

Environments (IMPROVE) Site in Great Basin National Park located in White Pine County, Nevada.

The Fallon station is approximately 70 miles southwest of the Project Area; the Fernley station is approximately 75 miles southwest of the Project Area. These are State and Local Air Monitoring Sites for continuous monitoring of the pollutants. The latest NDEP Trend Report stated there were no exceedances reported for the PM₁₀ and O₃ standards for the Fallon station, and no exceedances reported for the PM₁₀, PM_{2.5}, and O₃ standards for the Fernley station. between 2000 and 2010 (NDEP 2013a).

3.1.3.1 Background Concentrations

The BAPC recommends using appropriate background concentrations as a suitable background value to approximate pre-existing pollutant concentrations. For unmonitored rural areas, such as the Project Area, the BAPC recommends background values of 10.2µg/m³ for the PM₁₀ 24-hour averaging period, 8.0µg/m³ for the PM_{2.5} 24-hour averaging period, 2.3µg/m³ for the PM_{2.5} annual averaging period, and zero for all other criteria pollutants. The BAPC considers these values appropriate for remote mining facilities. The BAPC’s practice for particulate analyses is to use measured concentrations from the IMPROVE monitoring stations as representative background concentration for rural Nevada mine sites (Enviroscientists 2015c).

3.1.3.2 Existing Project Emissions

All of the areas within the Project Area are currently active. The existing Project contains sources of air pollutants such as the existing ADR facility, crushing system, generators, and on-site off-road equipment for exploration and mining operations and reclamation activities.

Air emission estimates were calculated based on the maximum operations for each applicable time period, using EPA approved AP-42 emission factors (EPA 2009a) for the existing Project and information provided by Gold Acquisition Corp. Table 3.1-3 shows the emissions, in tons per year (tpy), for the existing Relief Canyon Mine. Table 3.1-4 shows the hazardous air pollutants for the existing Relief Canyon Mine. Table 3.1-5 shows the GHG emissions for the existing Relief Canyon Mine.

Table 3.1-3: Existing Relief Canyon Mine Emissions Summary

Source Category	PM	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC
Point Sources Emissions	110.46	42.07	8.63	100.14	0.48	35.52	2.63
Fugitive Sources Emissions	0.065	0.060	0.060	1.30	0.021	9.84	0.61
Project Total (tons/year)	110.53	42.13	8.69	101.44	0.50	45.36	3.23

Source: Enviroscientists 2015

Table 3.1-4: Existing Relief Canyon Mine Hazardous Air Pollutants

Hazardous Air Pollutants	Facility Total (tpy)
Benzene	0.039
Toluene	0.015
Xylenes	0.010
Formaldehyde	0.013
Acetaldehyde	0.0077
Acrolein	0.0011
Naphthalene	0.0060
Mercury	0.015
Total	0.11

Source: Enviroscientists 2015

Table 3.1-5: Existing Relief Canyon Mine Greenhouse Gas Emissions

Pollutants	Metric Tons
CO ₂ e	11,214

Source: Enviroscientists 2015

3.2 Cultural Resources

3.2.1 Regulatory Framework

Title 54 United States Code (U.S.C.) § 300101, et seq., commonly known as the National Historic Preservation Act of 1966 as amended (NHPA), and the Archaeological Resources Protection Act (ARPA) of 1979, as amended, are the primary laws regulating cultural resource preservation.

Title 54 U.S.C. § 306108, commonly known as Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on Historic Properties and affords the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. Project-related actions may adversely affect any site, structure, or object that is, or can be, included in the National Register for Historic Places (NRHP).

3.2.2 Assessment Area

The assessment area for cultural resources is the Project Area.

3.2.3 Existing Environment

Approximately 2,753 acres within the Project Area were surveyed to Class III standards. Approximately 221 acres of existing facilities within the Project Area were excluded from the cultural survey. BLM Reports CRR2-3259 (ASM 2014) and CRR2-3275 (ASM 2015) present the results of the cultural inventory. Nineteen newly identified archaeological sites and 39 isolated cultural resources were recorded in the Project Area. Identified site types include prehistoric flaked stone scatters, a lithic quarry site, a wild horse trap, a mineral claim, a prospect, mining sites, a mill site with an ethnohistoric component, historic refuse scatters, a utility line, and a historic road segment. Of the 19 archaeological sites in the Project Area, 18 are recommended as not eligible for listing in the NRHP. One site, 26PE4152/CrNV-63-12637, is recommended as not eligible for inclusion in the NRHP under Criteria A, B, and C, and unevaluated for NRHP listing under

Criterion D, pending subsurface testing and further archival research. Site 26PE4152/CrNV-63-12637 would be managed as though it is eligible. Based on the State Protocol Agreement between the Bureau of Land Management and the Nevada State Historic Preservation Office as amended through December 2014 (Protocol), isolates are categorically excluded from inclusion on the NRHP (BLM and State Historic Preservation Office [SHPO] 2014).

3.3 Invasive, Non-Native Species

3.3.1 Regulatory Framework

The Federal Noxious Weed Act of 1974 provides for control and management of non-indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health. The act prohibits importing or moving any noxious weeds identified by regulation, and allows for inspection and quarantines to prevent the spread of noxious weeds.

Executive Order (EO) 13112, Invasive Species, directs federal agencies to prevent the introduction of invasive species, to provide for their control, and to minimize the economic, ecological, and human health impacts caused by invasive species. The policy set forth in BLM Manual 9015 - Integrated Weed Management requires all ground disturbing projects and any projects that alter plant communities be assessed to determine the risks of introducing and spreading noxious weeds (BLM 1992).

The Nevada Department of Agriculture (NDA) has responsibility for jurisdiction, management, and enforcement of the State of Nevada's noxious weed law. The legal definition of a noxious weed is "any species of plant which is, or is likely to be, detrimental or destructive and difficult to control or eradicate" (NRS 555.005). The plants on Nevada's noxious weeds list are mandated to be controlled on both private and public land. The NDA also maintains and updates the list of Nevada noxious weeds under the NAC 555.010. The Nevada noxious weeds listed on NAC 555.010 are further divided into the following categories of species: "A," "B," and "C."

3.3.2 Assessment Area

The assessment area for invasive, non-native species is the Project Area.

3.3.3 Existing Environment

A noxious weed inventory of the Project Area was conducted on June 7 through 14 and June 26 through 29, 2014. Four noxious weed species listed on the 2012 Nevada Noxious Weed List were observed within the Project Area: 1) hoary cress (*Cardaria draba*); 2) perennial pepperweed (*Lepidium latifolium*); 3) Russian knapweed (*Acroptilon repens*); and 4) saltcedar (*Tamarix ramosissima*) (Enviroscientists 2015a). The majority of the noxious weed occurrences were documented within the western portion of the Project Area in areas exhibiting signs of disturbance. These observations are shown on Figure 3.3.1. All of the weeds are Category C, with the exception of Russian knapweed which is Category B. The state requires Category B weeds to be controlled in areas where populations are not well established or previously unknown to occur and eradication of Category C weeds from nursery stock dealer premises. Site abatement of Category C weeds is conducted at the discretion of the state quarantine officer (NAC 555.010).

There were two noxious weed occurrences within the area affected by the Proposed Action – saltcedar and perennial pepperweed (Enviroscientists 2015a). The saltcedar occurrence was located in the area of the proposed pit expansion and the perennial pepperweed occurrence was located adjacent to proposed exploration disturbance (Figure 3.3.1).

Other invasive and non-native plant species observed within the Project Area that are not classified as noxious weeds in the State of Nevada included: annual rabbitsfoot grass (*Polypogon monspeliensis*); annual wheatgrass (*Eremopyrum triticeum*); burningbush (*Bassia scoparia*); cheatgrass (*Bromus tectorum*); clasping pepperweed (*Lepidium perfoliatum*); crossflower (*Chorispora tenella*); curvseed butterwort (*Ceratocephala testiculata*); herb sophia (*Descurainia sophia*); meadow barley (*Hordeum brachyantherum*); pale madwort (*Alyssum alyssoides*); prickly lettuce (*Letuca serriola*); prickly Russian thistle (*Salsola tragus*); red brome (*Bromus rubens*); redstem stork's bill (*Erodium cicutarium*); saltlover (*Halogeton glomeratus*); tall tumbled mustard (*Sisymbrium altissimum*); and yellow salsify (*Tragopogon dubius*) (Enviroscientists 2015a).

3.4 Migratory Birds

3.4.1 Regulatory Framework

The Migratory Bird Treaty Act (MBTA) implements international treaties that provide for migratory bird protection. The act authorizes the Secretary of the Interior to regulate the taking of migratory birds. The act also provides that it shall be unlawful, except as permitted by regulations, “to pursue, take, or kill any migratory birds, or any part, nest or egg of any such bird”, however, does not regulate their habitat. The list of species protected by the MBTA was revised in March 2010 and includes 1,007 species native to the United States.

EO 13186 directs federal agencies taking actions that are likely to have a measureable effect on migratory bird populations to develop and implement a Memorandum of Understanding (MOU) with the United States Fish and Wildlife Service (USFWS) that promotes the conservation of migratory bird populations.

The USFWS and the BLM signed, January 17, 2010, a MOU pursuant to EO 13186 to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and avoid or minimize adverse impacts on migratory birds through enhanced collaboration between the USFWS and the BLM, in coordination with state, tribal, and local governments. This MOU identifies specific activities where cooperation between agencies would contribute to the conservation of migratory birds.

3.4.2 Assessment Area

The assessment area for migratory birds is the Project Area. The assessment area for raptors included a one-mile buffer around the Project Area. The assessment area for nesting eagles included a ten-mile buffer around the Project Area.

3.4.3 Existing Environment

The NDOW provided a list from their database on March 23, 2015, of the various species of raptors (that use diverse habitat types), which may reside in the vicinity of the Project Area. There are 47 known raptor nest sites within ten miles of the Project Area (Enviroscientists 2015a).

On May 13, 2014, and June 10, 2014, aerial golden eagle and raptor surveys were conducted within and surrounding the Project Area (Wildlife Resource Consultants [WRC] 2014). The golden eagle and raptor survey had two primary objectives: 1) to identify suitable nesting habitat and nests for golden eagles and raptors within and near the Project Area; and 2) to determine raptor and golden eagle nest occupancy status and territory (or breeding area) distribution. A total of 50 golden eagle nest structures were identified at 37 nest sites within the ten-mile buffer surrounding the Project Area. Five of the 37 golden eagle nest sites were identified as occupied (i.e., either occupied and inactive or occupied and active), while two nest sites were classified as active (by definition, an active nest is an occupied nest). A minimum of 16 golden eagle breeding areas were delineated within the ten-mile buffer surrounding the Project Area. There were no golden eagle nests within the area of the Proposed Action (Enviroscientists 2015a). Three potential raptor nests were identified within or near the one-mile buffer surrounding the Project Area. Of these three raptor nests, the first raptor nest was identified as an inactive nest of an unidentified species, while a second nest was identified as an active red-tailed hawk nest. The third raptor nest was not surveyed in 2014; however, in 2013, the third raptor nest was identified as an active kestrel (*Falco* sp.) nest (WRC 2014). There were no raptor nests within the area of the Proposed Action.

Migratory bird clearance surveys were conducted on May 5 and May 27, 2014, in portions of the Project Area where exploration activities were occurring. Bird species observed within the Project Area during the surveys included the following: black-throated sparrow (*Amphispiza bilineata*), ash-throated flycatcher (*Myiarchus cinerascens*), common raven (*Corvus corax*) and American kestrel. There were no active nests within the area of the Proposed Action at the time of the surveys (Enviroscientists 2014).

3.5 Native American Religious Concerns

3.5.1 Regulatory Framework

Several federal laws require the BLM and other federal agencies to consult with affected tribes, tribal organizations and/or individuals with opportunities to participate in consultation and to advise on proposed projects that may have an effect on cultural sites, resources and traditional activities. These include the NHPA and ARPA noted above, as well as the American Indian Religious Freedom Act (AIRFA) (P.L. 95-341), the NAGPRA of 1990 (P.L. 101-601), and EO 13007 (1996, Indian Sacred Sites) and 13175 (2000, Consultation and Coordination with Indian Tribal Governments). These laws direct the BLM to make best efforts to identify sites, resources and activities of religious, traditional and/or cultural importance, and subsequently attempt to limit or even eliminate negative effects on those resources. The BLM also employs the BLM Manual Section 8120, Tribal Consultation Under Cultural Resource Authorities and guidance from National Register Bulletin 38, Guidelines for Evaluating and Documenting Traditional Cultural Properties (TCPs), in its consultation process.

As defined in National Register Bulletin 38, a traditional cultural property (TCP) “can be defined generally as one that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community’s history, and (b) are important in maintaining the continuing cultural identity of the community” (Parker and King 1998). Further, a TCP can be:

- A location associated with the traditional beliefs of a Native American group about its origins, its cultural history, or the nature of the world;

- A location where Native American religious practitioners have historically gone, and are known or thought to go today, to perform ceremonial activities in accordance with traditional cultural rules of practice; and
- A location where a community has traditionally carried out economic, artistic or other cultural practices important in maintaining its historical identity.

3.5.2 Assessment Area

The assessment area for Native American Religious Concerns is the Project Area.

3.5.3 Existing Environment

Letters requesting consultation on the Proposed Action were sent to several tribes. The Battle Mountain Band, Fallon Paiute Shoshone Tribe, and the Pyramid Lake Paiute Tribe received their letters on August 17, 2015; Lovelock Paiute Tribe received their letter on August 24, 2015; and the Winnemucca Indian Colony received their letter on September 24, 2015. No issues have been identified; however, consultation is ongoing.

3.6 Wastes – Hazardous or Solid

3.6.1 Regulatory Framework

Federal hazardous material and waste laws and regulations are applicable to hazardous substances used, stored, or generated by the Proposed Action. Applicable federal laws include the following: Hazardous and Solid Waste Amendments, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Toxic Substances Control Act, Superfund Amendments and Reauthorizations Act, RCRA, and the Safe Explosives Act. Pursuant to regulations promulgated under Section 102 of CERCLA, as amended, release of a reportable quantity of a hazardous substance to the environment in a 24-hour period must be reported to the National Response Center (40 CFR Part 302). A release of a reportable quantity on public land must also be reported to the BLM and BMRR. In 1999, the metal mining industry began submitting reports on the release of chemicals to the EPA and appropriate state agencies, under Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986; commonly referred to as the Toxics Release Inventory Program.

Nevada hazardous material and waste laws and regulations are applicable to hazardous substances used, stored, and generated by the Project. NAC 445A.240 requires immediate reporting of a release to the NDEP of a reportable quantity of a hazardous substance, listed in Table 302.4 in 40 Part CFR Part 302.

3.6.2 Assessment Area

The assessment area for wastes, hazardous or solid, is the Project Area.

3.6.3 Existing Environment

Materials (primarily petroleum products) currently being used or generated at the Relief Canyon Mine and the on-site amount of these materials are shown in Table 3.6-1.

Table 3.6-1: Existing Relief Canyon Petroleum Products

Product	Gallons
Diesel	1,000
Dyed Diesel	12,000
Gasoline	100
Used Oil	500
Propane	4,500

Used lubricants and solvents are characterized according to the RCRA requirements and are stored appropriately. An Emergency Response Plan to establish measures (WPCP: Appendix F Spill Response Best Management Practices) (Knight Piésold 2016) designed to prevent oil and oil-related products from spilling and affecting the environment on-site or off-site of the mine is maintained on site. Spills that meet or exceed the reportable spill criteria in the Emergency Response Plan would be reported to the required state and federal regulatory agencies.

Monthly inventories of hazardous materials are maintained at the mine and reported annually. Hazardous waste is stored according to state, federal, and local regulations on a covered and sealed concrete pad with secondary containment berms near the truck shop until removal and disposal at an authorized facility. Used oil and coolant are also stored in secondary containment. The materials are either recycled or disposed of in accordance with state, federal, and local regulations. Used coolant and oil would not be mixed. Used containers are disposed of or recycled according to federal, state, and local regulations.

A Class III-waivered landfill #F444 issued by the NDEP Bureau of Waste Management (BWM), which is also authorized by the BLM in NVN-064634 is located on site. The existing mine site landfill is located near the plant on public land in the S½SW¼ Section 18, T27N, R34E. The landfill is operated in compliance with NAC 444.731 through 444.747 for the on-site collection and disposal of Project-generated authorized non-hazardous inert solid waste. A new Class III-waivered landfill, to be authorized by BWM, would be integrated into Waste Rock Storage Area 5.

3.7 Water Resources

3.7.1 Regulatory Framework

The administration, preservation, and appropriation of water resources in Nevada include both state and federal regulations. The NDEP has primacy for administration of the Clean Water Act (CWA). The NDEP defines waters of the State of Nevada as water courses, waterways, drainage systems, and ground water. When a proposed project has the potential to directly or indirectly affect water, the State of Nevada is authorized to implement its own permit programs under the provisions of state law or the federal CWA. The NDEP requires compliance with National Pollution Discharge Elimination System permits related to discharge of wastewater to surface waters from discharge points.

The Nevada Water Pollution Control Law gives the State Environmental Commission authority to require controls on diffuse sources of pollutants, if these sources have the potential to degrade the quality of waters of the state. This same law also provides the state with authority to maintain water quality for public use, agriculture, existing industries, wildlife, and economic development. Nevada has been granted authority by EPA to enforce drinking water standards established under the CWA.

The administration and adjudication of water rights within the state is the responsibility of the NDWR, State Engineer's Office. Water appropriations are also obtained through the Nevada State Engineer.

3.7.2 Assessment Area

The assessment area is a combination of the USGS HUC 5 Packard Wash watershed and the Coeur Rochester ground water model boundary.

3.7.3 Existing Environment

A hydrogeological study and an evaluation of post-mining ground water level recovery and ground water baseline conditions at the Project (SWS 2015) were conducted. This hydrogeological study evaluated baseline ground water levels and projected ground water recovery beneath the North and South Pits after three years of mining (presumed to start in 2017 and end in 2019, depending on permit acquisition and other factors). This report was submitted to and accepted by the BLM. The report was also submitted to the NDEP BMRR as Appendix D of Gold Acquisition Corp.'s 2015 Plan Modification.

Hydrologic data were collected from the Relief Canyon site from 2012 to 2015, from Coeur Rochester Mining wells in Packard Valley from 2011 to 2013, and from the Buena Vista Mine from 2013 and 2014. The following tasks were performed to develop the hydrology baseline report (SWS 2015):

- Collected ground water levels from a network of 21 piezometers, two production wells, and seven monitoring wells on site; nine piezometers and wells owned by Coeur Rochester Mine in Packard Valley; and six wells owned by the Buena Vista Mine.
- Developed ground water elevation contour maps based on water elevation data obtained from the Relief Canyon piezometer and well network in 2012, 2013, and 2014;
- Designed and implemented an aquifer pumping test of the Relief Canyon water production wells, PW-1 and PW-2, to evaluate the hydrologic response to pumping these wells for 28 days followed by a 16-month aquifer recovery period;
- Assessed the regional and local ground water levels from 1984 through 2015;
- Performed a water budget and water balance model analysis;
- Estimated ground water levels beneath the North and South Pits at the end of three years of mining as well as subsequent post-mining water level recovery using two methodologies: graphical methods, and a water balance model; and
- Compiled and evaluated ground water, ephemeral pit lake, and spring chemistry.

3.7.3.1 Ground Water

Three hydrogeologic units control ground water flow within the Project Area: 1) an alluvial ground water system in the Quaternary alluvium within Packard Wash; 2) a fractured bedrock ground water system in the Grass Valley Formation; and 3) a fractured bedrock ground water system in the Cane Springs Formation. The Quaternary alluvium consists of interlayered silt, sand, clay, and gravel with moderate hydraulic conductivity. Ground water flow in the alluvial aquifer generally follows topography, and flows from east to west toward the center of the Packard Valley and then flows south to the Carson Sink. The Grass Valley Formation is composed predominantly of low permeability argillite, siltstone, and sandstone. The Cane Springs Formation is composed primarily of high permeability limestone, but contains siltstone and mafic flows including diabase. Ground water within the bedrock aquifers also generally flows from east to west until it encounters the South Humboldt Thrust Fault and possibly the range front fault zone that appear to act as barriers that cause ground water to flow toward the south. Hydraulic conductivity within the Grass Valley Formation is generally low with limited connectivity to the alluvial and Cane Springs aquifers. Hydraulic conductivity of the Cane Springs Formation is relatively high although the aquifer is thought to be compartmentalized by numerous faults, fractures, and karst features.

The elevation of the water table in the Cane Springs Formation aquifer in the mine area fluctuates in response to pumping and to precipitation levels, with higher elevations measured following periods of above average precipitation. For example, the water level elevation in production well PW-2 was 5,143 feet amsl in 1984. This ground water elevation may have been influenced by the very high precipitation levels in 1983, which may have produced an anomalously high recharge rate. The water levels in PW-1 and PW-2 declined due to production pumping at rates up to 178 gpm from 1984 through 1993. The water level in PW-1 was measured in 1991 at an elevation of 5,063 feet amsl.

The water levels then recovered in both wells to elevations of 5,120 to 5,121 feet amsl in October 2005 after 12 years of no production pumping. The 5,120 feet amsl recovery level appears to represent the ground water elevation following an average period of precipitation in 2004 and the first half of 2005 and little or no pumping of the wells. This recovered water level elevation may also be influenced by evaporative losses from the open pits, which have bottom elevations of 5,120 to 5,122 feet amsl, and are fractured due to blasting by previous mining.

Production pumping in wells PW-1 and PW-2 has occurred from 2007 to 2015 at rates of 12 to 14 gpm. Ground water levels in PW-1 and PW-2 and the on-site piezometers completed in the Cane Springs Formation aquifer declined from nine to 22 feet between 2012 and 2014.

Comparison of the on-site water levels to water levels measured at Coeur Rochester, at the northern end of Packard Valley, and the Buena Vista Mine at the southern end were made to determine the reason for the ground water decline. The Coeur Rochester piezometer, NP11-Test, completed in the older Weaver Formation adjacent to the range front fault 3.5 miles north of Relief Canyon, also experienced a decline of 11.9 feet from 2012 to 2014, which was attributed to production pumping at Coeur. Other Coeur Rochester bedrock wells in Packard Valley and bedrock wells at the Buena Vista Mine south of Packard Valley only declined at rates of zero to 0.1 feet/month as compared to Cane Springs Formation wells and piezometers at Relief Canyon, which declined at an average rate of 0.7 feet/month. This indicates the decreased precipitation and recharge from 2011 to 2014 only slightly affected regional ground water levels and that Relief Canyon production

well pumping and evaporative losses from the open pits are the main reason for the faster rates of decline in the Cane Springs Formation wells and piezometers at the mine.

Ground water levels measured in the Grass Valley Formation near the Relief Canyon Mine declined between zero and 16 feet from 2012 to 2014 depending on proximity to the range front fault with piezometers adjacent to the fault declining up to 16 feet. The rate of decline in the piezometers near the range front fault zone is similar to the Cane Springs Limestone wells at rates of 0.7 feet/month. The observed decline in the ground water levels observed in the Grass Valley Formation piezometers near the range front fault zone is likely due to continued production pumping, evaporative losses from the blasting-related fractures in the bottom of the open pits, with a minor component from reduced local recharge rates.

Ground water levels measured in monitoring wells completed in Quaternary alluvium near the Relief Canyon Mine heap leach pads were unchanged between 2009 and 2015 but one alluvial piezometer upgradient of the heap leach pads declined at a rate of 0.1 feet/month from 2013 to 2015. Ground water levels measured in Coeur Rochester alluvial monitoring wells in Packard Valley and Buena Vista Mine alluvial wells between 2012 and 2014 declined at rates up to 0.4 feet/month with most wells declining at rates of 0.1 feet/month. The lack of water decline in the Packard Valley alluvial aquifer near the heap leach pads is believed to be due to limited direct precipitation recharge of the alluvium due to the low elevations and because of differing hydrogeologic conditions. The alluvial aquifer is believed to be recharged primarily by ground water flow from the surrounding mountain range and spring discharge, with a minor component of the total recharge occurring during intense storm events, as infiltration directly into the alluvium. The ground water flow across the range front fault from the bedrock to the alluvial aquifers is very slow due to the low permeability of the fault zone. Therefore, the reduced local recharge due to drought conditions during the past four years in the mountain range has not yet affected ground water levels in the alluvium in the area of the Relief Canyon Mine but has affected alluvial wells elsewhere in Packard Valley with a rate of decline of generally 0.1 feet/month.

3.7.3.1.1 Pumping Test

A 28-day pumping test of PW-1 and PW-2 in February 2014 at pumping rates up to 600 gpm produced significant and extensive drawdown of up to 20 feet in the Cane Springs Formation rocks underlying the pit area. However, drawdown was not observed in the alluvial aquifer or in the Grass Valley Formation during the 28-day pumping test with the exception of Grass Valley Formation piezometers along the range front fault zone. The observed drawdown in the wells and piezometers completed in the Cane Springs Formation indicate that pumping production wells PW-1 and PW-2, which are completed within the fractured and compartmentalized carbonate system, would control the elevation of the future water table under the North, South, and Lightbulb Pits during mining and pumping activities.

The observed drawdown and limited rate of water level recovery observed in the 28-day recovery period and the subsequent 16 months through July 2015 suggest that production pumping continues to affect water levels in the Cane Springs Formation. By July 2015, ground water elevations within the Cane Springs Formation had recovered to within 12 to 30 feet of the February 2014 pre-pumping test levels during a period of continued pumping. Water balance modeling indicates recharge during normal precipitation and inflow along the range front fault from the north is 57 gpm to the Cane Springs Formation in the area of the Relief Canyon pits. The continued

pumping of PW-1 and PW-2 at 12 to 14 gpm thus represents 21 to 26 percent of the normal recharge rate.

3.7.3.2 Ground Water Quality

3.7.3.2.1 Alluvial Ground Water Quality

Alluvial ground water quality data from the monitoring wells surrounding the heap leach pads are summarized in quarterly and annual reports submitted to BLM and NDEP. Water quality data were collected in 2005 from the Windmill well, which is located near the intersection of Coal Canyon Road and Packard Valley Road (2015 Plan Modification, Appendix D).

Ground water, in Relief Canyon monitoring wells MW-08-1, MW-08-2, and MW-08-3, is a calcium chloride type. These three wells are installed into the alluvial aquifer on the east side of Packard Valley. The Windmill well, installed into the alluvial aquifer on the west side of Packard Valley, is a sodium chloride type. The observed differences in water type are most likely due to different source rocks. The ground water in the Relief Canyon monitoring wells is derived in part from limestone source rocks east of the mine. The source rocks for the alluvial ground water on the west side of the valley in the Windmill well may contain evaporate minerals such as halite (NaCl) from a past playa or are volcanic source rocks along the north and west sides of the valley. It appears that chloride and Total Dissolved Solids (TDS) increase toward the center of the valley. Water quality generally met the Nevada Reference Values (NRVs) with occasional exceedances for arsenic (concentrations up to 0.039 mg/L) in some Relief Canyon monitoring wells and the Windmill well and an exceedance for TDS in the Windmill well. The TDS concentrations ranged from 350 to 660 milligrams per liter (mg/L) in the Relief Canyon monitoring wells and were 1,100 mg/L in the Windmill well. The pH of the alluvial ground water was neutral in all wells.

3.7.3.2.2 Bedrock Ground Water Quality

Ground water quality information has been obtained from ongoing sampling of PW-1 and PW-2 since 1984 and 1988, respectively, sampling of the North and Lightbulb Pit piezometers when they were installed, and sampling of the Grass Valley Formation monitoring well, MW-13-01 (SWS 2015). Water quality samples were not taken when the South Pit piezometer was installed because the piezometer is in close proximity to the production wells.

Ground water quality in PW-1, PW-2, Lightbulb Pit, and North Pit are mixed sodium bicarbonate and calcium sulfate type. The Grass Valley Formation ground water is a calcium chloride type. The Grass Valley Formation water type is the same as sampled in the alluvial monitoring well MW-08-1.

TDS concentrations ranged from 480 to 680 mg/L in the production wells, from 710 to 820 mg/L in the samples from the Lightbulb and North Pit piezometers, and was 830 mg/L in the Grass Valley Formation (MW-13-01). The pH of the bedrock ground water is neutral.

Water quality in PW-1 and PW-2 was good with several exceedances above the NRV for arsenic in each well, with concentrations up to 0.024 mg/L, and several exceedances for iron that were likely the result of water with suspended solids due to insufficient purging before sampling. Ground water quality in the pit piezometers was also good, although arsenic and manganese concentrations slightly exceeded the NRV in the Lightbulb Pit. Water quality in the Grass Valley

Formation in MW-13-01 had the highest TDS and exceeded the NRV for aluminum and manganese.

3.7.3.2.3 Spring Water Quality

Springs located in the general area include Antelope Spring, Black Knob Spring, and Willow Creek Spring. Spring samples were collected in December 2012 and the following flow rates measured:

- Antelope Spring 0.25 gpm
- Black Knob Spring 25 gpm
- Willow Creek Spring Not measured

Antelope Spring was a sodium chloride type, and Black Knob Spring and Willow Creek Spring are calcium chloride and calcium bicarbonate types.

Water quality generally met the NRV in Black Knob Spring and Willow Creek Spring with TDS concentrations ranging from 240 to 400 mg/L. However, the TDS concentration in Antelope Spring was 1,800 mg/L, greater than the NRV of 1,000 mg/L. Arsenic concentrations exceeded the NRV in Willow Creek Spring and the chloride concentration exceeded the NRV in Antelope Spring.

3.7.3.3 Pit Lakes

3.7.3.3.1 Ephemeral Pit Lakes

Review of BLM and NDEP files revealed no record of pit lake formation prior to 1998 (Dyer Engineers 2005). In 1998, visual inspection of the North and South Pits indicated a pit lake with a reported depth of approximately 20 feet or an elevation of 5,141 feet amsl. This corresponds with a period of 16 inches of annual rainfall or more than 270 percent of normal rainfall indicating the pit lakes were formed from a combination of surface water runoff and ground water levels at or above the base of the pits. The pit lakes were reportedly present through 1999 but were declining in depth and dried up in 1999. Pit lakes were observed again from May 2000 to May 2001 with a depth of eight feet (elevation 5,129 to 5,130 feet amsl) and were gone by November 2001. No pit lakes were observed from November 2001 until June 2005. Pit lakes were present from June 2005 through June 2006 as verified by topographic mapping in June 2006 that indicated ponded water in both the North and South Pits with elevations of 5,129.9 feet amsl in the North Pit and 5,130.6 feet amsl in the South Pit. This indicates approximately seven to eight feet of water within the pits. The source of the pit lake water is likely from a combination of spring snowmelt accumulating as surface water in the pits and a ground water elevation near the bottom of the pits.

3.7.3.3.2 Ephemeral Pit Lake Water Quality

Pit lake water was sampled in 2000 and 2006 in the North and South Pits (SWS 2015). Pit lake elevations in 2000 and 2006 were approximately 5,130 feet amsl indicating approximately seven to eight feet of water in the pit lakes.

Pit lake water quality was different in the North and South Pit lakes although both have calcium sulfate type water and neutral pH values from 7.9 to 8.1. The North Pit piezometer also had a calcium sulfate type indicating ground water beneath the North Pit had the same water type.

TDS values in the North Pit lake ranged from 1,900 to 2,100 mg/L with sulfate concentrations of 1,100 mg/L, arsenic concentrations of 0.014 to 0.044 mg/L, and antimony concentrations of 0.004 to 0.008 mg/L. Only arsenic concentrations in the South Pit Lake exceeded the NRV.

The TDS, sulfate, and arsenic concentrations exceeded the NRV in both 2000 and 2006 while in 2000 the antimony concentration only exceeded the NRV. The increased TDS and sulfate concentrations are partly a result of evapoconcentration within the pit lake as ground water in the North Pit piezometer had TDS and sulfate concentrations of 710 and 230 mg/L, respectively (SWS 2015).

The South Pit Lake had much lower TDS concentrations (770 to 1,000 mg/L), and much lower sulfate concentrations (330 to 440 mg/L) than the North Pit Lake, but the arsenic concentrations (0.053 to 0.064 mg/L) were higher than the North Pit Lake (SWS 2015).

The geology in and around the North Pit is more variable than the South Pit and more gabbro is exposed in the pit wall rocks in the North Pit. Both pit areas have abundant neutralizing potential as shown by the neutral pH. but the South Pit lacks thick sections of clay-matrix and limestone breccias, jasperoids, and variably silicified breccia alteration types. Also the deformed limestone unit below the massive limestone crops out only in the North Pit. These differences in geologic units beneath the two pits appear to be the reason for the differences in water chemistry between the two pit lakes (SWS 2015).

Other Resources

3.8 Geology and Minerals

3.8.1 Regulatory Framework

On lands open to location under the General Mining Law of 1872, as amended, the BLM administers the surface acres of public land and federal subsurface mineral estate under the Mining Law and the FLPMA. The BLM has been charged by the U.S. Congress with the management of activities on public lands under the General Mining Law. The BLM implements this management through the 43 CFR 3809 surface management regulations.

3.8.2 Assessment Area

The Assessment Area is the Project Area.

3.8.3 Existing Environment

The Relief Canyon mine area is located along the eastern side of Packard Flat, a topographic low approximately two miles in width and five miles in length. This valley lies between the southern portion of the Humboldt Range and the middle to northern portion of the West Humboldt Range. Packard Flat is believed to be bounded on the eastern and western margins by Basin and Range style fault zones. Figure 3.8.1 shows the Project Area geology.

3.8.3.1 Stratigraphy

The Project Area is underlain by Quaternary alluvium and colluvium west of the open pits. Alluvial fans underlie the heap leach pads and ponds west of the open pits and consist of unconsolidated material derived from outwash deposits from the adjacent ranges. The alluvium is composed of lenticular, interbedded units of sand, silty sand, gravelly sand, gravel, sandy gravel, silty gravel, clayey gravel, gravelly silt, clayey silt, and silty clay. Alluvial thickness in monitoring wells in the area of the HLPs exceeds 180 feet.

The primary rocks exposed in the mine area include the Grass Valley Formation and the Cane Springs Formation. The contact between the Grass Valley formation and underlying limestone units is a thrust fault, locally called the South Humboldt Thrust.

The Grass Valley Formation crops out in the southeast part of the Relief Canyon mine area. The Formation is in fault contact with massive limestone as well as the thin-bedded unit. This fault is informally known as the South Humboldt Thrust. The Grass Valley Formation consists mostly of olive-gray, noncalcareous, thinly bedded argillite, siltite, and quartzite. This formation is poorly exposed in the north. Thickness can range from 2,000 feet in the north to 300 feet in the south part of the Project Area. Numerous small faults are common in the Grass Valley Formation (Johnson 1977).

Detailed geologic mapping is shown on Figure 3.8.1. Two principal carbonate units have been identified: a massive to thick bedded limestone and a thin bedded, foliated, and deformed limestone. These informal units may correlate with the Cane Springs Formations. Throughout the Project Area, the massive limestone displays significant dissolution and karst development. This is particularly true at the thrust contact with the overlying Grass Valley Formation. The thin bedded, foliated, and deformed limestone exhibits numerous northwest trending folds. Many thrust faults are also found within these limestone units. Siltstone, undifferentiated mafic units, and diabase units are included within the Cane Springs Formation.

As shown on Figure 3.8.1, other rock units exposed in the northern part of the Project Area include mafic dikes, thin-bedded limestones of the Prida Formation, and Weaver Formation spherulitic tuffs, air fall and water lain ash, shale/siltstone, fine-grained volcanoclastic rocks, tuffs, and lithic tuffs.

3.8.3.2 Geologic Structures

The Relief Canyon pit area structure contains a large number of faults and fractures. Stratigraphic unit thickness and lithology can vary greatly over short distances within the pit. The South Humboldt Thrust is the major structural feature in the area of the Relief Canyon mine and forms the contact between the overlying Grass Valley Formation and the underlying Cane Springs Formation. A second unnamed, low angle thrust fault separates the massive thick bedded limestone of the Cane Springs Formation (TRIm) from the thin bedded deformed limestone of the Cane Springs Formation (TRl). A third unnamed fault separates the thin bedded, deformed limestone of the Cane Springs Formation (TRl) from the underlying upper volcanic unit (TRv). Numerous additional north-south and northeast striking, steeply dipping faults and fractures are present in the Relief Canyon pit area and are broadly related to the formation of a regional anticline structure. Finally, a range front fault is located west of the North and South Pits and forms the contact between the bedrock deposits of the Humboldt Range and the alluvium.

3.8.3.3 Geochemistry

A geochemical characterization study was conducted to assess the ARD and leachate quality (ARD/ML) of the waste rocks at the Relief Canyon Mine (Knight Piésold 2014b). The results of the geochemistry evaluation are summarized in this section and presented in detail in Appendix E of the 2015 Plan Modification. A summary of the waste rock types to be mined at the Project and their relative percentages of the total waste to be mined is shown in Table 2.1-4.

To characterize ARD/ML of the materials to be mined at the Project, a weighted approach was used to assess variability of the waste rock types shown in Table 2.1-4. Forty-four samples from 22 boreholes were selected to characterize the spatial and lithological variation of the deposit. All 44 of the samples were subjected to ABA procedures. Sixteen of these samples were selected for MWMP testing, with twelve subjected to sequential MWMP testing. The MWMP simulates the release of metals into the environment during exposure of the waste rock to precipitation events representing the first flush of stored-up oxidation products. The Sequential MWMP provides further insight into the evolution of water quality as it percolates through the waste rock facility. The number of samples collected was based on geologic data collected from bore hole logging to identify lithotypes, professional judgment and guidelines presented by the EPA and the MEND manual.

The samples were analyzed in a Nevada Certified Laboratory. The tests performed included paste pH, ABA Modified Sobek procedure – Michigan State University Reclamation Research Unit (EPA-600/2-78-054), and MWMP (American Society for Testing and Materials 2007b; NDEP 1990) tests.

The ABA tests performed on the waste rock to be produced during mining under the Proposed Action indicate this material is non-reactive and is not expected to generate acid upon exposure to weathering. The standard (single-leach) MWMP tests indicated some of the samples leached arsenic, antimony, aluminum, sulfate, TDS, or chloride at concentrations greater than their respective NRV. However, the results from sequential MWMP tests indicate the “first flush” of solutes observed in the single-leach MWMP test were followed by lower concentrations with the additional rounds (up to four) of leaching conducted under the sequential MWMP testing protocol. After four rounds of leaching, concentrations of arsenic and antimony were below their respective NRV in all but one sample for antimony and one sample for arsenic.

3.9 Public Safety, Transportation, and Access

3.9.1 Regulatory Framework

The NDOT is responsible for maintaining and improving Nevada's highway system, which includes U.S. highways and Interstate highways within the state's boundaries. The Pershing County Road Department is responsible for maintaining Coal Canyon Road and Packard Flat Road.

3.9.2 Assessment Area

The assessment area for public safety includes the Coal Canyon Road, Packard Flat Road, and the Project Area.

3.9.3 Existing Environment

The Project is located in a generally unpopulated area. Access to the Project is via I-80 and the Coal Canyon Road, which is a paved, two-lane road maintained by Pershing County. Vehicular traffic consists of cars, four-wheel drive trucks, and highway rated haulage trucks. The road traverses open range and is not fenced.

3.10 Social and Economic Values

3.10.1 Regulatory Framework

The Pershing County Master Plan 2012 provides guidance for future land use and community and economic development in Pershing County. Two guiding principles that are relevant to economics and social values related to the Project include:

- Fostering Economic Development - The County's resource based economy is subject to serious fluctuations as mineral prices shift, mines open and close and agricultural production varies. Agricultural employment has decreased as operations have become more mechanized. More economic stability is needed, particularly in the form of more secure middle wage jobs. The industrial park in Lovelock could become a valuable asset if the County is able to attract potential end users of the park. Mining will continue to be a boom/bust market that should be buffered with greater employment diversity. Quality medical and educational facilities are other important elements of economic development activities.
- Coordinating Growth and Service Provision - Increased cooperation between the County, city, state and federal agencies will enhance each jurisdiction's effectiveness. City/County growth coordination is particularly important in the area surrounding Lovelock. Cooperation between the County and the BLM would be important to maintain access to public lands, to provide for a variety of appropriate uses and to review potential land swaps. Coordination with the school district would be needed to help secure appropriate sites and to ensure that student demands do not exceed school capacities.

The Humboldt County Regional Master Plan 2012 includes the following economic development goals to economics and social values relevant to the Project:

- To achieve a diversified and stable economy that is compatible with planned growth and quality of life objectives, provides adequate employment and business opportunities for current and future generations, and strengthens the tax base;
- To maintain and enhance natural resource-based industries including mining, agriculture, ranching, recreation and tourism, and seek value-added manufacturing of these resources; and
- To promote economic development that provides continuing employment, economic vitality, increased tax base, and is consistent with the plan's goals and policies.

The Lyon County Comprehensive Master Plan 2010 includes the following economic goal relevant to the Project:

- **Diverse Economy** – The economy will continue to be strong and diverse; attracting businesses that employ residents in primary jobs, as well as service jobs that meet the needs of local residents.

There are no relevant goals in the Churchill County 2010 Master Plan.

3.10.2 Assessment Area

The assessment area for economics and social values comprises Pershing County, Humboldt County, Lyon County, and Churchill County (Figure 3.10.1). The assessment area is based on the location of the Relief Canyon Mine in Pershing County and the potential resident locations of future mine employees in Pershing County, Humboldt County, Lyon County, and Churchill County.

3.10.3 Existing Environment

3.10.3.1 Population and Demographics

The population of Nevada grew by approximately 35 percent between 2000 and 2010 and is estimated to have grown another approximate five percent between 2010 and 2014. Populations of counties in the assessment area are shown below in Table 3.10-1. Humboldt County saw a population increase between 2010 and 2014 similar to the state, while Lyon County’s growth was approximately half of the state’s growth, and Churchill County only experienced a 0.9 percent growth between 2010 and 2014. Pershing County experienced a population decline of approximately 0.6 percent between 2000 and 2014.

Table 3.10-1: Population Statistics and Estimates of Assessment Area

Area	2000 Census	2010 Census	2014 Estimates	Percent Change 2010 to 2014
Pershing County	6,693	6,753	6,714	-0.6
Humboldt County	16,106	16,528	17,388	5.2
Lyon County	34,501	51,980	53,344	2.6
Churchill County	23,982	24,877	25,103	0.9
Nevada	1,998,257	2,700,551	2,843,301	5.3

Source: NSDO 2015a, 2015b, 2015c

Table 3.10-2 shows that Pershing County varies from Humboldt County, Lyon County, Churchill County, and the State of Nevada as a whole with respect to gender and age. Specifically, population and demographic statistics for Pershing County are somewhat skewed given that approximately 1,680 men, or approximately 25 percent of its total population, are incarcerated at the Lovelock Correctional Center (Nevada Department of Corrections 2015).

Table 3.10-2: Demographic Statistics of Assessment Area

Demographics	Pershing County	Humboldt County	Lyon County	Churchill County	State of Nevada
Gender, 2014					
Female, percent	36.7	47.8	49.4	49.4	49.7
Male, percent	63.3	52.2	50.6	50.6	50.3
Age					
Persons under five years of age, percent, 2014	4.6	7.8	5.3	6.5	6.2
Persons under 18 years of age, percent, 2014	18.5	27.3	22.4	23.3	23.4

Demographics	Pershing County	Humboldt County	Lyon County	Churchill County	State of Nevada
Persons 65 years of age and over, percent, 2014	13.8	10.6	19.7	18.0	14.2
High School graduate or higher, percent of person's age 25+ (2009-2013)	78.9	82.9	84.3	89.2	84.6
White alone persons, not Hispanic or Latino, percent, 2014	66.5	66.5	76.3	74.3	51.5
Persons of Hispanic or Latino origin, percent, 2014	23.3	26.1	15.8	13.3	27.8
American Indian and Alaska Native persons, percent, 2014	4.4	5.0	3.2	5.2	1.6
Black or African American persons, percent, 2014	4.2	1.2	1.3	2.2	9.1

Source: US Census Bureau 2015

3.10.3.2 Income, Employment, and Economy

Based on 2014 figures, employment in Nevada is dominated by the leisure and hospitality service industry and the trade, transportation, and utilities sector. The leisure and hospitality industry (inclusive of gaming, hotel, recreation, and food service) has the highest proportion of employment with approximately 28 percent of the state's workforce in the sector. The next largest employment sector is trade, transportation, and utilities with approximately 19 percent of the jobs statewide.

Approximately one percent of jobs statewide is in the natural resource and mining industries (NDETR 2014a). Employment by major industry in the assessment area with statewide employment by the same sector is shown in Table 3.10-3.

Mining has been, and continues to be, important to the economic well-being of Nevada. Nevada leads the nation in production of gold and provides the highest average salary of any other super sector in Nevada (Applied Analysis 2014a; 2014b). Nevada gold production accounted for approximately 69 percent of total United States production and approximately 5.9 percent of world production (Applied Analysis 2014a). Average earnings for metal mining workers in 2014 totaled \$91,936, compared to \$88,608 for all mining workers, and \$44,720 for all workers statewide (NDETR 2014b).

The 2014 average annual wage in Pershing County totaled \$50,425. The average annual wage for a worker in the natural resources and mining sector was \$73,153. The average annual wage for an employee in the leisure and hospitality sector was \$16,496 (NDETR 2014a).

The 2014 average annual wage for a worker in Humboldt County was \$52,549. The average annual wage for a worker in the natural resources and mining sector was \$86,514. The average annual wage for an employee in the leisure and hospitality sector was \$17,697 (NDETR 2014a).

The 2014 average annual wage for a worker in Lyon County was \$38,731. The average annual wage for a worker in the natural resources and mining sector was \$57,600. The average annual wage for an employee in the leisure and hospitality sector was \$17,756 (NDETR 2014a).

The 2014 average annual wage for a worker in Churchill County was \$41,563. The average annual wage for a worker in the natural resources and mining sector was \$31,326. The average annual wage for an employee in the leisure and hospitality sector was \$17,092 (NDETR 2014a).

Table 3.10-3: Employment by Sector in 2014 for Assessment Area and State of Nevada

Sector	Pershing County	Humboldt County	Lyon County	Churchill County	State of Nevada
<i>Private Sector Industries</i>	1,158	6,561	10,112	5,989	1,055,775
Natural Resources and Mining	705	2,315	946	295	16,754
Construction	--	363	550	454	63,189
Manufacturing	29	247	2,063	450	41,451
Trade, Transportation, and Utilities	191	1,425	3,219	1,865	229,794
Information	--	63	16	96	13,679
Financial Activities	22	112	349	230	55,095
Professional and Business Services	15	426	753	513	156,000
Education and Health Services	23	289	467	917	113,282
Leisure and Hospitality	139	1,160	1,470	954	335,846
Other services	25	161	272	214	29,932
<i>Government</i>	712	1,497	2,030	1,686	146,881
<i>Unclassified</i>	9	1	7	1	755
Total All Industries	3,028	14,620	22,254	13,664	2,258,433

Source: NDETR 2014a

3.10.3.3 Public Finance

Taxes paid by mining operations are a primary source of revenue for the State of Nevada, counties, and local governments. Major tax categories paid by mining companies include: sales and use taxes on purchases; property taxes; modified business taxes; and Net Proceeds of Minerals (NPM) taxes. Based on information from the Nevada Department of Taxation and industry surveys, estimated state and local taxes paid by the mining industry in 2012 were approximately \$431 million, including approximately \$176 million in NPM taxes (Applied Analysis 2014c).

NPM taxes are primarily paid to the county where the ore is mined. NPM taxes distributed for all mining operations across the State of Nevada in fiscal year 2013-14 totaled approximately \$33.8 million. NPM taxes paid to Pershing County for all active operations totaled approximately \$1.5 million over that same time frame. NPM taxes paid to Humboldt County for all active operations totaled approximately \$2.3 million over that same time frame. NPM taxes paid to Lyon County for all active operations totaled \$145,999 over that same time frame. NPM taxes paid to Churchill County for all active operations totaled approximately \$499,405 in fiscal year 2013-14 (Nevada Department of Taxation 2015).

3.10.3.4 Housing

Pershing County

In 2014, there were 2,416 housing units in Pershing County. Based on an approximate 66 percent owner-occupied housing unit rate, approximately 1,594 units were owner-occupied and approximately 822 were renter occupied. This compares to an average owner-occupied housing rate of approximately 57 percent in Nevada as a whole. The median value of owner-occupied housing units in Pershing County (2009-2013) totaled \$138,100 (U. S. Census Bureau 2015); compared to a median value of \$169,100 in Nevada as a whole.

Humboldt County

In 2014, there were 7,275 housing units in Humboldt County. Based on an approximate 71 percent owner-occupied housing unit rate, approximately 5,165 units were owner-occupied and approximately 2,110 were renter occupied. The median value of owner-occupied housing units in Humboldt County (2009-2013) totaled \$147,400 (U. S. Census Bureau 2015).

Lyon County

In 2014, there were 22,399 housing units in Lyon County. Based on an approximate 70 percent owner-occupied housing unit rate, approximately 15,679 units were owner-occupied and approximately 6,720 were renter occupied. The median value of owner-occupied housing units in Lyon County (2009-2013) totaled \$133,400 (U. S. Census Bureau 2015).

Churchill County

In 2014, there were 10,686 housing units in Churchill County. Based on an approximate 62 percent owner-occupied housing unit rate, approximately 6,625 units were owner-occupied and approximately 4,061 were renter occupied. The median value of owner-occupied housing units in Churchill County (2009-2013) totaled \$153,300 (U. S. Census Bureau 2015).

3.10.3.5 Community Facilities and Services

Community service providers for education, law enforcement, fire protection, ambulance services, and health care are summarized below.

Pershing County

The Pershing County School District (PCSD) includes one high school, one middle school, and two elementary schools. The high school, middle school, and one elementary school are located in Lovelock, while the other elementary school is located in Imlay. The high school serves approximately 200 students and the middle school enrolled 152 students during the 2014-2015 school year (PCSD 2015).

The Nevada Division of Public and Behavioral Health (DPBH) provides community health nursing (CHN) services to residents of all ages and incomes in Pershing County (DPBH 2015). There is a CHN office in Lovelock that provides the following services: cancer screenings; adult and child immunizations; well child and healthy kids' examinations; fluoride varnishes; chronic disease education; lead testing; and family planning. Health care services in Pershing County are also provided by the Pershing General Hospital in Lovelock, which includes a long-term care facility, physician's clinic, family practice, podiatrist, and vascular surgeon (Pershing General Hospital 2015).

Law enforcement in Pershing County is provided by the Pershing County Sheriff's Department, the City of Lovelock Police Department, and Nevada Highway Patrol (NHP). Fire protection and ambulance services for Pershing County are provided by the Lovelock Fire Department (Pershing County 2015). In addition, the Lovelock area is home to the Lovelock Correctional Center, which serves as a medium security prison for approximately 1,680 inmates. Staff includes 213 protective services staff as well as 48 other professional and administrative staff (Nevada Department of

Corrections 2015). The BLM provides fire protection and suppression activities on federal lands within Pershing County. There is one fire station serviced by the BLM Winnemucca District in Pershing County, the Lovelock Fire Station located in Lovelock, Nevada. This station is housed with the Lovelock Fire Department through a cooperative agreement with the City of Lovelock and the BLM (BLM 2015b).

Humboldt County

The Humboldt County School District serves approximately 3,500 students in 11 schools: three Kindergarten (K)-4 schools; one 5-6 middle school; one 7-8 junior high; and one 9-12 high school located in Winnemucca. There are also four K-8 schools and one K-12 school in rural areas throughout Humboldt County (Humboldt County School District 2015). Great Basin College maintains a center in Winnemucca (Great Basin College 2015).

The DPBH also provides CHN services to residents of all ages and incomes in Humboldt County (DPBH 2015). There is a CHN office in Winnemucca and provides the same services as the CHN office in Lovelock. Health care and emergency services are provided by the Humboldt General Hospital and include the following: cardiac rehabilitation; laboratory services; long-term care; nutrition/dietary services; obstetrics; radiology; respiratory therapy; social services; a surgery center; and a wellness center (Humboldt General Hospital 2015).

Law enforcement in Humboldt County is provided by the Humboldt County Sheriff's Department, Winnemucca City Police, and NHP. Fire protection is provided by the Winnemucca Volunteer Fire Department (VFD). The Winnemucca Rural Fire Department, an all-volunteer department, provides fire protection services to the Grass Valley area of Humboldt County and a portion of Pershing County. The BLM provides fire protection and suppression activities on federal lands within Humboldt County. There are three fire stations serviced by the BLM Winnemucca District in Humboldt County: Winnemucca station; McDermitt station; and the United States Forest Service Paradise Valley Station, which is supervised by the BLM through a cooperative agreement (BLM 2015b).

Lyon County

The Lyon County School District serves approximately 8,082 students in 18 schools: four pre-Kindergarten (PK)-4 schools; three PK-6 schools; one PK-8 school; one PK-12 school; one 5-6 school; two 7-8 schools; one 5-8 school; one 5-12 school; and four 9-12 schools (Nevada Department of Education 2015).

The DPBH also provides CHN services to residents of all ages and incomes in Lyon County (DPBH 2015). There are CHN offices in Dayton, Fernley, Silver Springs, and Yerington that provide the same services as the CHN offices in Lovelock and Winnemucca. Renown Medical Group provides primary and urgent care services in Fernley and Silver Springs.

Law enforcement in Lyon County is provided by the Lyon County Sheriff's Office, Yerington Police Department, and NHP. Fire protection and emergency medical services are provided by the Central Lyon County Fire Protection District (FPD), the Mason Valley FPD, the North Lyon County FPD, and the Smith Valley FPD (Lyon County 2015). The BLM provides fire protection and suppression activities on federal lands within Lyon County through the BLM Carson City District Office.

Churchill County

The Churchill County School District serves approximately 3,488 students in seven schools: two PK schools; one K-1 school; one 2-3 school; one 4-5 school; one 6-8 school; and one 9-12 school (Nevada Department of Education 2015).

The DPBH also provides CHN services to residents of all ages and incomes in Churchill County (DPBH 2015). There is one CHN office in Fallon that provides the same services as the CHN offices in Lovelock, Winnemucca, Dayton, Fernley, Silver Springs, and Yerington. Banner Churchill Community Hospital in Fallon provides the following services: cancer care; diagnostic imaging; emergency care; emergency medical services; heart care; infusion center; laboratory services; maternity services; nutrition; rehabilitation services; surgical services; and women's services (Banner Health 2015).

Law enforcement in Churchill County is provided by the Churchill County Sheriff's Office, City of Fallon Police Department, and NHP. Fire protection is provided by the Fallon/Churchill VFD (Churchill County 2015). The BLM provides fire protection and suppression activities on federal lands within Churchill County through the BLM Carson City District Office.

3.11 Rangeland Management

3.11.1 Regulatory Framework

The BLM is committed by policy and directed by law (the Taylor Grazing Act of 1934, as amended and supplemented, the FLPMA, and the Public Rangeland Improvement Act of 1978) to manage forage in a sustained yield basis and to improve the condition of the public rangelands.

Regulations (43 CFR 1601.05(b) and CFR 4100.08) require the BLM to manage livestock grazing on public lands under the principles of multiple use and sustained yield. To accomplish these goals, livestock grazing is permitted on public rangelands within specific administration areas called allotments. The grazing permits have mandatory terms and conditions per 43 CFR 4130.3-1(a), including kind and number of livestock, period of use, allotment(s) to be used, and the amount of use in animal unit months (AUMs). BLM grazing permits are managed to attain allotment specific objectives and the Standards for Rangeland Health. Permits are evaluated periodically by the BLM to determine whether management goals are being met or making progress towards being met.

3.11.2 Assessment Area

The assessment area for rangeland management is the Project Area.

3.11.3 Existing Environment

The Project Area is located primarily within the South Rochester Allotment, with a small portion in the northwest corner of the Project Area located in the Coal Canyon-Poker allotment. The South Rochester Allotment consists of approximately 170,807 acres of public land. Based on GIS data analysis, there are approximately 171,740 BLM-administered acres supporting 1,386 AUMs within the South Rochester allotment. The Coal-Canyon Poker Allotment consists of approximately 97,829 acres of public land supporting 3,699 AUMs. Natural drainages and other

surface water features support livestock grazing within the allotments. BLM-and NDOW-approved barbed wire fencing is in place to minimize the intrusion of livestock into the heap leach processing area. Eight-foot high chain-link fences are in place around the lined ponds. Fencing and/or cattle guards are in appropriate locations as shown on Figure 2.1.1. There is a security gate near the administration building to control access to the processing facilities.

3.12 Soils

3.12.1 Regulatory Framework

The BLM Regulations for surface management of public land mined under the General Mining Law of 1872 (30 U.S.C. § 22 et seq.) are provided in 43 CFR 3809. Specifically, 43 CFR 3809.1 required mining-related activities to minimize impacts to soil resources. Guidance for reclamation is provided in the BLM Handbook H-3042-1 (1992).

State of Nevada laws and regulations, NAC 445A.350 - NAC 445A.447 (Mining Facilities) and NAC 519A.010 - NAC 519A.415 (Regulation of Mining Operations), were developed to implement the requirements of the NRS 445A.300 - NRS 445A.730 (Water Pollution Control) and NRS 519A.010- NRS 519A.290 (Reclamation of Land Subject to Mining Operations). The purpose of these statutes are 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.

3.12.2 Assessment Area

The assessment area for soil is the Project Area.

3.12.3 Existing Environment

The existing environment in the Project Area consists of 347 acres of existing disturbance occupied by mine facilities and areas cleared of vegetation and soil. The majority of the upper elevations of the Project Area are composed of outcrop and thin soil layers. Physiographic features occurring in the Project Area include fan remnants with slopes ranging from two to 15 percent and mountains with slopes ranging between 30 and 75 percent. The general soil texture associated with the fan remnant features include very to extremely gravelly loam to gravelly loam. Soil texture associated with the mountain feature is primarily extremely cobbly loam. According to the Natural Resource Conservation Service (NRCS), five soil associations were identified within the Project Area.

Bubus very fine sandy loam; Eastwell-Shabliss-Blackhawk association; Oxcorel-Beoska association; Pufer, very steep-Atlow Pufer association; Puffer-Mulhop-Rock outcrop association; and Snapp-Oxcorel association. Soil associations within the Project Area are shown on Figure 3.12.1 and listed in Table 3.12-1.

Biological Soil Crusts

Using a GIS predictive model developed by the Winnemucca BLM, approximately one third of the Project Area covers soils that have a moderate potential for the presence of biological soil crusts. The remaining Project Area covers soils that exhibit low potential for biological soil crust. Also the amount of existing disturbance apparent from air photo imagery suggests an even higher total area of low potential.

Table 3.12-1: Soil Associations within the Project Area

Association	Soil Series	Range in Depth to Restrictive Feature	Landscape position/ % Slope	Profile Soil Texture	Permeability	Erosion Hazard by Water	Erosion Hazard by Wind
Bubus very fine sandy loam 0 to 2 percent slopes (932)	Bubus and similar soils (100%)	More than 80 inches	Lake plains / 0 to 2 percent slope	0 to 13 inches: very fine sandy loam 13 to 60 inches: stratified sandy loam to silt loam	Well drained, low runoff	High	High
Eastwell-Shabliss-Blackhawk association (1550)	Eastwell and similar soils (35)	10 to 20 inches to duripan	Fan remnants / 2 to 8 percent slope	0 to 6 inches: very gravelly loam 6 to 12 inches: very gravelly loam 12 to 20 inches: cemented 20 to 60 inches: very cobbly loam	Well drained, very high runoff	High	High
	Shabliss and similar soils (30)	10 to 20 inches to duripan	Partial ballenas / 30 to 50 percent slope	0 to 3 inches: gravelly loam 3 to 19 inches: loam 19 to 30 inches: cemented 30 to 60 inches: very gravelly loamy sand	Well drained, very high runoff	High	High
	Blackhawk and similar soils (20)	10 to 20 inches to duripan	Partial ballenas / 30 to 50 percent slope	0 to 3 inches: gravelly loam 3 to 14 inches: gravelly very fine sandy loam 14 to 30 inches: cemented 30 to 48 inches: very gravelly sandy loam 48 to 60 inches: extremely gravelly coarse sand	Well drained, very high runoff	High	High
Oxcorel-Beoska association (669)	Oxcorel (45%)	More than 80 inches	Fan remnants / 2 to 8 percent slope	0 to 8 inches: gravelly very fine sandy loam 8 to 34 inches: clay 34 to 60 inches: very gravelly sandy loam	Well drained, very high runoff	Moderate	Moderate
	Beoska (40%)	More than 80 inches	Fan remnants / 2 to 8 percent slope	0 to 13 inches: gravelly very fine sandy loam 13 to 25 inches: clay loam 25 to 44 inches: stratified gravelly sandy loam to gravelly very fine sandy loam 44 to 60 inches: stratified very gravelly sandy loam to extremely gravelly very fine sandy loam	Well drained, very high runoff	Moderate	Moderate

Association	Soil Series	Range in Depth to Restrictive Feature	Landscape position/ % Slope	Profile Soil Texture	Permeability	Erosion Hazard by Water	Erosion Hazard by Wind
Puffer, very steep – Atlow-Puffer association (957)	Puffer and similar soils (40%)	4 to 14 inches to lithic bedrock	Mountains / 50 to 75 percent slope	0 to 2 inches: very cobbly loam 2 to 11 inches: very gravelly loam 11 to 21 inches: unweathered bedrock	Well drained, very high runoff	Low	Low
	Atlow and similar soils (30%)	4 to 20 inches to lithic bedrock	Mountains / 50 to 75 percent slope	0 to 4 inches: very flaggy loam 4 to 15 inches: very gravelly clay loam 15 to 25 inches: unweathered bedrock	Well drained, very high runoff	Low	Low
	Puffer and similar soils (15%)	4 to 14 inches to lithic bedrock	Mountains / 15 to 30 percent slope	0 to 2 inches: very cobbly loam 2 to 11 inches: very gravelly loam 11 to 21 inches: unweathered bedrock	Well drained, very high runoff	Low	Low
Puffer-Mulhop-Rock outcrop association (955)	Puffer and similar soils (45%)	4 to 14 inches to lithic bedrock	Mountains / 30 to 50 percent slope	0 to 2 inches: very cobbly loam 2 to 11 inches: very gravelly loam 11 to 21 inches: unweathered bedrock	Well drained, very high runoff	Low	Low
	Rock outcrop (20%)	-	Mountains	-	-	-	-
	Mulhop and similar soils (20%)	4 to 14 inches to lithic bedrock	Mountains / 30 to 50 percent slope	0 to 6 inches: very gravelly loam 6 to 17 inches: very gravelly loam 17 to 27 inches: unweathered bedrock	Well drained, very high runoff	Low	Low
Snapp-Oxcorel association (750)	Snapp (50 %)	More than 80 inches	Fan remnants / 2 to 8 percent slope	0 to 9 inches: very fine sandy loam 9 to 28 inches: gravelly clay 28 to 39 inches: gravelly clay loam 39 to 60 inches: extremely gravelly loamy sand	Well drained, high runoff	High	High
	Oxcorel (40 %)	More than 80 inches	Fan remnants / 2 to 8 percent slope	0 to 8 inches: gravelly very fine sandy loam 8 to 34 inches: clay 34 to 60 inches: very gravelly sandy loam	Well drained, high runoff	High	High

Source: NRCS Web Soil Survey 2015, Survey Area Data: Version 11, August 18, 2014.

3.13 Special Status Species

3.13.1 Regulatory Framework

Special status species are those plants and animals that are listed, candidate, or proposed for listing under the ESA of 1973 (16 U.S.C. 1531 et seq.), as amended, State of Nevada listed species, and species managed as “Sensitive” by the BLM. The ESA provides for the conservation of federally listed plant and animal species and their habitats. The BLM Manual 6840 provides management policy for federally listed species and BLM- designated Sensitive species.

The Bald and Golden Eagle Protection Act prohibits the take or possession of bald and golden eagles with limited exceptions. Take, as defined in the act, includes “to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb.” Disturb means to agitate or bother a bald or golden eagle to a degree that causes or is likely to cause, based on the best scientific information available, injury to an eagle; a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior. An important eagle use area is defined as an eagle nest, foraging area, or communal roost site that eagles rely on for breeding, sheltering, or feeding and the landscape features surrounding a nest, foraging area, or roost site. The BLM also has policy guidance for addressing potential impacts of projects on golden eagles (IM No. NV 2010-034). This memorandum indicates that the BLM Field Manager must notify applicants during the permitting process that construction and operation of a facility may result in take and that it is the applicant’s responsibility to consult with the USFWS and obtain any applicable permits. The BLM should also provide applicants federal guidelines for inventory and monitoring protocols. Bald and golden eagles are discussed under migratory birds in Section 3.4.

3.13.2 Assessment Area

The assessment area for special status species, other than raptors, is the Project Area. The assessment area for raptors includes a one-mile buffer around the Project Area. The nesting eagle assessment area includes a ten-mile buffer around the Project Area.

3.13.3 Existing Environment

The USFWS, Nevada Natural Heritage Program (NNHP), and NDOW were contacted to obtain information on sensitive species that have the potential to occur within the Project Area (Enviroscientists 2015a). In addition, the BLM Sensitive list was evaluated for species with the potential to occur within the buffer areas around the Project Area.

No federally listed endangered, threatened, or candidate species or critical habitats are known to occur within the Project Area. Data from the NNHP database indicates that one special status plant species, Lahontan milkvetch (*Astragalus porrectus*), was previously recorded within the vicinity of the Project Area. The NNHP also specified that habitat within or near the Project Area may also be available for the following special status species: windloving buckwheat (*Eriogonum anemophilum*), a Nevada BLM sensitive plant species, and Nevada suncup (*Camissonia nevadensis*), a NNHP vulnerable plant species; Nevada viceroy (*Limenitis archippus lahontani*), a NNHP Critically Imperiled wildlife species; Townsend’s big-eared bat (*Corynorhinus*

townsendii), a Nevada BLM Sensitive wildlife species, and pallid bat (*Antrozous pallidus*), a Nevada BLM Sensitive wildlife species (Enviroscientists 2015a).

The BLM lists 82 Sensitive species with the potential to occur regionally, which includes the Project Area. The BLM determined that the Project Area may provide suitable habitat for 53 of the 82 Sensitive species, which included 18 plants, 13 birds, 19 mammals, and three insects (Enviroscientists 2015a). Field surveys conducted in 2014 (Enviroscientists 2014) documented two Nevada BLM Sensitive plant species and two Nevada BLM Sensitive bird species as utilizing habitat within the Project Area. A third plant species, Lahontan milkvetch, a NNHP vulnerable species, was also present. The two Nevada BLM Sensitive plant species were Lahontan beardtongue (*Penstemon palmeri* var. *macranthus*) and sand cholla (*Grusonia pulchella*). The two Nevada BLM Sensitive avian species were golden eagle (*Aquila chrysaetos*) and Western burrowing owl (*Athene cunicularia hypugaea*) (Enviroscientists 2015a).

3.13.3.1 Plants

A special status plant survey was conducted in June 2014 (Enviroscientists 2014) as a component of baseline botanical surveys for the Project. Figure 3.13.1 shows the survey tracks over the Project Area. The special status plant survey followed the protocols established in the Survey Protocols Required for National Environmental Policy Act (NEPA)/ESA Compliance for BLM Special Status Plant Species provided by the BLM. During a special status species habitat evaluation conducted on site by the BLM in the spring of 2014, the BLM identified the occurrence of sand cholla (*Grusonia pulchella*) within the Project Area.

A systematic survey was conducted for sand cholla throughout the areas of the proposed Project disturbance and a surrounding 300-foot buffer (Focused Survey Area) that overlapped with suitable habitat for this BLM sensitive plant species.

Although sand cholla was specifically targeted during the special status plant species survey, all special status plant species with potential habitat within the Project Area were of focus during the survey. A Global Positioning System (GPS) track log was taken during all surveys in order to ensure proper coverage of the Project Area with emphasis on areas of potential habitat for special status species and within the Focused Survey Area (Enviroscientists 2015a).

Lahontan Beardtongue (BLM Sensitive)

Twenty-seven occurrences of Lahontan beardtongue were observed within or near drainages throughout the Project Area. The drainages were dry during the botanical surveys, and the surface soil textures within the drainages generally ranged between gravelly loam to gravelly, sandy loam. All drainages within the Project Area were surveyed as potential habitat for Lahontan beardtongue. Three or more occurrences of Lahontan beardtongue were in the area of the Proposed Action in the vicinity of the proposed exploration roads (Figure 3.13.2) (Enviroscientists 2015a).

Lahontan Milkvetch (NNHP Vulnerable)

Three occurrences of Lahontan milkvetch were recorded within the Project Area. The first occurrence was observed along the southwestern boundary of the Project Area (i.e., the southwestern occurrence), while the other two Lahontan milkvetch occurrences were adjacent to one another in the southeastern portion of the Project Area (i.e., the southeastern occurrences). There are no occurrences of Lahontan milkvetch within the area of the Proposed Action (Enviroscientists 2015a).

Sand Cholla (BLM Sensitive)

Eighty-one occurrences of sand cholla were recorded within the Project Area. Eighty of the 81 sand cholla occurrences were observed in the Inter-Mountain Basins Mixed Salt Desert Scrub and Disturbed Inter-Mountain Basins Mixed Salt Desert Scrub vegetation communities. A single occurrence of sand cholla was observed within the Disturbed Landscape/Road community within the central-east portion of the Project Area near the southwest corner of the existing mine pits. Eight occurrences of sand cholla are within the area of the Proposed Action (Figure 3.13.2) (Enviroscientists 2015a).

3.13.3.2 Wildlife

On August 1, 2014, an on-site bat habitat assessment was performed by the NDOW and Enviroscientists. On December 10 and 11, 2014, focused wildlife surveys were conducted in the areas of potential habitat for bats, greater sage-grouse, and pygmy rabbit within the Project Area.

The results of the bat surveys indicated only minimal and temporary bat use and unlikely habitat for maternity, hibernacula, or long-term roosting, therefore bats will not be discussed further. Similarly, pygmy rabbit, pygmy rabbit sign, and suitable pygmy rabbit habitat were not observed within the Project Area during the focused wildlife survey and they will not be discussed further (Enviroscientists 2015a).

Occupied western burrowing owl burrows were identified in the Project Area during the botanical surveys in June of 2014. Due to the occurrence of these burrows, western burrowing owls were present within the Project Area and further surveys for western burrowing owl were deemed unnecessary.

No surveys were conducted for the dark kangaroo mouse (*Microdipodops megacephalus*), pale kangaroo mouse (*Microdipodops pallidus*), or Preble's shrew (*Sorex preblei*), because a take permit was not issued due to the mortality risk associated with trapping small mammals. Given the presence of suitable habitat in the Project Area, these three species are assumed to be present for the purpose of this analysis (Enviroscientists 2015a).

3.13.3.3 Birds

Greater Sage-grouse (BLM Sensitive)

A greater sage-grouse survey and habitat assessment was conducted in December 2014. No greater sage-grouse or sign was observed within the Project Area. The surveyed area within the Project Area was determined to be unlikely habitat for greater sage-grouse, as encroachment by Utah juniper trees occurred throughout the sagebrush-dominated vegetation communities (Enviroscientists 2015a). In addition, NDOW reported that there are no known greater sage-grouse lek sites in the vicinity of the Project Area.

According to the 2014 greater sage-grouse habitat map developed by the U. S. Geological Survey (USGS) for the State of Nevada's Sagebrush Ecosystem Program (IM No. NV-2015-017), the area containing disturbance associated with the Proposed Action is either not habitat or classified as Other Habitat Management Area (OHMA) (Figure 3.13.3). The OHMA area within the Project because the area lacks the following key habitat features as defined by the Sagebrush Ecosystem Technical Team (SETT) (2014): water sources (SWS 2015), riparian and wet meadows; sagebrush cover greater than 65 percent within the landscape for seasonal habitat use; and cover by shrub species other than big sagebrush (*Artemisia tridentata*). High levels of disturbance within the Project Area from livestock and feral horse grazing and mineral exploration activities have altered the native landscape conditions within the Project and have promoted the prevalence of invasive and non-native annual plant species such as cheatgrass and saltlover.

Western Burrowing Owl (BLM Sensitive)

No focused wildlife surveys were conducted for the western burrowing owl because the presence of western burrowing owl within the Project Area was assumed based on the owl signs (pellets, whitewash, cricket carcasses, and feathers) documented during the botanical surveys. Three occupied western burrowing owl burrows were recorded within the Inter-Mountain Basins Mixed Salt Desert Scrub vegetation community.

3.13.3.4 Mammals

Dark Kangaroo Mouse (BLM Sensitive)

The dark kangaroo mouse is restricted to the Great Basin Desert. Based on calculations derived from Hafner and Upham 2011, the dark kangaroo mouse distribution is estimated to extend over 32.5 million acres across Nevada. Its preferred habitat occurs on fine gravelly soil, primarily valley bottoms and alluvial fans with big sagebrush, rabbitbrush (*Chrysothamnus* spp.), and horsebrush (*Tetradymia* spp.) vegetation. The dark kangaroo mouse would likely occur in Inter-Mountain Basins Big Sagebrush Shrubland and Great Basin Xeric Mixed Sagebrush Shrubland. Breeding for the dark kangaroo mouse occurs from April to September. No specific surveys were conducted for the dark kangaroo mouse. Given the presence of suitable habitat, the species is assumed present for this analysis.

Pale Kangaroo Mouse (BLM Sensitive)

Based on information from the California BLM (2015a), the ranges of the dark and pale kangaroo mice overlap, but pale kangaroo mice have a much narrower range. They prefer habitats in high, cold deserts (they are most commonly found in Nevada but California has a small population in Inyo and Mono counties). Pale kangaroo mice live in burrows about one foot below the ground. Their burrows are not extensive and are not used for food storage. The burrows are built in windblown sand and may be up to six feet long. They mainly feed on seeds and grains, but they also eat insects when they are available. They hunt in open areas with no canopy to protect them. The breeding season is from March to September. During years with high rainfall, vegetation is abundant and females may have multiple litters. In dry years, females may not reproduce. Given the presence of suitable habitat, the species is assumed present for this analysis.

Preble's Shrew (BLM Sensitive)

Preble's shrew has been found mostly in sagebrush and grassland habitats and occasionally in coniferous forest, marshes, and riparian areas. Based on information available via NatureServe (2014) and NNHP species information, Preble's Shrew habitat extends throughout northern Nevada in Elko, Humboldt and Washoe Counties potentially extending through 13.6 million acres. Preble's shrew usually occurs in sagebrush-grassland habitats often when vegetative cover is between 40 percent and 60 percent. Potentially suitable foraging and nesting habitat occurs within the Project Area in the Inter-Mountain Basins Big Sagebrush Shrubland habitat. No surveys were conducted for Preble's shrew in the Project Area; however, based on the presence of acceptable habitat the species is assumed present.

3.14 Vegetation

3.14.1 Regulatory Framework

The FLPMA, Public Rangelands Improvement Act of 1978, 43 CFR 4180, and the NDEP BMRR revegetation standards, *Guidelines for Successful Revegetation for the Nevada Division of Environmental Protection, the Bureau of Land Management and the U.S.D.A. Forest Service*, provide the direction, goals, and objectives for vegetation management and reclamation success on BLM-administered public land in the Project Area.

3.14.2 Assessment Area

The assessment area for vegetation includes the area that would be affected by the proposed expansion of the mine and ancillary facilities.

3.14.3 Existing Environment

The assessment area is located at the southern end of the Humboldt Range within Packard Flat at elevations ranging from 4,650 to 6,923 feet amsl. Baseline botanical surveys within the Project Area were conducted from June 7 through June 14, 2014, and June 26 through June 29, 2014 (Enviroscientists 2015a). The landscape exhibited disturbed conditions as a result of previous

mining activities, ongoing mineral exploration, and continuous grazing by livestock and feral horses. Dirt roads associated with mining, mineral exploration, and ranching were present throughout the area of the Proposed Action.

Through the use of definitions provided by the Southwest Regional Gap Analysis Project (SWReGAP) (USGS GAP 2005) and Peterson (2008), the following nine vegetation communities were delineated within the area of the Proposed Action: 1) Inter-Mountain Basins Mixed Salt Desert Shrub; 2) Disturbed Inter-Mountain Basins Mixed Salt Desert Scrub; 3) Inter-Mountain Basins Rabbitbrush-Big Sagebrush Drainage; 4) Inter-Mountain Basins Big Sagebrush Shrubland with Encroaching Utah Juniper; 5) Great Basin Black Sagebrush-Utah Juniper Woodland; 6) Great Basin Sagebrush-Utah Juniper Woodland; 7) Great Basin Xeric Mixed Sagebrush Shrubland; 8) Limestone Outcrop; and 9) Disturbed Landscape/Road (Figure 3.3.1). The following discussion is a description of the communities comprising an acre or greater within the area of the Proposed Action.

Inter-Mountain Basins Mixed Salt Desert Scrub

The Inter-Mountain Basins Mixed Salt Desert Scrub vegetation community is present in the Waste Rock Dump 5 and the Relief Canyon Pit areas. The Inter-Mountain Basins Mixed Salt Desert Scrub vegetation community is dominated by the following shrub species: shadscale saltbush, yellow rabbitbrush, bud sagebrush, and Nevada jointfir (*Ephedra nevadensis*). Sandberg bluegrass, a perennial grass species, is also prevalent in this vegetation community along with the two invasive and non-native annual species saltlover and cheatgrass. Gooseberryleaf globemallow (*Sphaeralcea grossulariifolia*) is scattered throughout the Inter-Mountain Basins Mixed Salt Desert Scrub vegetation community but in low densities.

Disturbed Inter-Mountain Basins Mixed Salt Desert Scrub

The Disturbed Inter-Mountain Basins Mixed Salt Desert Scrub vegetation community is present in the heap leach pad area. The degradation in this community is primarily a result of livestock grazing. The Disturbed Inter-Mountain Basins Mixed Salt Desert Scrub vegetation community generally contains the same plant species as the adjacent Inter-Mountain Basins Mixed Salt Desert Scrub community. The difference between these two vegetation communities occurs with the dominant plant species. The Disturbed Inter-Mountain Basins Mixed Salt Desert Scrub community is dominated by the invasive and non-native annual plant species saltlover and cheatgrass. The common shrub species within the Disturbed Inter-Mountain Basins Mixed Salt Desert Scrub vegetation community are shadscale saltbush, yellow rabbitbrush, and bud sagebrush.

Inter-Mountain Basins Rabbitbrush-Big Sagebrush Drainage

The Inter-Mountain Basins Rabbitbrush-Big Sagebrush Drainage vegetation community is present in the Waste Rock Dump 5 and the Relief Canyon Pit areas. The vegetation community occupies prominent ephemeral drainages in which water flows from the Humboldt Range in the eastern portion of the Project Area west to Packard Flat during large precipitation events. The soils within the Inter-Mountain Basins Rabbitbrush-Big Sagebrush Drainage community are cobbly and very gravelly loam.

The three shrub species, rubber rabbitbrush, yellow rabbitbrush, and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), are codominant within the Inter-Mountain Basins Rabbitbrush-Big Sagebrush Drainage vegetation community. The perennial grass species Sandberg bluegrass is another prominent plant species within this vegetation community. The invasive and non-native annual plant species saltlover and cheatgrass are also abundant in the Inter-Mountain Basins Rabbitbrush-Big Sagebrush Drainage community. Native forb species are not abundant in this vegetation community, but common forb species that are scattered throughout the community include tufted Townsend daisy (*Townsendia scapigera*), Palmer's buckwheat (*Eriogonum palmerianum*), and tufted evening primrose (*Oenothera caespitosa*).

Inter-Mountain Basins Big Sagebrush Shrubland with Encroaching Utah Juniper

The Inter-Mountain Basins Big Sagebrush Shrubland with Encroaching Utah Juniper vegetation community is present in the Relief Canyon Pit and the proposed exploration roads areas. The Inter-Mountain Basins Big Sagebrush Shrubland with Encroaching Utah Juniper contains only scattered Utah juniper and is still dominated by Wyoming big sagebrush. Yellow rabbitbrush, Mormon tea (*Ephedra viridis*), and slender buckwheat (*Eriogonum microthecum*) are also common shrub species within this vegetation community, while Sandberg bluegrass is a prevalent perennial grass, and cheatgrass, an invasive and non-native annual grass, was also abundant. The vegetation community also contains a diverse assortment of forb species, but no single species contributes an absolute cover of five percent or more. Common forb species include cushion buckwheat (*Eriogonum ovalifolium*), spiny phlox (*Phlox hoodii*), longleaf phlox (*Phlox longifolia*), tapertip hawksbeard (*Crepis acuminata*), roughseed cryptantha (*Cryptantha flavoculata*), scabland fleabane (*Erigeron bloomeri*), Bruneau Mariposa lily (*Calochortus bruneauis*), and woollypod milkvetch (*Astragalus purshii*).

Great Basin Black Sagebrush-Utah Juniper Woodland

The Great Basin Black Sagebrush-Utah Juniper Woodland is present in the area of the proposed exploration roads. Similar to the Inter-Mountain Basins Big Sagebrush Shrubland with Encroaching Utah Juniper vegetation community, the presence of Utah juniper in the Great Basin Black Sagebrush-Utah Juniper Woodland community is likely the result of Utah juniper encroaching into the black sagebrush shrubland. However, the density and cover of Utah juniper in the Great Basin Black Sagebrush-Utah Juniper Woodland community is higher than compared to that in the Inter-Mountain Basins Big Sagebrush Shrubland with Encroaching Utah Juniper vegetation community. Black sagebrush and Utah juniper are codominant species, while Wyoming big sagebrush, Mormon tea, rubber rabbitbrush, and yellow rabbitbrush are also abundant shrub species within this vegetation community. Sandberg bluegrass is a prevalent perennial grass, and spiny phlox and tapertip hawksbeard are scattered throughout the community.

Great Basin Sagebrush-Utah Juniper Woodland

The Great Basin Sagebrush-Utah Juniper Woodland vegetation community is present in the proposed exploration roads areas. It is a distinct association of plant species that supports black sagebrush, Wyoming big sagebrush, and Utah juniper as codominant plant species. Although Utah Juniper is a codominant plant species, shrubs dominate this landscape. Rubber rabbitbrush, yellow

rabbitbrush, and Mormon tea are also prevalent shrub. Two invasive and non-native annual grass species, cheatgrass and red brome (*Bromus rubens*) were abundant throughout this vegetation community. The following perennial grass species are scattered throughout the community: Sandberg bluegrass; squirreltail; and Indian ricegrass.

Limestone Outcrop

The Limestone Outcrop community is present in the area of the Relief Canyon pit and the proposed exploration roads. Large limestone rock outcrops dominate the landscape, and the rock outcrops are sparsely covered by various plant species. The most common plant species are Utah juniper, Wyoming big sagebrush, Nevada jointfir, yellow rabbitbrush, cheatgrass, and Sandberg bluegrass.

Disturbed Landscape/Road

The Project Area contains many large areas that are disturbed by roads, cattle and feral horse grazing, mineral exploration, and mining and mineral processing activities. The Disturbed Landscape/Road community is present in the Relief Canyon pit, waste rock storage facilities, processing plant, administrative buildings, and the heap leach pad areas. This community is dominated by invasive and non-native annual plant species that include saltlover, cheatgrass, red brome, burningbush (*Bassia scoparia*), prickly Russian thistle, clasping pepperweed, and meadow barley (*Hordeum brachyantherum*). Due to previous reclamation efforts around the existing mining pits and on the waste rock storage facilities, native plant species also occupy the Disturbed Landscape/Road community. The most common shrub species within these portions of the Disturbed Landscape/Road community are rubber rabbitbrush and shadscale saltbush with scattered patches of Heermann's buckwheat (*Eriogonum heermannii*). Three native annual buckwheat species, Palmer's buckwheat, birdnest buckwheat (*Eriogonum nidularium*), and nodding buckwheat (*Eriogonum cernuum*), are abundant throughout the community. Two common perennial grass species are Sandberg bluegrass and crested wheatgrass (*Agropyron cristatum*) which are both grass species that are commonly included in seed mixes applied during reclamation efforts.

3.15 Wildlife

3.15.1 Regulatory Framework

Section 102.8 of the FLPMA states that the policy of the U.S. is to manage public land in a manner that protects the quality of multiple resources and provides food and habitat for fish, wildlife, and domestic animals. The Public Rangelands Improvement Act of 1978 directs the BLM to improve rangeland conditions with due consideration given the needs of wildlife and their habitats. Wildlife and fish resources and their habitat on public land are managed cooperatively by the BLM and NDOW under a MOU as established in 1971. The MOU describes the BLM's commitment to manage wildlife and fisheries resources habitat, and the NDOW's role in managing population. The NDOW administers state wildlife management and protection programs as set forth in NRS Chapter 501, Wildlife Administration and Enforcement, and NAC Chapter 503, Hunting, Fishing, and Trapping; Miscellaneous Protective Measures. NRS 501.110 defines the various categories of wildlife in Nevada, including protected categories. NAC 503.010, 503.080, 503.110, and 503.140

list the wildlife species currently placed in the state's various legal categories, including protected species, game species, and pest species.

3.15.2 Assessment Area

The assessment area for general wildlife is the Project Area.

3.15.3 Existing Environment

On January 15, 2014, the NDOW provided data with information on the known or potential occurrence of wildlife resources in the vicinity of the Project. According to the NDOW, the entire Project Area and the four-mile buffer surrounding the Project Area are considered occupied habitat for the pronghorn antelope (*Antilocapra americana*). The eastern mountainous portion of the Project Area and the western and eastern portions of the four-mile buffer surrounding the Project Area serve as occupied mule deer (*Odocoileus hemionus*) habitat. There are no known bighorn sheep (*Ovis canadensis*) or elk (*Cervus elaphus*) distributions that occur within four miles of the Project Area (Enviroscientists 2015a).

The NDOW identified the following non-special status wildlife species as having been observed in the vicinity of the Project Area: Great Basin fence lizard (*Sceloporus occidentalis longipes*); western fence lizard (*Sceloporus occidentalis*); and zebra-tailed lizard (*Callisaurus draconoides*). The following NDOW-listed species of conservation priority also have the potential to occur in the Project Area: desert horned lizard (*Phrynosoma platyrhinos*), long-nosed leopard lizard (*Gambelia wislizenii*); Townsend's big-eared bat (*Corynorhinus townsendii*); and western small-footed myotis (*Myotis ciliolabrum*).

4 ENVIRONMENTAL CONSEQUENCES

The following sections describe the direct and indirect environmental consequences that would result from implementation of the Proposed Action and No Action alternatives. The existing conditions for each resource below can be found in Chapter 3.

4.1 Air Quality

4.1.1 Proposed Action

Criteria Air Pollutants

Dispersion modeling was used to assess potential air quality impacts resulting from pollutant sources associated with Proposed Action activities. These impacts include the operation of stationary and mobile equipment and fugitive emission sources associated with mining and heap leaching activities.

Air emission estimates were calculated based on the maximum material throughput for each applicable time period, using EPA approved AP-42 emission factors (EPA 2009) for the Proposed Action. Table 4.1-1 shows the emissions, in tpy, that were used in the modeling analysis.

Table 4.1-1: Modeled Emission Rates for the Project

Source Category	PM*	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC*	Pb
Point Sources Emissions	3.35	2.90	2.81	101.97	0.49	35.92	2.78	0.000
Fugitive Sources Emissions	302.36	121.60	14.08	186.58	7.23	382.70	8.30	0.002
Project Total (tons/year)	305.71	124.50	16.90	288.55	7.72	418.62	11.08	0.002

*PM and volatile organic compounds (VOC) (not modeled)

Source: Enviroscientists 2015

The results of the NEPA dispersion modeling for the Project Area are presented in Table 4.1-2. This table shows the highest modeled results with the appropriate background concentrations at any point of public access for all pollutant-averaging time combinations, the location (in Universal Transverse Mercator [UTM] North American Datum 1983 [NAD 83] coordinates) of the highest modeled public access receptor, and the lowest applicable standard (NAAQS or Nevada AAQS) for each of the pollutant-averaging time combinations.

Table 4.1-2 shows the emissions from stationary and mobile equipment and fugitive dust emissions associated with the Proposed Action, including background concentrations, would not exceed the NAAQS or Nevada AAQS.

Table 4.1-2: Highest Modeled Air Pollutant Concentrations from the Proposed Action at Receptor Points Accessible to Public

Pollutant	Averaging Time	Met. Data Year	Highest Modeled Receptor Point			Applicable Ambient Standard (µg/m ³)
			Receptor Location ¹		Dispersion Modeling Results (µg/m ³) ²	
			UTM Easting (m)	UTM Northing (m)		
PM ₁₀	24-Hour	2010-2014	396791	4451525	60.91	150
PM _{2.5}	24-Hour	2010-2014	396790	4451450	13.30	35
	Annual	2010	398334	4452557	3.57	12
SO ₂	1-Hour	2010-2014	396757	4451182	3.65	196
	3-Hour	2012	396787	4451175	3.19	1,300
	24-Hour	2010	396786	4451080	0.74	365
	Annual	2011	396786	4451055	0.08	80
CO	1-Hour	2010	400084	4452530	496.93	40,000
	8-Hour	2011	399934	4452532	126.14	10,000
NO ₂	1-Hour	2010-2014	400059	4452530	175.21	188
	Annual	2010	399134	4452544	6.89	100

¹ All coordinates in UTM projection, NAD 83.

² Background concentration values are included.

Source: Enviroscientists 2015

Hazardous Air Pollutants

HAPs emissions were calculated to determine if the Project constituted a major HAPs source. HAPs emissions from the Project would result from the handling of earthen materials, the combustion of the hydrocarbon fuels, the operation of thermal units, and the handling and use of various chemicals. The inventory considers all stationary sources, as well as the process fugitive emissions from mining the open pit and placement of the waste rock in the WSRAs and the processing operations in the heap leach area. The fugitive dust from hauling, waste rock disposal, and blasting are included.

A summary of the total HAPs emissions that would be emitted from the Project is presented in Table 4.1-3. The facility-wide HAPs emissions would be 1.52 tpy. Cyanide compounds would be the highest emitted single HAP at 1.17 tpy. These estimated emissions include both fugitive sources and emissions from the processing facility. The estimated mercury emissions also include emissions of mercury from the thermal units permitted under the MOPTC.

EPA thresholds for any single HAP or all HAPs combined are ten and 25 tpy, respectively. With the exception of Pb, there are no ambient air quality standards for HAPs. HAP emissions would have an incremental impact on the air quality in the vicinity of the Project Area.

Table 4.1-3: Hazardous Air Pollutants Emissions for the Proposed Action

HAPs	Facility Total (tpy)
Benzene	0.07
Toluene	0.029
Xylenes	0.020
Formaldehyde	0.035
Acetaldehyde	0.021
Acrolein	0.0029
Naphthalene	0.011
Antimony	0.00039
Arsenic	0.037
Beryllium	0.0009
Cadmium	0.00043
Chromium	0.026
Cobalt	0.0019
Cyanide (Hydrogen Cyanide Compounds)	1.17
Lead	0.0024
Manganese	0.070
Mercury	0.015
Nickel	0.0061
Selenium	0.00034
Total	1.52

Source: Enviroscientists 2015

Greenhouse Gas Emissions

GHGs include CO₂, CH₄, N₂O, hydro fluorocarbons, per fluorocarbons, and sulfur hexafluorides. GHG emissions from the Project construction and operations specifically include CO₂, CH₄, and N₂O emissions from combustion units. Each GHG has been assigned a global warming potential (GWP) that relates to the potential of the gas to trap heat in the atmosphere over a specified period of time. A relative contribution method has been established by the Intergovernmental Panel on Climate Change (IPCC) to estimate a total GHG weighted emissions based on CO₂ as the reference gas with CO₂e equaling one GWP. The GWP equivalents for CH₄ and N₂O are 25 and 298, respectively. The GHG emission estimate for the Project is presented in Table 4.1-4.

Table 4.1-4: Proposed Project Greenhouse Gas Emissions

GHG	Metric Tons
CO ₂ e	27,135

Source: Enviroscientists 2015

The total Project CO₂e emissions of 27,135 metric tons per year is the GWP that is expected as a result of GHG emissions after the Proposed Action commences. The major portion of CO₂ GHG emissions are from fuel combustion. No GHG data exist for existing conditions at the proposed Project. For the purposes of this analysis, a baseline of zero GHG emissions has been established for reference conditions.

The analysis of Nevada's GHG emissions indicates that for 2010, statewide gross GHG emissions totaled 45 million metric tons (MMt) of CO_{2e}. GHG emissions are expected to increase during the projection period (2011-2030) with an average increase of about 0.3 MMt per year. Total gross GHG emissions are expected to reach 53 MMt CO_{2e} by the year 2030 (NDEP 2013b). GHG emissions from the proposed Project have a potential to introduce an additional 0.027 MMt CO_{2e} within the projected time frame. The amount of GHG emissions is less than one percent of the expected statewide GHG emissions and is considered minimal.

Nationally, the CO₂ emissions as a result of fossil fuel combustion (energy emissions) are projected to increase by 17 percent to 6,447 MMt by the year 2020. For non-energy CO₂ sources, emissions are expected to increase one MMt each year to 396 MMt by 2020. Energy-based CO₂ emissions make up over 99 percent of the total proposed Project GHG emissions. Because the CO₂ emissions from the proposed Project are equivalent to 0.027 MMt, the contribution of the Project to the national projected CO₂ emissions would be less than one percent and is considered minimal.

4.1.2 No Action Alternative

As a result of the No Action Alternative, the existing and authorized Project would continue to operate under current conditions. There would be a temporary increase in emissions during reclamation for approximately three years. Air emissions from the existing operations would not be expected to increase over current levels. See Section 3.1 for a discussion of the current emissions.

4.2 Cultural Resources

4.2.1 Proposed Action

There is one unevaluated site in the Project Area (ASM 2015). Gold Acquisition Corp. would avoid the unevaluated site during all Project activities. In addition, the Proposed Action identifies that inadvertent discoveries of previously undetected cultural resources would be treated as required under 43 CFR 10.4, 43 CFR 3809.420(8)(b), and Section IV of the Protocol. Any such discovery would be immediately reported to the authorized BLM officer. All operations in the immediate area of the discovery would be suspended, and the site would be protected until the authorized officer could develop an appropriate plan for management of the resource. No direct or indirect adverse effects to historic properties are anticipated as a result of implementation of the Proposed Action. Cultural resources are not further analyzed in this EA.

4.2.2 No Action Alternative

The No Action Alternative would not affect cultural resources in the Project Area.

4.3 Invasive, Non-Native Species

4.3.1 Proposed Action

Disturbed sites and recently seeded areas have potential to be invaded and colonized by undesirable species such as noxious weeds and invasive plants. Two noxious weeds – salt cedar and perennial

pepperweed – as well as several invasive species are known to occur in the area affected by the Proposed Action. Indirect impacts would include potential introduction of species from disturbed or reclaimed areas to undisturbed areas of native vegetation. Through implementation of the EPMS outlined in Section 2.1.12 and implementation of the Noxious Weed Monitoring and Control Plan (Enviroscientists 2015b), no appreciable impact is expected.

4.3.2 No Action Alternative

Under the No Action Alternative, the exploration drilling program would continue, and mining and heap leaching activities could continue on previously authorized surface disturbance. Following the completion of these activities, the closure and reclamation of the exploration, mine, and heap leach facilities would take place. Ongoing weed control programs at the Relief Canyon Mine would continue. Successful reclamation of the existing disturbance area would occur sooner, as compared to the Proposed Action, resulting in a vegetation community that would be less susceptible to weed invasion.

4.4 Migratory Birds

4.4.1 Proposed Action

Potential direct and indirect impacts to migratory birds would result from vegetation removal and other activities associated with the Proposed Action; especially if activities disrupt habitats in the nesting and brood-rearing period. The number of acres of undisturbed habitat that would be removed as a result of the Proposed Action by vegetation type is summarized in Table 4.4-1.

Table 4.4-1: Undisturbed Vegetation in the Area of the Proposed Action

Vegetation Community	Acres
Disturbed Inter-Mountain Basins Mixed Salt Desert Scrub	3.9
Disturbed Landscape/Road	34.5
Great Basin Black Sagebrush - Utah Juniper Woodland	2.1
Great Basin Sagebrush - Utah Juniper Woodland	1.7
Great Basin Xeric Mixed Sagebrush Shrubland	0.2
Inter-Mountain Basins Big Sagebrush Shrubland with Encroaching Utah Juniper	17.7
Inter-Mountain Basins Mixed Salt Desert Scrub	114.2
Inter-Mountain Basins Rabbitbrush - Big Sagebrush Drainage	6.0
Limestone Outcrop	2.0

These foraging and breeding habitats are common and widespread in Nevada and the Great Basin. Loss of these areas as a consequence of the Proposed Action would have a negligible effect on species which nest in the area if construction of mine and ancillary facilities were to take place outside of the nesting and brood-rearing period. Raptors that forage over the Project Area would experience a reduced prey base due to a reduction in habitats that support small mammals and insects. Following mining, successful reclamation would create habitat for raptor prey. The reclaimed land would have more grass and forb forage and less mature shrub forage in the

would remove approximately 22 acres of sagebrush/Utah juniper habitat. The loss of this relatively small amount of low value/transitional habitat would not likely affect greater sage-grouse.

Based on the greater sage-grouse baseline studies performed in the Project Area, it appears highly unlikely that greater sage-grouse would utilize the OHMA area within the Project Area because the area lacks the following key habitat features: water sources (SWS 2014), riparian and wet meadows; sagebrush cover greater than 65 percent within the landscape for seasonal habitat use; and cover by shrub species other than big sagebrush (*Artemisia tridentata*).

4.13.2 No Action Alternative

The No Action Alternative would be similar to the Proposed Action.

4.14 Vegetation

4.14.1 Proposed Action

Direct and indirect impacts to vegetation would occur from construction of the proposed expansion of mine facilities. The amount of vegetation removed by community type is summarized in Table 4.4-1. The majority of vegetation would be removed from the Inter-Mountain Basins Mixed Salt Desert Scrub community.

Dust from roads and mining activities could coat vegetation in areas adjacent to or downwind from dust sources. Dust on vegetation would weaken some species and predispose them to insect infestation. Control of fugitive dust on the haul and access roads through the use of water and chemical binders would reduce the amount of dust that would settle on vegetation.

Reclamation and revegetation activities would be in conformance with the BLM and State of Nevada Reclamation regulations. Reclamation and revegetation would minimize the direct impacts to the vegetation communities within the Project Area. Following mining, proposed disturbances including roads, heap leach and waste rock disposal facilities would be reclaimed to attain the desired plant community to support wildlife. Growth media and seeding would not occur within the pit, which would remain unvegetated. Concurrent reclamation during and after mining would likely reestablish permanent and stable vegetation cover within five to ten years; assuming that livestock use of the area is deferred and noxious weeds are controlled. It is unlikely that sagebrush would be reestablished on reclaimed areas and communities of big sagebrush have proven difficult to reestablish on reclaimed land (Vicklund et al. 2004). Reclaimed plant communities would likely differ in species composition from native pre-mining communities. Grasses with low densities of forbs and shrubs would dominate the reclaimed areas.

4.14.2 No Action Alternative

Under the No Action Alternative, the exploration drilling program would continue, mining and heap leaching activities could continue on previously authorized surface disturbance. The No Action Alternative would not affect undisturbed vegetation within the area of the Proposed Action. Implementation of the current approved reclamation plan for the Relief Canyon Mine would result

in establishment of vegetation on those areas to be seeded. Weather, especially drought, livestock grazing, and wildfire would continue to modify plant communities in terms of canopy structure and species diversity. The No Action Alternative would have similar but fewer potential impacts than the Proposed Action because there would be less disturbance.

4.15 Wildlife

4.15.1 Proposed Action

Potential direct and indirect impacts to wildlife would result from removal of 182.3 acres of habitat, which represents the amount of habitat within the area of the Proposed Action that is undisturbed. Loss of habitat would reduce local availability of forage, security, and breeding cover for wildlife inhabiting the area. Species dependent on these disturbed sites would be killed or displaced. Displaced animals may be incorporated into adjacent populations, depending on variables such as species behavior, density, and habitat quality. Adjacent populations may experience increased mortality, decreased reproductive rates, or other responses resulting from competition with displaced individuals. The extent of habitat loss due to displacement would vary among species and individuals. Although a common wildlife response to noise and human presence is displacement, some animals become acclimated to noise, traffic, and other human activities and occupy habitat affected by mine-related disturbance.

Species such as mule deer, pronghorn antelope, bighorn sheep, and coyote have relatively large home ranges. The Project Area represents a relatively small part of the ranges of these species. Specifically, it encompasses less than ten percent of the mule deer distribution within the four-mile buffer area. Occupied pronghorn antelope distribution exists throughout the entire Project Area and the four-mile buffer area. No known occupied bighorn sheep or elk distributions exist in the vicinity of the Project Area (Enviroscientists 2015, Appendix F). The loss of 182.3 acres of habitat would not affect local and regional populations.

Small mammals, lizards, snakes, and insects would be killed by construction activities and vehicle traffic. Often lizards, snakes, and small mammals seek cover underground and removal of soil and rock would result in direct mortality. Small mammals can rapidly colonize reclaimed land, often within one to two years (Hingten and Clark 1984); however, the potential for small mammals to colonize reclaimed areas depends on the diversity and cover of vegetation and proximity to undisturbed habitats that would provide a source for populations of small mammals (Larken et al. 2008).

Approximately 70 acres of habitat would remain as open pit as a result of pit expansion, resulting in a long-term loss of potential habitat for wildlife species that rely on diverse plant communities for food and cover. Raptor species may use the pit wall for nesting or roosting habitat.

4.15.2 No Action Alternative

Under the No Action Alternative, the exploration drilling program would continue, mining and heap leaching activities could continue on previously authorized surface disturbance. The No Action Alternative would not affect populations of wildlife in the Project Area beyond the indirect

effects created by existing mining operations. Closure and reclamation of the Relief Canyon Mine in accordance with approved plans would restore habitat for wildlife. Existing conditions such as weather, habitat, and predation would continue to influence population density in the Project Area.

5 CUMULATIVE EFFECTS

5.1 Introduction

This section describes the cumulative effects that could result from potential impacts of the Proposed Action and the No Action Alternative, when combined with past, present, and reasonably foreseeable future actions (RFFA) in the vicinity of the Project Area.

The CEQ defines cumulative impact as “...*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 (1508.7).*”

5.1.1 Cumulative Analysis Methodology

Assumptions for Cumulative Effects Analysis

Based on the environmental consequences analysis presented in Chapter 4, no direct or indirect impacts on the environment have been identified for the following resources or resource uses:

- Supplemental Authority Elements
 - Areas of Critical Environmental Concern
 - Cultural Resources
 - Environmental Justice
 - Farmlands (Prime or Unique)
 - Fish Habitat
 - Floodplains
 - Forests and Rangelands
 - Human Health and Safety
 - Invasive, Non-native Species
 - Native American Religious Concerns
 - Threatened or Endangered Species
 - Wastes, Hazardous/Solid
 - Water Quality
 - Wetlands and Riparian Zones
 - Wild and Scenic Rivers
 - Wilderness
- Additional Resources
 - Fire Management
 - Forestry and Woodland Resources
 - Lands and Realty
 - Lands with Wilderness Characteristics
 - Noise
 - Paleontological Resources
 - Public Safety

- Recreation
- Special Status Plant Species
- Transportation/Traffic
- Visual Resources
- Wild Horses and Burros

Consequently, no cumulative effects from implementation of the Proposed Action have been identified for these resources and they are not discussed further in this chapter.

The cumulative effects analysis included in this section is based on implementation of the Proposed Action, which has a time frame of approximately ten years for construction, operation, closure, and reclamation (see Section 2.1.1). Conservatively, cumulative or additive impacts (through reclamation) are described for RFFAs for ten years (i.e., through year 2026).

5.1.2 Description of Cumulative Effects Study Area Boundaries

The extent of the cumulative effects study area (CESA) varies for each resource, based on the geographic area of each resource expected to contribute an additive effect when combined with the potential effects of the Proposed Action. As a result, the list of projects or actions considered under the cumulative analysis may vary according to the resource being considered. The CESAs are shown on Figures 5.1.1 and 5.1.2 and described in Table 5.1-1.

Table 5.1-1: Cumulative Effects Study Areas

Resource	CESA Name	CESA size (acres)
Migratory Birds, Soils, Special Status Wildlife Species, Vegetation, Wildlife (General)	Wildlife	174,781
Rangeland Management	Range	254,864
Water Resources	Water Resources	140,294
Air Quality	Air Quality	2,112,456
Geology and Minerals	Geology	2,974
Socioeconomics	Socioeconomics	14,563,564

The Wildlife CESA (174,781 acres/273 square miles [mi²]) is identified as portions of NDOW hunt units 043 and 182 with a northern border of Limerick Canyon and a southern border of Muttelbury Canyon and a township and range line (Figure 5.1.1). The Wildlife CESA was developed to address potential cumulative impacts to soils, vegetation, migratory birds, special status wildlife species, and other wildlife species. This CESA represents the likely maximum extent Project activities could have on these resources.

The Range CESA (254,864 acres/398 mi²) is identified as the South Rochester Allotment (Figure 5.1.1). This CESA was developed to address potential cumulative impacts to rangeland management. This CESA was chosen for rangeland management because the activities associated with the Proposed Action are located within this allotment.

The Water Resources CESA (140,294 acres/219 mi²) is identified as the USGS HUC 5 Packard Wash watershed and the Coeur Rochester ground water model boundary (Figure 5.1.1). This CESA was developed to address potential cumulative impacts to ground water quantity. This CESA was chosen because it represents the Project's hydrologic assessment area.

In addition, a generalized discussion of cumulative effects is presented for air quality, geology, and socioeconomics based on the following geographic areas:

Consistent with the analysis of direct and indirect impacts, the Air Quality CESA is a 50-kilometer (km) buffer around the Project Area, consistent with the USEPA's Guideline on Air Quality Models (Appendix W to 40 CFR Part 51) (CFR, Title 40, Sec 51, Appendix W 2016). This general area is bisected by I-80 and includes the Florida Canyon Mine on the northern end and a portion of the Carson Sink on the southern end (Figure 5.1.2).

The Geology CESA (2,974 acres/five mi²) is identified as the Project Area (Figure 5.1.1). This CESA was developed to address potential cumulative impacts to geology and mineral resources. This CESA represents the most likely maximum extent Project activities could have on geology and mineral resources in the region.

Consistent with the analysis of direct and indirect impacts, the Socioeconomics CESA includes Pershing County, Humboldt County, Lyon County, and Churchill County (Figure 3.10.1). The CESA is based on the location of the Relief Canyon Mine in Pershing County and the potential residence locations of future mine employees in Pershing County, Humboldt County, Lyon County, and Churchill County. Employment, income, and taxes paid to local governments would be most affected in these respective counties.

5.1.3 Past, Present, and Reasonably Foreseeable Future Actions

5.1.3.1 Past and Present Actions

General past and present actions in the Wildlife, Range, and Water Resources CESAs, include mining and exploration, energy production and distribution, wildfire, fuels treatment, livestock grazing and rangeland improvements, ROW construction, and recreation.

Mining and Mineral Development

A range of locatable mineral projects have been developed and mined in BLM's Winnemucca District dating back to the 1860s. Locatable minerals include gold, silver, mercury, tungsten, manganese, molybdenum, copper, barite, sulfur, gypsum, limestone, iron, diatomite, and clay, as well as precious and semiprecious gemstones (BLM 2013a).

A range of past and present surface management plans associated with past and present mineral development are located within the Wildlife, Range, and Water Resources CESAs. Table 5.1-2 provides general statistics as accessed from BLM's Land & Mineral Legacy Rehost 2000 (LR2000) system (BLM 2016a) regarding the acreage of potential disturbance associated with past (expired) and current (authorized) surface management plans and mineral material disposal sites in the Wildlife CESA.

For purposes of cumulative effects analysis, the total number of acres for each case recordation file is assumed to represent the total number of disturbed acres. While some of these acres may have been totally or partially reclaimed or never disturbed at all, these estimates provide a conservative assessment of total past or present disturbance related to mineral development within the CESA. In total, these mineral actions represent approximately 1.8 percent of the total land area within the Wildlife CESA.

Table 5.1-2: Summary of Past and Present Mineral Actions in Wildlife CESA

Case Type	Disposition	Number of Cases (by Individual Serial Numbers)	Range of Size	Total Potential Disturbed Acreage
Surface Management Plan/Notice	Authorized	19	0.12 to 1,741.50 acres	2,611
Surface Management Plan/Notice	Expired	7	0.99 to 4.92 acres	18
Mineral Material Disposal Sites	Authorized	7	4.96 to 200 acres	529
Total	-	33	-	3,158
Percentage of Wildlife CESA (174,781 acres)				1.8

Source: BLM 2016a

All of the expired cases in the Wildlife CESA are less than five acres each. A vast majority of the authorized cases are small, with only four cases exceeding 50 acres. The four larger cases are associated with the Rochester Mine, the existing operations at the Relief Canyon Mine, the Colado Plant, and the Spring Valley exploration project. Another small mine in the area is Nevada Cement Company's limestone mine. This mine is located on private land so it was not listed in the BLM's LR2000 database.

Table 5.1-3 provides general statistics regarding the acreage of potential disturbance associated with past (expired) and current (authorized) surface management plans in the Range CESA. The Rochester Mine, the Colado Plant, and existing operations at the Relief Canyon Mine make up the majority of the total expired and authorized surface management case acres within the entire CESA and in total, these mineral actions represent one percent of the total Range CESA.

Table 5.1-3: Summary of Past and Present Mineral Actions in Range CESA

Case Type	Disposition	Number of Cases (by Individual Serial Numbers)	Range of Size	Total Potential Disturbed Acreage
Surface Management Plan/Notice	Authorized	6	1.4 to 1,741.5 acres	2,543
Surface Management Plan/Notice	Expired	4	1 to 4.99 acres	15
Mineral Material Disposal Sites	Authorized	7	4.96 to 480 acres	970
Total	-	17	-	3,528
Percentage of Range CESA (254,864 acres)				0.1

Source: BLM 2016a

Table 5.1-4 provides general statistics regarding the acreage of potential disturbance associated with past (expired) and current (authorized) surface management plans in the Water Resources CESA. The Rochester Mine, the Spring Valley Exploration Project, and existing operations at the Relief Canyon Mine make up the majority of the total expired and authorized surface management case acres within the entire CESA and in total, these mineral actions represent 1.6 percent of the total Water Resources CESA.

Table 5.1-4: Summary of Past and Present Mineral Actions in Water Resources CESA

Case Type	Disposition	Number of Cases (by Individual Serial Numbers)	Range of Size	Total Potential Disturbed Acreage
Surface Management Plan/Notice	Authorized	16	0.11 to 1,741.5 acres	2,262
Surface Management Plan/Notice	Expired	5	0.08 to 4.92 acres	8
Mineral Material Disposal Sites	Authorized	1	20 acres	20
Total	-	22	-	2,290
Percentage of Water Resources CESA (140,294 acres)				1.6

Source: BLM 2016a

The main mineral developments in the three CESAs are the Rochester Mine and the existing operations at the Relief Canyon Mine. The Colado Plant operations are also a main activity in the Wildlife and Range CESAs. The main permitted activities at the Rochester Mine include an open pit gold and silver mine and heap leach operation. BLM approved an amendment in August 2009 for the construction of an additional heap leach pad, and the extension of the mine life. EP Minerals' Colado Plant, located near Lovelock, Nevada, currently processes both diatomaceous earth and perlite. Details regarding the existing Relief Canyon Mine operations are discussed in Chapter 2 of this EA.

Energy Production and Distribution

The Nevada BLM Geographic Information Systems (GIS) data (BLM 2016b) contain four individual authorized geothermal leases within the Wildlife CESA, 19 leases within the Range CESA, and one lease within the Water Resources CESA. As shown in Table 5.1-5, two leases are common between the Wildlife and Range CESAs, and one lease is common between the Range and Water Resources CESAs.

Table 5.1-5: Geothermal Lease Summary

Lease Number	Township	Range	Section(s)	Lease Holder
<i>Wildlife CESA</i>				
NVN-079305	27 North	32 East	22, 24, 27, 28	Gradient Resources Inc.
NVN-079306	27 North	32 East	2, 10, 12, 14	Gradient Resources Inc.
NVN-079307	28 North	32 East	34, 36	Gradient Resources Inc.
NVN-079352	28 North	32 East	22, 26	Gradient Resources Inc.
<i>Range CESA</i>				
NVN-074854	26 North	35 East	35	TGP New York Canyon LLC

Lease Number	Township	Range	Section(s)	Lease Holder
NVN-076298	25 North	35 East	1, 2, 3	TGP New York Canyon LLC
NVN-076299	25 North	35 East	10, 11, 12	TGP New York Canyon LLC
NVN-076300	25 North	35 East	14, 15	TGP New York Canyon LLC
NVN-076301	25 North	36 East	6	TGP New York Canyon LLC
NVN-076302	26 North	35 East/36 East	25/29, 30	TGP New York Canyon LLC
NVN-077217	24 North	32 East	6	Ormat Nevada Inc.
NVN-079305	27 North	32 East	22, 24, 27, 28	Gradient Resources Inc.
NVN-079306	27 North	32 East	10, 14	Gradient Resources Inc.
NVN-086890	25 North	35 East	9, 16, 20, 21, 22, 28, 29	TGP New York Canyon LLC
NVN-086893	26 North	36 East	20, 21	TGP New York Canyon LLC
NVN-088404	25 North	31 East/32 East	24, 26/18	Venture Prospects LLC
NVN-088412	25 North	34 East/35 East	24, 25/19, 30	TGP New York Canyon LLC
NVN-088417	25 North	36 East	1, 2, 3, 10, 11, 12	TGP New York Canyon LLC
NVN-088418	25 North	36 East	4, 5	TGP New York Canyon LLC
NVN-088419	26 North	36 East	26, 27, 34, 35, 36	TGP New York Canyon LLC
NVN-088814	26 North	36 East	28, 33	TGP New York Canyon LLC
NVN-090742	26 North	35 East/36 East	13/8, 9, 10, 15, 16, 17, 18	TGP New York Canyon LLC
NVN-090743	26 North	35 East/36 East	22, 23, 24, 26, 27, 34/19	TGP New York Canyon LLC
<i>Water Resources</i>				
NVN-088412	24 North	35 East	6	TGP New York Canyon LLC

Source: BLM 2016b

No producing oil or gas wells have been located within the Winnemucca District. The potential for oil and gas development in the CESAs is considered low.

Wildfire

The BLM reports that throughout the Winnemucca District, a total of 1,127 fires burned a total of 1.8 million acres between 1990 and 2011. Habitat and surface use loss is due to the invasion of cheatgrass in burned areas. An accelerated fire return interval and frequency is observed in cheatgrass-infested areas below 6,500 feet amsl. BLM estimates that two percent of desert sink scrub, 12 percent of the salt desert scrub, 23 percent of sagebrush scrub, two percent of the riparian habitat, four percent of meadows, and six percent of the woodland has been impacted by fire over this time frame (BLM 2013a). Approximately 1.2 million acres burned between 2000 and 2015, throughout the Winnemucca District (BLM 2016b).

Table 5.1-6 presents a summary of fires, recent fire years, and associated acreages impacted within the Air Quality, Wildlife, Range, and Water Resources CESAs. Based on available GIS data, approximately 1,428 acres within the Wildlife CESA burned between 2000 and 2012 (approximately 0.8 percent), approximately 702 acres burned within the Range CESA (approximately 0.3 percent) between 2000 and 2011, and approximately 734 acres within the Water Resources CESA burned between 2006 and 2012 (approximately 0.5 percent). There were no documented wildland fires in the Wildlife CESA between 2013 and 2015, in the Range CESA between 2012 and 2015, or in the Water Resources CESA between 2013 and 2015 (BLM 2016a). Approximately 140,183 acres within the Air Quality CESA burned between 2000 and 2015 (BLM 2016a).

Table 5.1-6: Wildland Fire Acres in the CESAs

Fire Name	Fire Year	Wildlife CESA (acres)	Range CESA (acres)	Water Resources CESA (acres)	Air Quality CESA (acres)
Cottonwood	2000	-	5.5	-	6,121.6
Johnson	2000	-	-	-	36.4
M Pass	2000	-	-	-	37.8
Prince	2000	-	-	-	13,483.7
Star	2000	-	-	-	53.8
400	2001	-	-	-	324.0
Gooseberry	2001	-	-	-	16.1
Humboldt	2001	-	-	-	8.0
Limerick	2001	9.4	-	-	9.4
Peru	2001	-	-	-	1,481.7
Spaulding	2001	-	-	-	68,869.2
Standard	2001	-	-	-	1,280.3
TrinitySmt	2001	-	-	-	10.9
Victory	2001	-	-	-	0.7
Toulon	2002	-	-	-	1,160.7
93 Fire	2006	-	-	-	3.3
Florida	2006	-	-	-	14.7
Inskip Canyon	2006	-	-	-	743.5
LovelockHaystak	2006	-	-	-	0.6
Martin	2006	-	-	-	0.7
McCoy	2006	-	-	-	107.3
McCoy2	2006	-	-	-	50.4
Ragged Top	2006	-	-	-	1.3
Rochester	2006	-	-	2.5	2.5
Sage	2006	-	-	-	27,052.5
Unionville	2006	-	-	-	40.2
Upper Valley	2006	22.6	-	-	22.6
MM 116 Pershing	2007	0.3	-	-	0.3
MM93	2007	-	-	-	0.6
Pole Creek	2007	-	-	-	5.9
Rochester	2007	229.2	-	-	229.2
Sacramento	2007	-	-	-	3.8
Toulon	2007	-	-	-	0.2
7 Troughs	2010	-	-	-	1,667.3
Cottonwood	2010	-	-	-	1,571.4
Imlay 1	2010	-	-	-	0.5
Imlay 2	2010	-	-	-	3.9
Imlay 3	2010	-	-	-	3.1
MM 103 Assist	2010	-	-	-	7.9
Rochester	2010	3.9	-	3.9	3.9
Standard Mine	2010	-	-	-	0.1
John Brown	2011	-	-	-	1.0
Kennedy Summit	2011	-	-	-	36.7
Landfill	2011	-	-	-	1.0
Last Chance	2011	-	-	-	11,617.8
Leach	2011	-	-	-	185.7
Limerick	2011	0.1	-	-	0.1
MM 134	2011	-	-	-	35.3

Fire Name	Fire Year	Wildlife CESA (acres)	Range CESA (acres)	Water Resources CESA (acres)	Air Quality CESA (acres)
MM 142	2011	-	-	-	26.7
MM 146	2011	-	-	-	3.3
MM 91	2011	-	-	-	3.5
New York Canyon	2011	-	696.4	-	696.4
Rye Patch	2011	-	-	-	202.8
Spaulding Canyon	2011	-	-	-	1.0
Thunder Mountain	2011	-	-	-	0.1
Willow Canyon	2011	-	-	-	1,089.8
Willow Creek	2011	-	-	-	66.8
Mine	2012	1,003.7	-	727.7	1,003.7
MM 117	2012	-	-	-	2.4
MM 132	2012	-	-	-	4.9
Oreana	2012	155.1	-	-	155.1
Rocky Canyon	2012	-	-	-	370.5
Victory	2012	-	-	-	11.9
McGee	2013	-	-	-	1.2
Mud	2013	-	-	-	1.0
Rye Patch Canyon	2013	-	-	-	2.7
Coyote 1	2014	-	-	-	1.1
Coyote 2	2014	-	-	-	0.2
Imlay	2014	-	-	-	136.6
Star Creek	2015	-	-	-	181.8
Total		1,427.5	701.9	734.1	140,183.0

Source: BLM 2016b

Effects on vegetation can include loss or partial removal of upland species, potential removal of below ground biomass, soil hydrophobicity, and potential for increasing spread of noxious weeds and invasive grasses. Following each wildfire event, the BLM evaluates and develops appropriate Burned Area Rehabilitation plans to address specific resource concerns. The extent to which a burned area is reseeded is governed by variables that are evaluated on a site-specific basis such as burn intensity, soil stability, and pre-burn conditions. Site evaluations following wildfire events have determined unseeded areas could rehabilitate naturally due to pre-fire vegetative conditions, elevation, precipitation zone, and site potentials.

The Winnemucca District uses an integrated vegetation management strategy to obtain hazardous fuels management objectives. These include assessing vegetation conditions, identifying goals and objectives and implementing management actions to achieve goals and objectives. Common management actions include treatments such as prescribed fire and non-fire hazardous fuel treatments (mechanical, chemical, and biological fuel breaks) to manipulate vegetation to achieve desired vegetation objectives. Treatments are strategically situated to protect human communities and resource values (BLM 2013a). Of the entire acreage within the Winnemucca District, the BLM treated 11,087 acres between 2003 and 2010 via 52 individual projects (BLM 2013a). Main projects included chemical treatments, mowing, seeding, disking, thinning, and prescribed fire.

Livestock Grazing

Grazing allotments administered by the BLM located within the CESAs are summarized in Table 5.1-7 and include the number of active AUMs within each allotment (as a whole). There are seasonal grazing permits for cattle and sheep. Available GIS data identified five allotments within the Wildlife CESA and eight allotments within the Water Resources CESA. One allotment makes up the Range CESA. Livestock grazing, depending on the intensity and duration, can affect the diversity and productivity of plant communities and wildlife habitats.

Table 5.1-7: Grazing Allotments within the CESAs

Allotment Name	Active AUMs	Wildlife CESA (acres)	Range CESA (acres)	Water Resources CESA (acres)
Boyer Ranch Cottonwood Valley	1,790	-	-	67
Coal Canyon-Poker	3,144	55,941	-	15,925
Copper Kettle	2,333	-	-	29,883
Dixie Valley	6,341	-	-	1
Humboldt Sink	1,582	1,438	-	42
Star Peak	3,075	2,009	-	4,271
Rawhide	2,740	41,410	-	4,305
South Rochester	3,186	72,495	254,864	85,800

Source: BLM 2012; BLM 2016b

Rights-of-Way

Rights-of-way (ROWs) within the CESAs include roads and highways, wind development facilities, railroads, power transmission lines, communication sites, telephone lines, and irrigation and other water facilities. Most of these ROWs are linear features crossing portions of the landscape. Permanent disturbances associated with ROWs are typically limited. Approximately 50 individual authorized ROWs are located within the Wildlife CESA with a total of approximately 7,216 acres. Approximately 51 individual authorized ROWs are located within the Range CESA with a total of approximately 4,573 acres. Approximately 24 individual ROWs are located within the Water Resources CESA for a total of approximately 3,830 acres (BLM 2016a).

Recreation

Dispersed recreation occurs throughout the CESAs; however, no specific data are available on the level of uses in the CESAs. The five most popular dispersed recreational activities within the Winnemucca District include OHV use, hunting, pleasure driving and sight-seeing, fishing, and camping (BLM 2013a). The nearest developed recreational facilities to the CESAs include the state-managed Rye Patch Reservoir and Humboldt Wildlife Management Area which includes Toulon Lake and Upper Humboldt Lake. These facilities are located northwest and southwest of the CESAs and offer recreational activities such as boating, hunting, fishing, and camping.

5.1.3.2 Reasonably Foreseeable Future Actions

RFFAs are those actions that are known or could reasonably be anticipated to occur within the CESAs and within a time frame appropriate to the expected impacts from the Proposed Action. For this Project, the time frame for potential future actions is assumed to be the life-of-mine duration (including reclamation), or approximately ten years.

Based upon a review of LR2000 data (BLM 2016a), ten pending mineral surface management cases and two mineral material disposal site cases are currently on file in the Air Quality CESA, with a total acreage of approximately 511 acres (Table 5.1-8). There are 15 pending ROWs on file in the Air Quality CESA.

Table 5.1-8: RFFAs in the Air Quality CESA

Case Type	Serial Number	Applicant	Action Details	Total Potential Disturbed Acreage
MINERAL SURFACE MANAGEMENT (PLAN/NOTICE) AND DISPOSAL SITES				
380910	NVN-082694	Imperial Milling Inc.	Open pit mining	8
380910	NVN-093830	Rye Patch Gold US Inc.	Gold exploration	200
380910	NVN-093831	Rye Patch Gold US Inc.	Gold exploration	200
380913	NVN-092996	Nevada Iron LLC	Iron exploration	0.11
380913	NVN-092998	American Innovative Minerals LLC	Tungsten exploration	1.3
380913	NVN-093025	American Innovative Minerals LLC	Tungsten exploration	0.51
380913	NVN-093341	Discovery Harbour Resources Corporation	Gold exploration	2.7
380913	NVN-094248	Lode Inc.	Sampling	0.001
380913	NVN-094372	Murfield Nevada Inc.	Exploration drilling	2.06
380913	NVN-094495	Dan R. Turner	Exploration trenching	1.5
360413	NVN-087644	BLM	Big Meadows community sand and gravel pit	56
360413	NVN-089573	BLM	Coal Canyon community sand and gravel pit	38.98
RIGHTS-OF-WAY				
281001	NVN-077697	Nevada Cement Co.	Limestone conveyor and road from mine to mill site	53.719
281001	NVN-089325	Pershing County	Rye Patch	10.91

Case Type	Serial Number	Applicant	Action Details	Total Potential Disturbed Acreage
281001	NVN-089327	Pershing County	Spring Valley Road	94.55
281001	NVN-089386	Pershing County	Limerick Canyon Road	64
281001	NVN-091649	Pershing County	Packard Flat Road	10
281001	NVN-092476	Pershing County	American Canyon Road	40
281001	NVN-094492	Not available	Klondike Canyon Road	2.033
285002	NVN-092892	Sierra Pacific Power Co.	Powerline to Western Union radio relay station northwest of Imlay	7.15
285002	NVN-093931	NV Energy	13.2-kV transmission line	115.755
285003	NVN-090074	Nevada Iron LLC	Single-pole electrical transmission line	13
285003	NVN-091829	Sierra Pacific Power Co.	Woodsley power transmission line	6.2
285003	NVN-091976	Sierra Pacific Power Co.	Not available	0.86
285003	NVN-094332	NV Energy	120-kV transmission line	28
289001	NVN-086168	Nevada Specialty Minerals LLC	Split estate	207.346
289001	NVN-092181	Nevada Bureau of Mines and Geology	41 geodetic benchmarks	0.1

Source: BLM 2016a

Based upon a review of LR2000 data (BLM 2016a), five pending mineral surface management cases and one mineral material disposal site case are presently on file in the Wildlife CESA, with a total acreage of approximately 2,613 acres (Table 5.1-9). The largest pending ROW consists of a 13.2-kilovolt (kV) power transmission line proposed to provide power from the Rochester substation to the airway beacon in Pershing County (116 acres).

Table 5.1-9: RFFAs in the Wildlife CESA

Case Type	Serial Number	Applicant	Action Details	Total Potential Disturbed Acreage
MINERAL SURFACE MANAGEMENT (PLAN/NOTICE) AND DISPOSAL SITES				
380910	NVN-064629	Coeur Rochester, Inc.	Gold and silver mining and closure	2,170
380910	NVN-093830	Rye Patch Gold US Inc.	Gold exploration	200
380910	NVN-093831	Rye Patch Gold US Inc.	Gold exploration	200
380913	NVN-094372	Murfield Nevada Inc.	Exploration drilling	2
380913	NVN-094495	Dan R. Turner	Exploration trenching	1.5
360413	NVN-089573	BLM	Coal Canyon community sand and gravel pit	39
RIGHTS-OF-WAY				
281001	NVN-089327	Pershing County	Spring Valley Road	95
281001	NVN-089386	Pershing County	Limerick Canyon Road	64
281001	NVN-091649	Pershing County	Packard Flat Road	10
281001	NVN-092476	Pershing County	American Canyon Road	40
285002	NVN-093931	NV Energy	13.2-kV transmission line	116
285003	NVN-090074	Nevada Iron LLC	Single-pole electrical transmission line	13
285003	NVN-091829	Sierra Pacific Power Co.	Woosley power transmission line	6
285003	NVN-094332	NV Energy	120-kV transmission line	28
289001	NVN-092181	Nevada Bureau of Mines and Geology	41 geodetic benchmarks	0.1

Source: BLM 2016a

Based upon a review of LR2000 data (BLM 2016a), two pending mineral surface management cases and one disposal site case are presently on file in the Range CESA, with a total acreage of approximately 41 acres (Table 5.1-10). A total of five pending ROW cases are recorded in the Range CESA, with a total acreage of approximately 167 acres. The largest pending ROW consists of a 13.2-kV power transmission line proposed to provide power from the Rochester substation to the airway beacon in Pershing County (116 acres).

Table 5.1-10: RFFAs in the Range CESA

Case Type	Serial Number	Applicant	Action Details	Total Potential Disturbed Acreage
MINERAL SURFACE MANAGEMENT (PLAN/NOTICE) AND DISPOSAL SITES				
380913	NVN-092996	Nevada Iron LLC	Iron exploration	0.1
380913	NVN-094372	Murfield Nevada Inc.	Exploration drilling	2
360413	NVN-089573	BLM	Coal Canyon community sand and gravel pit	39
RIGHTS-OF-WAY				
281001	NVN-091649	Pershing County	Packard Flat Road	10
285002	NVN-093931	NV Energy	13.2-kV transmission line	116
285003	NVN-090074	Nevada Iron LLC	Single-pole electrical transmission line	13
285003	NVN-094332	NV Energy	120-kV transmission line	28
289001	NVN-092181	Nevada Bureau of Mines and Geology	41 geodetic benchmarks	0.1

Source: BLM 2016a

Based upon a review of LR2000 data (BLM 2016a), two pending mineral surface management cases and one disposal site case are presently on file in the Water Resources CESA, with a total acreage of approximately 241 acres (Table 5.1-11). A total of eight pending ROW cases are recorded in the Water Resources CESA, with a total acreage of approximately 365 acres. The largest pending ROW consists of a 13.2-kV power transmission line proposed to provide power from the Rochester substation to the airway beacon in Pershing County (116 acres).

Table 5.1-11: RFFAs in the Water Resources CESA

Case Type	Serial Number	Applicant	Action Details	Total Potential Disturbed Acreage
MINERAL SURFACE MANAGEMENT (PLAN/NOTICE) AND DISPOSAL SITES				
380913	NVN-093830	Rye Patch Gold US Inc.	Gold exploration	200
380913	NVN-094372	Murfield Nevada Inc.	Exploration drilling	2
360413	NVN-089573	BLM	Coal Canyon community sand and gravel pit	39
RIGHTS-OF-WAY				
281001	NVN-089327	Pershing County	Spring Valley Road	95
281001	NVN-089386	Pershing County	Limerick Canyon Road	64

Case Type	Serial Number	Applicant	Action Details	Total Potential Disturbed Acreage
281001	NVN-091649	Pershing County	Packard Flat Road	10
285002	NVN-093931	NV Energy	13.2-kV transmission line	116
285003	NVN-090074	Nevada Iron LLC	Single-pole electrical transmission line	13
285003	NVN-094332	NV Energy	120-kV transmission line	28
289001	NVN-092181	Nevada Bureau of Mines and Geology	41 geodetic benchmarks	0.1

Source: BLM 2016a

5.1.3.3 Continuation of Past and Present Actions

Past and present activities/events expected to continue throughout the CESAs include livestock grazing, wildlife habitat management, wildland fires, grazing permit renewals, mining, mineral exploration, and ROW construction. Dispersed recreation would likely increase over time consistent with recent visit and visitor use trends reported by the BLM (BLM 2013a).

5.2 Cumulative Impact Analysis

5.2.1 Air Quality

The Air Quality CESA includes a 50-km radius around the Project Area and consists of approximately 2,112,456 acres (Figure 5.1.2).

5.2.1.1 Impacts from Past and Present Actions

Prior to the implementation of the FCAA, few if any measures to control or minimize impacts to air quality were required. Most mining operations were of smaller scale and consisted of underground operations with small disturbance footprints. Most air quality impacts from these operations consisted of fugitive dust generated during exploration road building, trenching, and mining operations, as well as reclamation operations and travel on dirt roads. Present actions within the Air Quality CESA likely to be contributing to air quality impacts include wildland fire, dispersed recreation, ROW construction, mineral exploration and mining, industrial operations (i.e., construction facilities, power generation facilities, generators, and processing), and transportation networks. These activities are principally contributing point source particulate matter emissions and fugitive dust to the air quality; however, combustion sources also contribute emissions. Table 5.2-1 provides a summary of the emissions from major sources within the Air Quality CESA. These emissions include those sources that have air quality operating permits from the BAPC, vehicle travel on I-80 and other roads, railroads, and the Dixie Valley Geothermal Power Plant.

Historic wildland fires (2000-2015) have burned approximately 140,183 acres within the Air Quality CESA, which is approximately seven percent of the CESA. Authorized and expired mineral exploration and mining notices and plans of operations, as well as mineral material disposal sites, total approximately 17,156 acres of surface disturbance, which is approximately 0.7 percent of the Air Quality CESA. Authorized ROWs, covering approximately 22,716 acres (approximately one percent of the CESA), issued within the Air Quality CESA were issued for facilities that have the potential to create surface disturbance or impact air quality. Impacts to air quality from dispersed recreation are not quantifiable.

Table 5.2-1: Air Quality Emissions within the Air Quality CESA, Tons per Year

Emission Sources	PM	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOC
Facilities	1,843.7	606.1	283.6	761.0	186.5	603.3	102.0
Roads/Vehicles	131.5	131.5	120.8	5,488.2	18.5	5,180.7	272.0
Project Total	305.71	124.5	16.9	288.6	7.7	418.6	11.1
Total	2,280.9	862.0	421.6	6,538.0	212.8	6,202.6	385.0
Percent Cumulative Contribution	13.4	14.4	4.0	4.4	3.6	6.8	2.9

Source: Enviroscientists 2015

5.2.1.2 Impacts from RFFAs

RFFAs within the Air Quality CESA, which may contribute to impacts to air quality, include wildland fire, dispersed recreation, ROW construction (approximately 1,216 acres or approximately 0.06 percent of the CESA), mineral exploration and mining including mineral material disposal sites (approximately 511 acres or approximately 0.02 percent of the CESA), industrial operations (i.e., construction facilities, power generation facilities, generators), and transportation networks. Air quality impacts from RFFAs could include generation of fugitive dust during hard rock mining and exploration. Emissions may also be generated from processing facilities, burning of fossil fuels by heavy equipment and other vehicles, vehicle travel on paved and unpaved roads, and fugitive dust from travel on unpaved roads. Some of these emissions would be localized and subject to BAPC air quality permits and compliance, development of mitigation measures, and implementation of operational performance standards. Others would be more long term and basin wide.

5.2.1.3 Cumulative Impacts

Proposed Action

Each of the identified individual projects within the CESA, including existing and proposed mining operations, emit air pollutants. With the possible exception of motor vehicle emissions, the existing and proposed mining operations are major sources of criteria pollutants within the CESA. The modeling for the Proposed Action shows the levels of these pollutants are below the applicable NAAQS and Nevada AAQS. The Proposed Action contributions to the cumulative air quality environment would not result in cumulative impacts that would exceed the NAAQS and Nevada AAQS. The RFFAs would result in additional emissions similar to those currently emitted

by existing operations within the CESA. In addition, the major sources of pollutants (except for motor vehicle emissions) within the CESA would operate under permitted conditions established by the BAPC.

No Action Alternative

Under the No Action Alternative, incremental cumulative impacts to air quality within the CESA would result from past and present actions and RFFAs; however, the incremental contribution of this alternative would be less than the Proposed Action because there would be fewer mining activities. The cumulative emissions are generally dispersed and the stationary sources would be regulated by the BAPC to ensure impacts would be less than the levels consistent with the ambient air quality standards.

5.2.2 Migratory Birds, Special Status Species, and Wildlife

The CESA for migratory birds, special status species, and other wildlife is the Wildlife CESA. This CESA encompasses approximately 174,781 acres and is shown on Figure 5.1.1.

5.2.2.1 Impacts from Past and Present Actions

Past and present actions that could impact migratory birds, special status species, general wildlife and their habitat include exploration and mining, energy production and distribution, ROW construction and maintenance, livestock grazing, dispersed recreation and wildfires. Impacts to migratory birds, special status species, and other wildlife and their habitat have resulted from the following: 1) indirect impacts from the destruction of habitat associated with building roads and clearing vegetation; 2) indirect impacts from the disruption from human presence or noise; and 3) direct impacts or harm to avian species that result if trees and shrubs containing viable nests were cut down or ground nests destroyed by construction or ranching equipment. Past and present actions associated with mineral development have affected or would affect 3,158 acres, approximately 1.8 percent of the Wildlife CESA. Four geothermal leases have been issued across 12 sections in the CESA; however, there has been little surface disturbance associated with these leases to date.

A total of 1,428 acres (approximately 0.8 percent) have been burned in the Wildlife CESA by wildfire from 2000 through 2012. Fires have increased the cover and density of cheatgrass, which has accelerated the fire return interval in cheatgrass-infested areas. Since many shrubs do not re-sprout after fire, shrub-dominated plant communities (e.g., salt-desert shrub and sagebrush) have been reduced by 12 to 23 percent in Nevada (BLM2013a).

Livestock grazing, depending on the intensity and duration, can affect the diversity and productivity of wildlife habitats. There are approximately 173,293 acres of grazing allotments on BLM-administered land, representing approximately 99 percent of the CESA.

ROWs (defined by BLM case acres) within the CESA occupy 7,216 acres (four percent). Typically, placement of facilities in ROWs remove the habitat permanently (e.g., highways and roads) or alter habitat by soil disturbance (e.g., pipelines and power lines).

Dispersed recreational use in the CESA primarily includes off-highway vehicles (OHV) use, hunting, pleasure driving and camping. These activities can affect biological resources directly through animal mortality and risk of fire, which can kill animals and degrade arid land habitats. Past and present actions in the CESA have resulted in the increased density and distribution of annual grasses that proliferate after fire and grazing and trampling by livestock and wild horse and burros, and other disturbances that reduce the cover of native vegetation.

5.2.2.2 Impacts from RFFAs

Potential impacts to migratory birds, special status species, other wildlife and their habitat from livestock grazing, recreation, ROW construction, mineral exploration, mining, or loss of native vegetation associated with potential wildland fires could occur. Specific impacts from RFFAs would be similar to the specific impacts associated with the past and present actions. There are no specific data to quantify impacts to migratory birds, special status species, and other wildlife or their habitat within the CESA as a result of livestock grazing, recreation, or potential wildland fires. There are approximately 2,613 acres of pending minerals projects identified in the CESA, and approximately 372 acres of pending ROW projects.

5.2.2.3 Cumulative Impacts

Proposed Action

The Proposed Action (approximately 211 acres of temporary habitat removal) would impact approximately 0.1 percent of the CESA. Quantifiable past and present actions and RFFA disturbance in the Wildlife CESA total approximately 14,787 acres, which results in an incremental impact from the Proposed Action of approximately 0.1 percent. Since there are limited quantifiable data for all activities in the CESA, this calculation is a conservative analysis of the potential incremental impact of the Proposed Action. Project-related impacts would be localized and minimized due to implementation of the EPMs outlined in Section 2.1.12 and reclamation. Therefore, based on the above analysis and findings, incremental impacts to migratory birds, special status species, and other wildlife and their habitat as a result of the Proposed Action, when combined with the impacts from the past and present actions and RFFAs, are expected to be minimal.

No Action Alternative

The past and present actions and RFFAs used in this analysis for the Proposed Action would have a similar incremental cumulative impact as the No Action Alternative; however, the No Action Alternative would not result in any additional incremental cumulative impacts beyond the impacts associated with the Proposed Action.

5.2.3 Water Resources

The CESA for water resources is the Water Resources CESA. This CESA encompasses approximately 140,294 acres and is shown on Figure 5.1.1.

5.2.3.1 Impacts from Past and Present Actions

Past and present actions that could impact water quantity include exploration and mining, energy production and distribution, ROW construction and maintenance, livestock grazing, dispersed recreation and wildfires. Past and present actions associated with mineral development have or would affect 2,290 acres, approximately 1.6 percent of the Water Resources CESA. One geothermal lease has been issued across one section in the CESA; however, there has been little surface disturbance associated with this lease.

From 2000 through 2012, 734 acres (approximately 0.5 percent) have been burned in the Water Resources CESA by wildfire. There were no documented wildfires in the Water Resources CESA between 2013 and 2015 (BLM 2016b). Fires have decreased the cover around springs, which may result in an increase to the pumpage of ground water.

Livestock and wild horse and burro grazing, depending on the intensity and duration, can affect the water quantity. Ground water may be pumped to provide emergency water supplies when springs dry up or are affected by too many grazing animals. There are approximately 140,294 acres of grazing allotments on BLM-administered land, representing approximately 100 percent of the CESA.

ROWs (defined by BLM case acres) within the CESA occupy 3,830 acres (2.7 percent). Typically, placement of facilities in ROWs do not affect water quantity. Dispersed recreational use in the CESA primarily includes OHV use, hunting, pleasure driving and camping. These activities generally do not affect water quantity.

5.2.3.2 Impacts from RFFAs

Future land uses and practices that could result in potential impacts to water quantity include agriculture, municipal and rural development, livestock grazing, fuels treatments, wildland fire, ROW construction, minerals exploration, mining, and recreation. Specific impacts from RFFAs would be similar to the specific impacts associated with the past and present actions. There are no specific available data to quantify future water quantity impacts. There are approximately 241 acres of pending minerals projects identified in the CESA, and approximately 365 acres of pending ROW projects that could have impacts to water quantity.

5.2.3.3 Cumulative Impacts

Proposed Action

The Proposed Action (approximately 211 acres) would impact approximately 0.2 percent of the CESA. Quantifiable past and present actions and RFFA disturbance in the Water Resources CESA is approximately 7,460 acres, which results in an incremental impact from the Proposed Action of approximately three percent. Since there are limited quantifiable data for all activities within the CESA, this calculation is a conservative analysis of the potential incremental impact of the Proposed Action. Project-related impacts would be minimized due to implementation of the EPMS outlined in Section 2.1.12 and reclamation of the mine facilities. Based on the above analysis and

findings, incremental impacts to water quantity as a result of the Proposed Action, when combined with the impacts from the past and present actions and RFFAs, would be minimal.

No Action Alternative

The past and present actions and RFFAs used in this analysis for the Proposed Action would have a similar incremental cumulative impact as the No Action Alternative; however, the No Action Alternative would not result in any additional incremental cumulative impacts beyond the impacts associated with the Proposed Action.

5.2.4 Geology and Minerals

The CESA for geology and minerals is the Geology CESA or the Project Area and is shown on Figure 5.1.1.

5.2.4.1 Impacts from Past and Present Actions

Past and present actions that may have impacted or are currently impacting geology and minerals within the CESA include primarily mineral exploration and mining-related actions. Most past and present minerals operations within the CESA consist of mineral exploration, open pit mining, and heap leaching operations associated with the existing activities at the Relief Canyon Mine.

5.2.4.2 Impacts from RFFAs

With the exception of the Proposed Action, there are no known RFFAs that would be expected to occur within the Geology CESA.

5.2.4.3 Cumulative Impacts

Proposed Action

Under the Proposed Action, approximately 10.3 million tons of ore would be mined and processed using heap leach extraction methods; approximately 28.2 million tons of waste rock would be generated over the life of the Project. Implementation of surface disturbing activities associated with the open pit, waste rock storage facility, exploration drilling outside of the existing pit area, and construction of ancillary facilities would affect approximately 211 acres within the Project Area. Impacts to geology and mineral resources would include the potential loss of access to future mineral resources as a result of the permanent placement of the proposed 95.7-acre waste rock storage facility on private land and the partial pit backfill. It is anticipated these surface disturbances would have a minor effect on potential future access to remaining ore and would therefore result in a minor incremental cumulative impact to geology and mineral resources.

No Action Alternative

Less ore would be mined under the No Action Alternative; therefore, no additional cumulative impacts would result from the No Action Alternative beyond those analyzed for the Proposed Action.

5.2.5 Socioeconomics

The CESA for socioeconomics includes Pershing County, Humboldt County, Lyon County, and Churchill County (Figure 3.10.1). The rationale for the CESA formation is based on the location of the Relief Canyon Mine in Pershing County and the potential residence locations of future mine employees in Pershing County, Humboldt County, Lyon County, and Churchill County. Employment, income, and taxes paid to local governments would be most affected in these respective counties.

5.2.5.1 Impacts from Past and Present Actions

Past and present actions within the CESA include a similar range of general land uses as discussed for the Wildlife, Water Quality, and Range CESAs including activities associated with minerals exploration and mining, energy production and distribution, wildfire suppression, fuels treatment, livestock grazing and rangeland improvements, ROW construction, and recreation.

Specific to mining development in the CESA, based on 2013 data from the Nevada Bureau of Mines and Geology (NBMG) (NBMG 2015) four major metal mines are located within Pershing County, including the Relief Canyon Mine, Coeur Rochester Mine, Florida Canyon Mine, and Sunrise Gold Placer Mine, as well as four mines producing industrial minerals including the Colado Mine, Nassau Mine, Nevada Cement Limestone Mine, and Sexton Diatomite Mine. Seven major mines are located in Humboldt County including six gold/silver mines (Hycroft Mine, Lone Tree Complex, Marigold Mine, Pinson Mine, Turquoise Ridge Joint Venture, and Twin Creeks Mine), and one industrial mineral mine (MIN-AD Dolomite Mine). The only major mine in Lyon County is the NCC Fernley Limestone Operations. There are five industrial minerals mines in Churchill County including the Churchill Limestone Mine, Fernley Diatomite Operations, Hazen Diatomite Mine, Huck Salt Mine, and Nightingale Diatomite Mine (NBMG 2015).

Activities such as mining and energy production are part of the existing social and economic climate within the CESA and represent activities that support the existing population, provide continued employment opportunities and income generation, create a demand for public services, and help maintain revenues and defray expenditures for communities/counties within the socioeconomics CESA.

5.2.5.2 Impacts from RFFAs

The RFFAs that are known or could reasonably be anticipated to occur within the CESA over the approximately ten years of the Project life associated with the Proposed Action consist of the same range of activities discussed above, thus supporting continued long-term employment opportunities and economic development.

In addition to the Proposed Action, the BLM is reviewing a proposed mine expansion at the Coeur Rochester Mine, which would primarily expand the existing surface disturbance and project boundary by expanding the Stage IV heap leach pad, extend the mine life at that facility, and provide for closure activities at the mine (BLM 2015). The BLM is also reviewing a proposed mine

expansion at the Hycroft Mine, which would primarily expand the project boundary, increase surface disturbance, and extend the mine life (BLM 2014).

5.2.5.3 Cumulative Impacts

Proposed Action

Past and present actions within the socioeconomics CESA, as well as RFFAs including the Proposed Action, the Coeur Rochester Mine and Hycroft Mine expansions would collectively extend and enhance existing employment opportunities and economic growth in the area by extending operations and offering continued and some additional employment. Cumulative impacts, as a result of the Proposed Action when added to past and present actions and RFFAs, are expected to be generally positive with extended employment, income, and tax benefits over the ten-year life-of-mine.

On a temporary basis, the Proposed Action, the Coeur Rochester Mine expansion, and Hycroft Mine expansion would provide short-term employment to workers to support construction activities; some overlap with regard to construction timing between the three projects is possible. Many construction workers would likely already reside in the CESA. Based on the proposed maximum employment of 80 workers for the Proposed Action over an approximate ten-year period, it is unlikely the proposed Project would result in measurable changes to the demand for housing, public facilities and services, emergency and health care services, or public education. Anticipated schedules for increases or decreases in employment for RFFAs in the CESA are not known. However, the anticipated use of existing local workers or individuals seeking employment for the additional employment needed for the Proposed Action indicates a modest positive contribution to economic effects and cumulative employment, and minimal to no measurable additional demand for housing or public facilities and services and associated impacts.

Some specialty out-of-state contractors may be required for the three projects over a period of several months (e.g., to install leach pad liners), meaning there would be short-term cumulative effects on temporary housing (hotels), restaurants and other service sectors, as well as community services. Such impacts would be short term and existing facilities within the CESA would likely be adequate to support any short-term influx of construction workers.

No Action Alternative

Under the No Action Alternative, the proposed expansion activities associated with the Relief Canyon Mine would not be approved and, therefore, not have the beneficial impacts in the CESA associated with the Proposed Action. Therefore, the No Action Alternative's incremental cumulative impact when added to past and present actions and RFFAs, is expected to be minimal.

5.2.6 Rangeland Management

The CESA for rangeland management is the Range CESA. This CESA encompasses approximately 254,864 acres and is shown on Figure 5.1.1.

5.2.6.1 Impacts from Past and Present Actions

Past actions likely to have collectively impacted rangeland management include agriculture, municipal and rural development, ROW construction and maintenance, fuels treatments, wildland fire, transportation networks, minerals exploration, mining, and recreation. Building of sumps, fences or other linear features associated with these actions, or off-road travel could have destroyed forage or disrupted the movement of grazing animals. Approximately 3,528 acres of quantifiable past and present mineral actions, 702 acres of wildland fires, and 4,573 acres of ROWs have occurred within the CESA that could have impacted rangeland management.

5.2.6.2 Impacts from RFFAs

Future land uses and practices that could result in potential impacts to rangeland management include agriculture, municipal and rural development, ROW construction and maintenance, fuels treatments, wildland fire, transportation networks, minerals exploration, mining, and recreation. Specific impacts from RFFAs would be similar to the specific impacts associated with the past and present actions. There are approximately 41 acres of quantifiable RFFAs due to minerals activities and 167 acres of ROWs that could impact rangeland management.

5.2.6.3 Cumulative Impacts

Proposed Action

The Proposed Action (approximately 211 acres of temporary forage removal) would impact approximately 0.1 percent of the CESA. Quantifiable past and present actions and RFFA disturbance in the Range CESA total approximately 9,011 acres, which results in an incremental impact from the Proposed Action of approximately two percent. Since there are limited quantifiable data for all activities in the CESA, this calculation is a conservative analysis of the potential incremental impact of the Proposed Action. Project-related impacts would be minimized due to the reclamation of the mining facilities and successful revegetation. Therefore, based on the above analysis and findings, incremental impacts to rangeland management as a result of the Proposed Action, when combined with the impacts from the past and present actions and RFFAs, are expected to be minimal.

No Action Alternative

The past and present actions and RFFAs used in this analysis for the Proposed Action would have a similar incremental cumulative impact as the No Action Alternative; however, the No Action Alternative would not result in any additional incremental cumulative impacts beyond the impacts associated with the Proposed Action.

5.2.7 Soils

The CESA for soils is the Wildlife CESA. This CESA encompasses approximately 174,781 acres and is shown on Figure 5.1.1.

5.2.7.1 Impacts from Past and Present Actions

Past actions likely to have collectively impacted soils include agriculture, municipal and rural development, livestock grazing, rangeland improvements, ROW construction, fuels treatments, wildland fire, transportation networks, minerals exploration, mining, and recreation that disturbed or impacted soils, or that increased erosion or sedimentation. Impacts from these activities include loss of soils productivity due to changes in soil physical properties, soil fertility, soil movement in response to water and wind erosion, and loss of soil structure due to compaction. Approximately 3,158 acres of quantifiable past and present mineral actions, 1,428 acres of wildland fires, and 7,216 of ROWs have occurred within the CESA that could have impacted soils.

5.2.7.2 Impacts from RFFAs

Future land uses and practices that could result in potential impacts to soil erosion include agriculture, municipal and rural development, livestock grazing, rangeland improvements, ROW construction, fuels treatments, wildland fire, transportation networks, minerals exploration, mining, and recreation. Specific impacts from RFFAs would be similar to the specific impacts associated with the past and present actions. There are no specific available data to quantify future soil erosion. There are approximately 2,613 acres of pending minerals projects identified in the CESA, and approximately 372 acres of pending ROW projects that could have impacts to soils.

5.2.7.3 Cumulative Impacts

Proposed Action

The Proposed Action (approximately 211 acres) would impact approximately 0.1 percent of the CESA. Quantifiable past and present actions and RFFA disturbance in the Wildlife CESA is approximately 14,787 acres, which results in an incremental impact from the Proposed Action of approximately one percent. Since there are limited quantifiable data for all activities within the CESA, this calculation is a conservative analysis of the potential incremental impact of the Proposed Action. Project-related impacts would be minimized due to implementation of the EPMS outlined in Section 2.1.12 and reclamation. Therefore, based on the above analysis and findings, incremental impacts to soils as a result of the Proposed Action, when combined with the impacts from the past and present actions and RFFAs, would be minimal.

No Action Alternative

The past and present actions and RFFAs used in this analysis for the Proposed Action would have a similar incremental cumulative impact as the No Action Alternative; however, the No Action Alternative would not result in any additional incremental cumulative impacts beyond the impacts associated with the Proposed Action.

5.2.8 Vegetation

The CESA for vegetation is the Wildlife CESA. This CESA encompasses approximately 174,781 acres and is shown on Figure 5.1.1.

5.2.8.1 Impacts from Past and Present Actions

Past and present actions that could impact vegetation include exploration and mining, energy production and distribution, ROW construction and maintenance, livestock grazing, dispersed recreation and natural phenomena such as wildfires. Past and present actions associated with mineral development have or would affect 3,158 acres, approximately 1.8 percent of the Wildlife CESA. Four geothermal leases have been issued across 12 sections in the CESA; however, there has been little surface disturbance associated with these leases.

From 2000 through 2012, 1,428 acres (approximately 0.8 percent) have been burned in the Wildlife CESA by wildfire. There were no documented wildfires in the Wildlife CESA between 2012 and 2015 (BLM 2016b). Fires have increased the cover and density of cheatgrass, which has accelerated the fire return interval in cheatgrass-infested areas. Since many shrubs do not re-sprout after fire, shrub-dominated plant communities (e.g., salt-desert shrub and sagebrush) have been reduced by 12 to 23 percent in Nevada (BLM2013a).

Livestock and wild horse and burro grazing, depending on the intensity and duration, can affect the diversity and productivity of plant communities and wildlife habitats. There are approximately 173,293 acres of grazing allotments on BLM-administered land, representing approximately 99 percent of the CESA.

ROWs (defined by BLM case acres) within the CESA occupy 7,216 acres (four percent). Typically, placement of facilities in ROWs remove the vegetation permanently (e.g., highways and roads) or alter vegetation by soil disturbance (e.g., pipelines and power lines).

Dispersed recreational use in the CESA primarily includes OHV use, hunting, pleasure driving and camping. These activities can affect biological resources directly through game animal mortality and risk of fire, which can kill animals and degrade arid land habitats, and trampling of vegetation due to off-road vehicle travel. Past and present actions in the CESA have resulted in the increased density and distribution of annual grasses, which proliferate after fire and intense grazing and trampling by vehicles, and other disturbances that reduce the cover of native vegetation.

5.2.8.2 Impacts from RFFAs

RFFAs would have the same potential as past and present activities, such as mining operations, dispersed recreation and natural phenomena to impact vegetation. These actions would likely contribute to habitat fragmentation, displacement of native species, soil loss, and conversion of native vegetation communities with invasive, non-native species. There are approximately 2,613 acres of pending minerals projects identified in the CESA, and approximately 372 acres of pending ROW projects that could have impacts to vegetation.

5.2.8.3 Cumulative Impacts

Proposed Action

The Proposed Action (approximately 211 acres) would impact approximately 0.1 percent of the CESA. Quantifiable past and present actions and RFFA disturbance in the Wildlife CESA is approximately 14,787 acres, which results in an incremental impact from the Proposed Action of approximately one percent. Since there are limited quantifiable data for all activities within the CESA, this calculation is a conservative analysis of the potential incremental impact of the Proposed Action. Project-related impacts would be minimized due to implementation of the EPMS outlined in Section 2.1.12 and reclamation of the mine facilities (including revegetation). Based on the above analysis and findings, incremental impacts to vegetation as a result of the Proposed Action, when combined with the impacts from the past and present actions and RFFAs, would be minimal.

No Action Alternative

The past and present actions and RFFAs used in this analysis for the Proposed Action would have a similar incremental cumulative impact as the No Action Alternative; however, the No Action Alternative would not result in any additional incremental cumulative impacts beyond the impacts associated with the Proposed Action.

6 TRIBES, INDIVIDUALS, ORGANIZATIONS, OR AGENCIES CONSULTED

6.1 Native American Consultation

The following Tribes were consulted as part of government-to-government consultation: Battle Mountain Band, Fallon Paiute and Shoshone Tribe, Lovelock Paiute Tribe, Pyramid Lake Paiute Tribe and Winnemucca Indian Colony. Letters were sent to several tribes. The Battle Mountain Band, Fallon Paiute Shoshone Tribe, and the Pyramid Lake Paiute Tribe received their letters on August 17, 2015; Lovelock Paiute Tribe received their letter on August 24, 2015; and the Winnemucca Indian Colony received their letter on September 24, 2015. All five groups were provided copies of the Preliminary EA on June 9, 2016.

6.2 Coordination and/or Consultation (Agencies)

The USFWS, NNHP, and NDOW were contacted to obtain information on sensitive species that have the potential to occur within the Project Area. The SETT was contacted for information on greater sage-grouse and their habitat.

6.3 Individuals and/or Organizations Consulted

No additional individuals or organizations were consulted for the preparation of this EA.

6.4 Public Outreach/Involvement

A letter and map were sent to a mailing list of potentially interested members of the public on August 14, 2015. Four comment letters were received from private individuals, state agencies, county governments, and interested parties. In addition, two letters of support of the Project were received from Humboldt and Pershing Counties. Concerns identified both internally from BLM and externally from the public centered on ground water, air quality, wildlife, economic and social values, dark skies initiative, rangeland improvements, and invasive/ nonnative plant species. This assisted the BLM in refining issues and in identifying new issues, coordination needs and possible alternatives.

7 LIST OF PREPARERS

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8 REFERENCES

- Applied Analysis. Undated. *Nevada Mining Industry: Summary of the Industry's Economic Impact in Nevada*. http://www.nevadamining.org/issues_policy/pdfs/NMA-Brief05-Economic%20Impact%20Summary.pdf. Accessed September 29, 2015.
- _____. 2014a. *Nevada Mining Industry Global Mineral Production: Where Nevada Stands*. http://www.nevadamining.org/issues_policy/reports.php. Accessed September 3, 2015.
- _____. 2014b. *Nevada Mining Industry Summary of Employment and Wages*. http://www.nevadamining.org/issues_policy/reports.php. Accessed September 3, 2015.
- _____. 2014c. *Nevada Mining Industry Summary of Fiscal Impacts*. http://www.nevadamining.org/issues_policy/reports.php. Accessed September 4, 2015.
- ASM Affiliates (ASM). 2014. *A Class I Overview of Approximately 3,850 Acres in Pershing Gold's Relief Canyon Project Area, Pershing County, Nevada*. Bureau of Land Management Report CRR2-3259. Reno, Nevada.
- _____. 2015. *A Class III Cultural Resources Inventory of 2,753 Acres for the Pershing Gold Relief Canyon Project, Pershing County, Nevada*. Bureau of Land Management Report CRR2-3275. Reno, Nevada.
- Banner Health. 2015. *Services at Banner Churchill Community Hospital*. https://www.bannerhealth.com/Locations/Nevada/Banner+Churchill+Community+Hospital/Programs+and+Services/_Services.htm. Accessed October 13, 2015.
- Bureau of Land Management (BLM). 1992. *Integrated Weed Management*. BLM Manual 9015. December 2, 1992.
- _____. 2011. *What are Noxious and Invasive Weeds?* June 27, 2011. United States Department of the Interior. Available online at: www.blm.gov/wo/st/en/prog/more/weeds/weed_definition.html. Accessed September 17, 2015.
- _____. 2012. Rangeland Administration System. <http://www.blm.gov/ras/>. Accessed February 2016.
- _____. 2013a. *Proposed Winnemucca District Resource Management Plan and Final Environmental Impact Statement*. August 2013.
- _____. 2013b. Winnemucca District Drought Response Plan Environmental Assessment. Notice of Availability letter.
- _____. 2013c. Winnemucca Fire Management Plan Categorical Exclusion (DOI-BLM-NV-W101-2013-0038).

- _____. 2014. Hycroft Mine Expansion Phase 2 ePlanning page. <https://eplanning.blm.gov/epl-frontoffice/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage¤tPageId=57255>. Accessed March 2, 2016.
- _____. 2015. *Coeur Rochester Mine Plan of Operations Amendment 10 and Closure Plan Draft EIS*. <https://eplanning.blm.gov/epl-frontoffice/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage¤tPageId=53138>. Accessed March 2, 2016.
- _____. 2015a. *Pale Kangaroo Mouse*. United States Department of the Interior, Bureau of Land Management. Available online at: http://www.blm.gov/ca/forms/wildlife/details.php?metode=serial_number&search=2814&detaillabelc=Pale%20Kangaroo%20Mouse&detaillabels=Microdipodops%20pallidus. Accessed September 4, 2015.
- _____. 2015b. Winnemucca Fire Operations. United States Department of Interior, Bureau of Land Management. Available online at: http://www.blm.gov/nv/st/en/fo/wfo/blm_programs/Fire_and_Aviation/Operations.html. Accessed September 4, 2015.
- _____. 2016a. *Land & Mineral Legacy Rehost 2000 System – LR2000*. <http://www.blm.gov/lr2000/>. Accessed February 2016.
- _____. 2016b. BLM Nevada Geospatial Data. http://www.blm.gov/nv/st/en/prog/moreprograms/geographic_sciences/gis/geospatial_data.html. Accessed February 2016.
- Bureau of Land Management (BLM) and the Nevada State Historic Preservation Office (SHPO). 2014. *State Protocol Agreement between the Bureau of Land Management and The Nevada State Historic Preservation Office as amended through December 2014*.
- Churchill County. 2015. Churchill County Fire Department website. <http://churchillcounty.org/index.aspx?nid=156>. Accessed October 13, 2015.
- Ciciliano, D., T. Harris, D. Taylor, and D. Zyl. 2008. *Analysis of Economic and Occupational Skill Impacts of the Hard Rock Mining Sector on the Elko Micropolitan S.A. Economy*. University of Nevada, Reno Center for Economic Development. <http://www.unr.edu/Documents/business/uced/technical-reports/elko/08-09-04elko-mining-sector-final.pdf>. Accessed September 29, 2015.
- Dyer Engineers. 2005. *Pit Lake Assessment, Relief Canyon Mine, June 17, 2005*.
- Environmental Protection Agency (EPA). 2008a. *National Ambient Air Quality Standards for Ozone: Final Rule*. Federal Register, 40 CFR Parts 50 and 58. Office of Air Quality Planning and Standards. March 27, 2008.

- _____. 2008b. *National Ambient Air Quality Standards for Lead: Final Rule*. Federal Register, 40 CFR Parts 50, 51, 53, and 58. Office of Air Quality Planning and Standards. November 12, 2008.
- _____. 2009. EPA AP-42 *Emission Factors*. Available online at <http://www.epa.gov/ttn/chief/ap42/index.html>.
- _____. 2010a. *Primary National Ambient Air Quality Standards for Nitrogen Dioxide: Final Rule*. Federal Register, 40 CFR Parts 50 and 58. Office of Air Quality Planning and Standards. February 9, 2010.
- _____. 2010b. *Primary National Ambient Air Quality Standard for Sulfur Dioxide: Final Rule*. Federal Register, 40 CFR Parts 50, 53, and 58. Office of Air Quality Planning and Standards. June 22, 2010.
- _____. 2011. *Review of National Ambient Air Quality Standard for Carbon Monoxide: Final Rule*. Federal Register, 40 CFR Parts 50, 53, and 58. Office of Air Quality Planning and Standards. August 31, 2011.
- _____. 2013. *National Ambient Air Quality Standards for Particulate Matter: Final Rule*. Federal Register, 40 CFR Parts 50, 51, 52, 53 and 58. Office of Air Quality Planning and Standards. January 15, 2013.
- _____. 2015. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2013*. April 15, 2015.
- Enviroscientists, Inc. (Enviroscientists). 2015a. *Relief Canyon Mine Project 2014 Baseline Biological Survey Report*. Two volumes. Prepared for Gold Acquisition Corp. Submitted to the Bureau of Land Management Winnemucca District, Humboldt River Field Office. Submitted April 7, 2015. 663 pages.
- _____. 2015b. *Relief Canyon Mine Project Noxious Weed Monitoring and Control Plan*. Prepared for Gold Acquisition Corp. Submitted to the Bureau of Land Management Winnemucca District, Humboldt River Field Office. Submitted October, 2015. 15 pages.
- _____. 2015c. *Air Quality Impact Assessment to evaluate the Plan of Operations and the Nevada Reclamation Permit Modification (the 2015 Modification) for the Relief Canyon Mine*.
- Fifarek, R. H., D. W. Prihar, L. L. Hillesland, R. J. Casaceli, P. A. Dilles, and D. P. Miggins. 2015. *Tectonostratigraphic Framework and Timing of Mineralization at the Relief Canyon Mine, Pershing County, Nevada*. Geological Society of Nevada Symposium, Volume 1, pp 453 – 482.
- Great Basin College. 2015. *Great Basin College Locations*. <http://www.gbcnv.edu/campus/>. Accessed September 4, 2015.

- Hafner, John C. and Nathan S. Upham. Phylogeography of the Dark Kangaroo Mouse, *Microdipodops megacephalus*: Cryptic Lineages and Dispersal Routes in North America's Great Basin. *Journal of Biogeography*. (2011) 38, 1077-1097.
- Hingten, T.M. and W.R. Clark. *Small Mammals Recolonization of Reclaimed Coal Surface-Mined Land in Wyoming*. *Journal of Wildlife Management* 48: 1255-1261.
- Humboldt County School District. 2015. *About HCSD*. <http://www.hcsdnv.com/about-hcsd>. Accessed September 4, 2015.
- Humboldt General Hospital. 2015. *Hospital Services*. http://www.hghospital.org/Our_Services.aspx. Accessed September 4, 2015.
- Johnson, M. G. 1977. *Geology and Mineral Deposits of Pershing County, Nevada*. Nevada Bureau of Mines and Geology, Bulletin 89.
- Knight Piésold Consulting. 2014a. *Relief Canyon Mine Pit Slope Stability Study*. Prepared for Gold Acquisition Corp.
- _____. 2014b. *Relief Canyon Mine Geochemical Characterization Study*. Prepared for Gold Acquisition Corp.
- _____. 2016. *Relief Canyon Mine Adaptive Waste Rock Management Plan*. Prepared for Gold Acquisition Corp. Relief Canyon Mine Water Pollution Control Permit Major Modification and Renewal – NEV2007105.
- _____. 2016. *Relief Canyon Mine Emergency Response Plan Spill Response Best Management Practices*. Prepared for Gold Acquisition Corp. Relief Canyon Mine Water Pollution Control Permit Major Modification and Renewal – NEV2007105.
- Nevada Bureau of Mines and Geology (NBMG). 2015. *The Nevada Mineral Industry 2013*. Nevada Bureau of Mines and Geology Special Publication MI-2013. <http://pubs.nbmng.unr.edu/The-NV-mineral-industry-2013-p/mi2013.htm>. Accessed March 2, 2016.
- Romin, L.A. and J.A. Muck. 1999. *Guidelines for Raptor Protection from Human and Land Use Disturbance*. United States Fish and Wildlife Service, Utah Field Office. Salt Lake City, Utah. 42 pages.
- Lyon County. 2010. *Lyon County Comprehensive Master Plan*. Lyon County, Nevada.
- Lyon County. 2015. *Fire Department*. <http://www.lyon-county.org/index.aspx?NID=852>. Accessed September 4, 2015.

- Morefield, J.D. 2001. *Nevada Rare Plant Atlas. Nevada Natural Heritage Program, Nevada Department of Conservation and Natural Resources*. Carson City, Nevada. Available online at: <http://heritage.nv.gov/atlas>. Accessed September 4, 2015.
- NatureServe Explorer. 2014. *Sorex preblei* (Preble's Shrew) Range Map. Accessed August 2014 at:
http://explorer.natureserve.org/servlet/NatureServe?searchSpeciesUid=ELEMENT_GLOBAL.2.106475
- Nevada Department of Corrections. 2015. http://doc.nv.gov/Facilities/LCC_Facility/. Accessed September 3, 2015.
- Nevada Department of Education. 2015. *SY15-16 Nevada Public Schools*. http://www.doe.nv.gov/Schools_Districts/Nevada_Schools_and_District_Information/. Accessed September 4, 2015.
- Nevada Department of Employment, Training, and Rehabilitation (NDETR). 2014a. *Nevada Employment and Payrolls 2014*. <http://www.nevadaworkforce.com/>. Accessed September 3, 2015.
- _____. 2014b. *Quarterly Employment & Wages*. <http://www.nevadaworkforce.com/cgi/dataanalysis/industryReport.asp?menuchoice=industry>. Accessed September 3, 2015.
- Nevada Department of Taxation. 2015. *Annual Report Fiscal 2013 – 2014*. http://tax.nv.gov/Publications/Annual_Report/. Accessed September 4, 2015.
- Nevada Division of Public and Behavioral Health (NDPBH). 2015. *Community Health Nursing*. http://dpbh.nv.gov/Programs/ClinicalCN/Clinical_Community_Nursing_-_Home/. Accessed September 4, 2015.
- Nevada State Demographer's Office (NSDO). 2015a. *Nevada 2000 Census Data*. <http://nvdemography.org/nevada-census-2000/census-2000-detailed-data/>. Accessed September 3, 2015.
- _____. 2015b. *2010 Census Profiles by County and Incorporated City*. <http://nvdemography.org/nevada-2010-census/2010-census-profiles-by-county/>. Accessed September 3, 2015.
- _____. 2015c. *Estimates by County, City, and Unincorporated Town for July 1, 2014*. <http://nvdemography.org/data-and-publications/estimates/estimates-by-county-city-and-unincorporated-towns/>. Accessed September 3, 2015.
- Parker, Patricia L., and Thomas F. King. 1998. *Guidelines for Evaluating and Documenting Traditional Cultural Properties*. National Register Bulletin 38. U.S. Department of the Interior, National Park Service, Washington, D.C.

- Pershing County. 2012. Pershing County Master Plan. Pershing County, Nevada.
- Pershing County. 2015a. Fire Department website. <http://pershingcounty.net/index.php/Fire-Department/>. Accessed September 4, 2015.
- Pershing County School District (PCSD). 2015. *Schools*. <http://www.pershing.k12.nv.us/?PN=Schools2>. Accessed September 4, 2015.
- Pershing General Hospital. 2015. *Services*. <http://pershinghospital.org/services/>. Accessed September 4, 2015.
- Peterson, E. 2008. *International Vegetation Classification Alliances and Associations Occurring in Nevada with Proposed Additions 2008 Edition (First)*. March 11, 2008. Nevada Natural Heritage Program, Department of Conservation and Natural Resources, Carson City, Nevada. 347 pages.
- Sagebrush Ecosystem Technical Team (SETT). 2014. *2014 Nevada Greater Sage-grouse Conservation Plan*. Sagebrush Ecosystem Program. State of Nevada. October 1, 2014. Available Online at: http://sagebrusheco.nv.gov/uploadedFiles/sagebrushconvgov/content/home/features/2014_ConsolidatedStatePlan.pdf.
- Schlumberger Water Services (SWS). 2015. *Relief Canyon Mine Baseline Hydrogeological Characterization Report*. Prepared for Gold Acquisition Corp.
- United States Census Bureau (United States Census Bureau). 2015. *QuickFacts Beta*. <http://www.census.gov/quickfacts/table/PST045214/32,32027,32013,32019>. Accessed September 3, 2015.
- United States Geological Survey (USGS). 2005. *Southwest Regional GAP Analysis Project (SWREGAP) - Land Cover Descriptions*. RS/GIS Laboratory, College of Natural Resources, Utah State University. http://earth.gis.usu.edu/swgap/legend_desc.html. Accessed February 11, 2015.
- United States National Archives and Records Administration. 2016. Code of Federal Regulations. Title 40. *Protection of Environment*. http://www.ecfr.gov/cgi-bin/text-idx?SID=653ef7a12e5bbe0affdfeae7ee1b78e8&mc=true&node=ap40.2.51_11205.w&rgn=div9. Accessed March 3, 2016.
- Vicklund, L., G. Schuman, and A. Hild. 2004. Influence of sagebrush and grass seeding rates on sagebrush density and plant size. USDA Forest Service Proceedings RMRS-P-31.
- Welsh Hagen. 2015. *Technical Specifications and Operating Plans*.
- Wildlife Resource Consultants (WRC). 2014. *Relief Canyon Mine 2014 Golden Eagle and Raptor Nesting Surveys Report*. Prepared for Enviroscientists, Inc.

_____. 2015. *Relief Canyon Mine 2015 Golden Eagle and Raptor Nesting Surveys Report*.
Prepared for Enviroscientists, Inc.

9 FIGURES