0.0097	0.0002	0.1054	0.0020	0.0008	0.0000	0.0029	0.0000	0.0215	0.0004
Selenium	0.0156	0.0000	0.0000	0.0021	0.0146	0.0227	0.1589	0.0002	0.0006	0.0006	0.0022	0.0046	0.0324
Thallium	0.0010	0.0000	0.0000	0.0001	0.0003	0.0014	0.0030	0.0000	0.0000	0.0000	0.0001	0.0003	0.0006
Zinc	0.1155	0.0000	0.0000	0.0154	0.0018	0.1683	0.0713	0.0013	0.0000	0.0047	0.0004	0.0343	0.0049

[1]Diet of white-footed mouse consists of only 50% vegetation; therefore exposure doses presented above only represents 50% of diet.

[2]Diet of northern bobwhite consists of only 85% vegetation; therefore exposure doses presented above only represent 85% of diet.

[3]Diet of mallard consists of only 25% vegetation; therefore exposure doses presented above only represents 25% of diet.

[4]Diet assumes only two weeks of exposure per year (4%)

Table A-5. Calculated Exposure Doses and Hazard Quotients for Selected Receptors with Respect to the 6150 Backfill Upland Plant Exposure.

COPC	Measured 6150 Backfill Conc.	NOAEL Hazard Quotients for Receptors											
	Soil to Plant	White-footed Mouse		Desert Cottontail Rabbit		Mule Deer		Northern Bobwhite		Mallard		Livestock (cattle)	
		*Exposure Dose[1]	Hazard Quotient	*Exposure Dose	Hazard Quotient	*Exposure Dose	Hazard Quotient	*Exposure Dose[2]	Hazard Quotient	*Exposure Dose[3]	Hazard Quotient	Exposure Dose[4]	Hazard Quotient
Antimony	0.0006	0.0000	0.0000	0.0000	0.0003	0.0002	0.0034	0.0000	0.0011	0.0000	0.0009	0.0002	0.0028
Arsenic	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Barium	0.0038	0.0000	0.0000	0.0001	0.0000	0.0014	0.0000	0.0000	0.0000	0.0000	0.0000	0.0011	0.0022
Boron	8.0000	0.0001	0.0000	0.2671	0.0954	2.9136	1.0406	0.0009	0.0009	0.0812	0.0812	2.3780	0.8493
Cadmium	0.0050	0.0000	0.0000	0.0002	0.0019	0.0018	0.0911	0.0000	0.0000	0.0001	0.0008	0.0015	0.0213
Copper	0.0112	0.0000	0.0000	0.0004	0.0001	0.0041	0.0012	0.0002	0.0001	0.0001	0.0000	0.0033	0.0024
Flouride	0.5850	0.0000	0.0000	0.0195	0.0062	0.2131	0.0679	0.0004	0.0001	0.0059	0.0019	0.1739	0.0554
Lead	0.0004	0.0000	0.0000	0.0000	0.0000	0.0002	0.0011	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003
Manganese	0.0069	0.0000	0.0000	0.0002	0.0000	0.0025	0.0000	0.0000	0.0000	0.0001	0.0000	0.0020	0.0000
Selenium	0.0540	0.0000	0.0000	0.0018	0.0126	0.0196	0.1374	0.0000	0.0001	0.0005	0.0019	0.0160	0.1121
Thallium	0.0013	0.0000	0.0000	0.0000	0.0001	0.0005	0.0010	0.0000	0.0000	0.0000	0.0000	0.0004	0.0008
Zinc	0.1260	0.0000	0.0000	0.0042	0.0005	0.0459	0.0194	0.0006	0.0000	0.0013	0.0001	0.0375	0.0054

*****Assumes exposure is limited to only 25% of the year

[1]Diet of white-footed mouse consists of only 50% vegetation; therefore exposure doses presented above only represents 50% of diet.

[2]Diet of northern bobwhite consists of only 85% vegetation; therefore exposure doses presented above only represent 85% of diet.

[3]Diet of mallard consists of only 25% vegetation; therefore exposure doses presented above only represents 25% of diet.

[4]Diet assumes only two weeks of exposure per year (4%)

Table A-6. Calculated Exposure Doses and Hazard Quotients for Selected Receptors with Respect to the 6175 Backfill Upland Plant Exposure.

COPC	Measured 6150 Backfill Conc.	NOAEL Hazard Quotients for Receptors											
	Soil to Plant	White-footed Mouse		Desert Cottontail Rabbit		Mule Deer		Northern Bobwhite		Mallard		Livestock (cattle)	
		*Exposure Dose[1]	Hazard Quotient	*Exposure Dose	Hazard Quotient	*Exposure Dose	Hazard Quotient	*Exposure Dose[2]	Hazard Quotient	*Exposure Dose[3]	Hazard Quotient	Exposure Dose[4]	Hazard Quotient
Antimony	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0001	0.0000	0.0004
Arsenic	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Barium	0.0111	0.0000	0.0000	0.0001	0.0000	0.0016	0.0000	0.0000	0.0000	0.0000	0.0000	0.0033	0.0065
Boron	1.6000	0.0000	0.0000	0.0214	0.0076	0.2331	0.0832	0.0018	0.0018	0.0065	0.0065	0.4756	0.1699
Cadmium	0.0042	0.0000	0.0000	0.0001	0.0006	0.0006	0.0303	0.0000	0.0000	0.0000	0.0003	0.0012	0.0177
Copper	0.0040	0.0000	0.0000	0.0001	0.0000	0.0006	0.0002	0.0000	0.0000	0.0012	0.0003	0.0012	0.0008
Flouride	0.1170	0.0000	0.0000	0.0016	0.0005	0.0170	0.0054	0.0001	0.0000	0.0005	0.0001	0.0348	0.0111
Lead	0.0176	0.0000	0.0000	0.0002	0.0005	0.0026	0.0180	0.0000	0.0000	0.0001	0.0002	0.0052	0.0123
Manganese	0.0701	0.0000	0.0000	0.0009	0.0000	0.0102	0.0002	0.0001	0.0000	0.0003	0.0000	0.0208	0.0004
Selenium	0.0104	0.0000	0.0000	0.0001	0.0010	0.0015	0.0106	0.0000	0.0000	0.0000	0.0001	0.0031	0.0216
Thallium	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
Zinc	0.0294	0.0000	0.0000	0.0004	0.0000	0.0043	0.0018	0.0000	0.0000	0.0001	0.0000	0.0087	0.0012

***Assumes exposure is limited to only 10% of the year**

[1]Diet of white-footed mouse consists of only 50% vegetation; therefore exposure doses presented above only represents 50% of diet.

[2]Diet of northern bobwhite consists of only 85% vegetation; therefore exposure doses presented above only represent 85% of diet.

[3]Diet of mallard consists of only 25% vegetation; therefore exposure doses presented above only represents 25% of diet.

[4]Diet assumes only two weeks of exposure per year (4%)

Table A-7. Calculated Exposure Doses and Hazard Quotients for Selected Receptors with Respect to the Pit Lake Terrestrial Invertebrate Exposure.											
COPC	Measured Pit Lake Conc.	NOAEL Hazard Quotients for Receptors									
	Soil to Earthworm	Little Brown Bat		White-footed Mouse		Northern Bobwhite		Mallard		Rough-winged Swallow	
		Exposure Dose[1]	Hazard Quotient	Exposure Dose	Hazard Quotient	Exposure Dose[2]	Hazard Quotient	Exposure Dose[3]	Hazard Quotient	Exposure Dose	Hazard Quotient
Antimony	0.0037	0.0000	0.0000	0.0000	0.0000	0.0000	0.0012	0.0004	0.0747	0.0000	0.0000
Arsenic	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0000	0.0000
Barium	0.0019	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000
Boron	0.1440	0.0000	0.0000	0.0000	0.0000	0.0003	0.0003	0.0175	0.0175	0.0000	0.0000
Cadmium	0.0053	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006	0.0107	0.0000	0.0000
Copper	0.0072	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0009	0.0002	0.0000	0.0000
Flouride	0.2400	0.0000	0.0000	0.0000	0.0000	0.0005	0.0002	0.0292	0.0091	0.0000	0.0000
Lead	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Manganese	0.1024	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0125	0.0001	0.0000	0.0000
Selenium	0.0038	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005	0.0016	0.0000	0.0000
Thallium	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
Zinc	0.1761	0.0000	0.0000	0.0000	0.0000	0.0004	0.0000	0.0214	0.0017	1.3644	0.1949

[1]Diet of white-footed mouse consists of only 50% invertebrates; therefore exposure doses presented above only represents 50% of diet.

[2]Diet of northern bobwhite consists of only 15% invertebrates; therfore exposure doses presented above only represent 15% of diet.

[3]Diet of mallard consists of only 75% invertebrates; therefore exposure doses presented above only represents 75% of diet.

Table A-8. Calculated Exposure Doses and Hazard Quotients for Selected Receptors with Respect to the 6150 Backfill Terrestrial Invertebrate Exposure.											
COPC	Measured 6150 Backfill Conc.	NOAEL Hazard Quotients for Receptors									
	Soil to Earthworm	Little Brown Bat		White-footed Mouse		Northern Bobwhite		Mallard		Rough-winged Swallow	
		*Exposure Dose[1]	Hazard Quotient	*Exposure Dose	Hazard Quotient	*Exposure Dose[2]	Hazard Quotient	*Exposure Dose[3]	Hazard Quotient	*Exposure Dose	Hazard Quotient
Antimony	0.0024	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0001	0.0122	0.0000	0.0000
Arsenic	0.0042	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0000	0.0000
Barium	0.0029	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
Boron	0.3200	0.0000	0.0000	0.0000	0.0000	0.0002	0.0002	0.0097	0.0097	0.0000	0.0000
Cadmium	0.0012	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000
Copper	0.0721	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0022	0.0006	0.0000	0.0000
Flouride	0.1440	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0044	0.0014	0.0000	0.0000
Lead	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Manganese	0.0098	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0000	0.0000	0.0000
Selenium	0.0133	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0004	0.0014	0.0000	0.0000
Thallium	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Zinc	0.1921	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0058	0.0005	0.3721	0.0532

*****Assumes exposure is limited to only 25% of the year

[1]Diet of white-footed mouse consists of only 50% invertebrates; therefore exposure doses presented above only represents 50% of diet.

[2]Diet of northern bobwhite consists of only 15% invertebrates; therfore exposure doses presented above only represent 15% of diet.

[3]Diet of mallard consists of only 75% invertebrates; therefore exposure doses presented above only represents 75% of diet.

Table A-9. Calculated Exposure Doses and Hazard Quotients for Selected Receptors with Respect to the Pit Lake Mammal Exposure.

COPC	Measured Pit Lake Conc.	NOAEL Hazard Quotients for Receptors					
	Soil to Mammal	Coyote		Red-tailed Hawk		Common Barn Owl	
		Exposure Dose	Hazard Quotient	Exposure Dose	Hazard Quotient	Exposure Dose	Hazard Quotient
Antimony	0.0002	0.0001	0.0017	0.0000	0.0039	0.0000	0.0022
Arsenic	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Barium	0.0043	0.0019	0.0000	0.0004	0.0000	0.0003	0.0000
Boron	0.3240	0.1444	0.0516	0.0326	0.0326	0.0189	0.0189
Cadmium	0.0119	0.0053	0.0069	0.0012	0.0008	0.0007	0.0005
Copper	0.0027	0.0012	0.0002	0.0003	0.0001	0.0002	0.0000
Flouride	0.5400	0.2407	0.0767	0.0543	0.0170	0.0315	0.0098
Lead	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Manganese	0.2304	0.1027	0.0020	0.0232	0.0001	0.0134	0.0001
Selenium	0.0086	0.0039	0.0269	0.0009	0.0030	0.0005	0.0017
Thallium	0.0005	0.0002	0.0005	0.0001	0.0002	0.0000	0.0001
Zinc	0.2772	0.1236	0.0016	0.0279	0.0004	0.0161	0.0002

Table A-10. Calculated Exposure Doses and Hazard Quotients for Selected Receptors with Respect to the 6150 Backfill Mammal Exposure.

COPC	Measured 6150 Backfill Conc.	NOAEL Hazard Quotients for Receptors					
	Mammal	Coyote		Red-tailed Hawk		Common Barn Owl	
		*Exposure Dose	Hazard Quotient	*Exposure Dose	Hazard Quotient	*Exposure Dose	Hazard Quotient
Antimony	0.0002	0.0000	0.0004	0.0000	0.0010	0.0000	0.0006
Arsenic	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Barium	0.0065	0.0005	0.0000	0.0001	0.0000	0.0001	0.0000
Boron	0.7200	0.0361	0.0129	0.0081	0.0081	0.0047	0.0047
Cadmium	0.0028	0.0013	0.0017	0.0003	0.0002	0.0002	0.0001
Copper	0.0275	0.0003	0.0001	0.0001	0.0000	0.0000	0.0000
Flouride	0.3240	0.0602	0.0192	0.0136	0.0042	0.0079	0.0025
Lead	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Manganese	0.0220	0.0257	0.0005	0.0058	0.0000	0.0034	0.0000
Selenium	0.0299	0.0010	0.0067	0.0002	0.0007	0.0001	0.0004
Thallium	0.0007	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000
Zinc	0.3024	0.0309	0.0004	0.0070	0.0001	0.0040	0.0001

*Assumes exposure is limited to only 25% of the year

Table A-11. Calculated Exposure Doses and Hazard Quotients for Selected Receptors with Respect to the Pit Lake Water Exposure.

COPC	Measured Pit Lake Conc.	NOAEL Hazard Quotients for Receptors											
	Direct Water Ingestion	Little Brown Bat		White-footed Mouse		Desert Cottontail Rabbit		Coyote		Mule Deer		Red-tailed Hawk	
		Exposure Dose	Hazard Quotient	Exposure Dose	Hazard Quotient	Exposure Dose	Hazard Quotient	Exposure Dose	Hazard Quotient	Exposure Dose	Hazard Quotient	Exposure Dose	Hazard Quotient
Antimony	0.0250	0.0000	0.0004	0.0000	0.0001	0.0016	0.0278	0.0255	0.4316	0.1201	2.0356	0.0015	0.2469
Arsenic	0.0028	0.0000	0.0000	0.0000	0.0000	0.0002	0.0003	0.0039	0.0121	0.0183	0.0762	0.0002	0.0001
Barium	0.0120	0.0000	0.0000	0.0000	0.0000	0.0009	0.0000	0.0133	0.0003	0.0627	0.0012	0.0008	0.0000
Boron	1.3000	0.0010	0.0004	0.0001	0.0000	0.0643	0.0230	0.9965	0.3559	4.6996	1.6784	0.0580	0.0580
Cadmium	0.0510	0.0000	0.0000	0.0000	0.0000	0.0024	0.0262	0.0365	0.0475	0.1723	8.6160	0.0021	0.0014
Copper	0.0380	0.0000	0.0000	0.0000	0.0000	0.0010	0.0003	0.0155	0.0028	0.0731	0.0213	0.0009	0.0002
Flouride	1.7000	0.0017	0.0005	0.0002	0.0001	0.1071	0.0341	1.6609	0.5289	7.8327	2.4945	0.0966	0.0302
Lead	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0010	0.0070	0.0000	0.0000
Manganese	0.5900	0.0007	0.0000	0.0001	0.0000	0.0457	0.0009	0.7086	0.0138	3.3420	0.0649	0.0412	0.0002
Selenium	0.0370	0.0000	0.0002	0.0000	0.0000	0.0017	0.0120	0.0266	0.1858	0.1253	0.8764	0.0015	0.0053
Thallium	0.0016	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0017	0.0035	0.0078	0.0163	0.0001	0.0003
Zinc	0.8000	0.0006	0.0000	0.0001	0.0000	0.0393	0.0046	0.6090	0.0081	2.8720	1.2169	0.0354	0.0005

COPC	Northern Bobwhite		Mallard		Common Barn Owl		Rough-winged Swallow		Livestock (cattle)		Human	
	Exposure Dose	Hazard Quotient	Exposure Dose	Hazard Quotient	Exposure Dose	Hazard Quotient	Exposure Dose	Hazard Quotient	Exposure Dose*	Hazard Quotient	Exposure Dose*	Hazard Quotient
Antimony	0.0005	0.0765	0.0015	0.2490	0.0004	0.0625	0.0001	0.0134	0.0396	0.6720	0.0013	3.1512
Arsenic	0.0001	0.0000	0.0002	0.0004	0.0001	0.0000	0.0000	0.0000	0.0060	0.0086	0.0002	0.0384
Barium	0.0002	0.0000	0.0008	0.0000	0.0002	0.0000	0.0000	0.0000	0.0207	0.0406	0.0007	0.0033
Boron	0.0180	0.0180	0.0585	0.0585	0.0147	0.0147	0.0032	0.0032	1.5514	0.5541	0.0493	0.2466
Cadmium	0.0007	0.0004	0.0021	0.0357	0.0005	0.0004	0.0001	0.0001	0.0569	0.8127	0.0018	3.6171
Copper	0.0003	0.0001	0.0009	0.0002	0.0002	0.0001	0.0000	0.0000	0.0241	0.0171	0.0008	0.0767
Flouride	0.0299	0.0094	0.0974	0.0305	0.0245	0.0076	0.0053	0.0016	2.5857	0.8235	0.0822	1.6441
Lead	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0008	0.0000	104.1273
Manganese	0.0128	0.0001	0.0416	0.0002	0.0104	0.0001	0.0022	0.0000	1.1032	0.0214	0.0351	116.9148
Selenium	0.0005	0.0017	0.0016	0.0054	0.0004	0.0013	0.0001	0.0003	0.0414	0.2893	0.0013	0.2631
Thallium	0.0000	0.0001	0.0001	0.0003	0.0000	0.0001	0.0000	0.0000	0.0026	0.0054	0.0001	1.0276
Zinc	0.0110	0.0002	0.0357	0.0029	0.0090	0.0001	24.7182	3.5312	0.9481	0.1354	0.0301	0.1005

*Water ingestion assumes only two weeks of exposure per year (4%)