3.3 Soils and Reclamation

The study area for direct and indirect impacts for soils encompasses the ***area within the*** project boundary. The cumulative effects study area encompasses the project boundary and includes surface disturbance associated with past and present actions and RFFAs within a 30-mile radius of the proposed project.

3.3.1 Affected Environment

Soils in the study area and cumulative effects study area have formed in an arid environment from bedrock residuum, colluvium, widespread deposits of both younger and older alluvium, and isolated windblown deposits (BLM 1996a; Soil Conservation Service [SCS] 1992). The geologic setting in which soil parent materials have formed includes carbonate rocks, siliceous rocks, Tertiary-age volcanics, and sediments weathered from these sources (BLM 1996a). The physiography of the study area and the surrounding region generally consists of north-south trending mountains and foothills separated by extensive alluvial fans and fan piedmonts, fan skirts, and alkali flats on basin floors (SCS 1992).

For these various geomorphic positions, soil-forming factors and general soil characteristics within the cumulative effects study area are similar to those in the study area. As indicated in **Table 3.3-1**, soils on mountain and foothill sideslopes typically are shallow or moderately deep, and contain substantial volumes of gravel or rocks of larger sizes. Soils on the fans generally are deep, and may contain less overall rock or have smaller gravels than the mountain soils. Some soils on the fans have hardpans and/or salt concentrations that are limiting to plant growth. At lower elevations nearer the basin floor, soils on fan skirts or alkali flats are deep with medium or moderately fine textures. They typically have substantial salinity and alkalinity concentrations, and may be seasonally flooded in the lowest topographic positions.

Table 3.3-2 and **Figure 3.3-1** indicate the acreages and locations of soil mapping units within the project boundary as mapped by the SCS (now the Natural Resources Conservation Service [NRCS]). Additional soil survey investigations at a greater level of detail were conducted in the proposed disturbance areas for the Proposed Action (JBR 2005c).

NRCS information indicates that several mapping units dominate the study area, each having a total extent between approximately 3,000 and 7,500 acres (**Table 3.3-2**). These more extensive soil units include Batan silt loam, Creemon – Cren association, Golconda – Dun Glen association, Relley – Broyles association, Oxcorel – Beoska – Whirlo association, and Izod – Rock Outcrop association. General information for these soil mapping units is presented in **Table 3.3-1**.

Growth media salvage, stabilization of disturbance areas, and revegetation efforts in both the study area and cumulative effects study area reflect the evolving practices in the mining industry over time. Modern gold production in the area began in 1968 at the Cortez Mine. Additional expansions of mines and processing facilities occurred in the 1980s and 1990s. CGM has prepared reclamation plans in accordance with state and federal regulations and the Memorandum of Understanding (MOU) between NDEP and BLM that exists for reclamation planning, bonding, implementation, and monitoring.

Table 3.3-1
Summary of Soil Mapping Units and Characteristics

Map Symbol	Soil Association or Series	Dominant Physiographic Position	General Soil Depth (inches)	Dominant Soil Texture	Major Slope Range (percent)	Erosion Hazard (water/wind)	Other Characteristics
161	Batan silt loam	Alluvial flats	60+	Silt loam	0-2	Slight/slight	Salinity/alkalinity
167	Batan-Wendane-Valmy	Alluvial flats, fan skirts	60+	Silt clay loam, fine sandy loam	0-2	Slight/slight	Salinity/alkalinity, occasional flooding
169	Batan-Ocala-Ocala rarely flooded	Alluvial flats	60	Silt loam, silty clay loam	0-2	Slight/slight	Salinity/alkalinity, occasional flooding, seasonal depth to water
173	Beoska-Tenabo	Fan piedmonts	60+, 20	Silty clay loam, gravelly clay loam, very gravelly loamy sand	2-8	Moderate/slight	Salinity/alkalinity at depths below 1 foot, hardpan (Tenabo)
230	Broyles fine sandy loam	Fan skirts	60+	Fine sandy loam over stratified loam to gravelly loamy sand	0-2	Slight/slight	Salinity/alkalinity at depths below 1 foot
282	Chiara-Orovada	Fan piedmonts	16, 60+	Fine sandy loam	2-8	Slight/slight	Hardpan (Chiara)
290	Creemon silt loam	Fan skirts	60+	Very fine sandy loam	0-2	Slight/slight	Salinity/alkalinity
295	Creemon-Cren	Fan skirts, inset fans	60+	Very fine sandy loam, silt loam	0-2	Slight/slight	Salinity/alkalinity
296	Creemon-Hessing	Fan skirts and inset fans	60+	Silt loams over fine sandy loams and gravelly loams	0-2	Slight/slight	Salinity/alkalinity at depths greater than 15 inches
412	Golconda-Dun Glen	Fan piedmonts	20, 60+	Very fine sandy loam, gravelly very fine sandy loam	2-8	Slight/slight	Salinity/alkalinity at depths greater than 10 inches, hardpan (Golconda)
631	McConnel-Tulase	Beach plains an lagoons	60+	Loam, very gravelly sandy loam, silt loam	0-4	Slight/slight	Stoniness at depths greater than 1 foot (McConnel)
671[1]	Whirlo gravelly loam	Alluvial fans	60+	Gravelly loam, extremely gravelly sandy loam	0-8	Slight/slight	Salinity and stoniness at depths greater than 2 feet
706	Orvada-Wieland-Chiara	Fan piedmonts	60+, 60+, 15	Fine sandy loam, gravelly loam, gravelly clay	2-8	Slight/slight	Slight salinity, hardpan (Chiara)
711	Paranat silty clay loam	Floodplains	60+	Silty clay loam to silt loam	0-2	Slight/slight	Frequent flooding, seasonal depth to water
855	Relley-Broyles	Fan skirts, inset fans	60+	Silt loam, very fine sandy loam	0-2	Slight/slight	Salinity/alkalinity, flooding (Broyles)
861[1]	Zineb gravelly loam	Fan aprons, fan skirts	60+	Gravelly loam to extremely cobbly coarse sand	2-8	Slight/slight	Stoniness at depths greater than 1 foot
1091	Tulase silt loam	Fan skirts	60+	Silt loam	2-8	Slight/slight	None
1092	Tulase-Bubus-McConnel	Basin floors, piedmont slopes	60+	Silt loam, sandy loam	2-8	Slight/slight	Salinity/alkalinity (Bubus)
1160	Whirlo gravelly loam	Fan piedmonts	60+	Gravelly loam, extremely gravelly sandy loam	2-8	Slight/slight	Stoniness
1165	Whirlo-Creemon	Inset fans and ephemerals	60+	Very gravelly loam, silt loam	0-4	Slight/slight	Stoniness (Whirlo), hardpan (Creemon)
1169	Whirlo-Broyles	Fan skirts, inset fans	60+	Gravelly loam, extremely gravelly sandy loam	2-8	Slight/slight	Stoniness (Whirlo), Salinity/alkalinity (Broyles)

Table 3.3-1 (Continued)

Map Symbol	Soil Association or Series	Dominant Physiographic Position	General Soil Depth (inches)	Dominant Soil Texture	Major Slope Range (percent)	Erosion Hazard (water/wind)	Other Characteristics
1203[1]	Tulase-Bubus-McConnel	Fan skirts, basin floors	60+	Silt loam, extremely gravelly loamy sand	0-8	Slight/slight	Salinity/alkalinity at depths below 2 feet (Bubus), stoniness below 1 foot (McConnel)
1233[1]	Perwick-Pewitt-Tulase	Insert fans, low hills	All; mostly 20-40 or 10-20	Gravelly loam, gravelly sandy loam, silt loam	2-50	Slight/slight	Depth to rock
1240	Redflame-Kingingham	Fan piedmonts	60+, 20	Very gravelly clay loam, gravelly sandy loam	2-15	Slight/slight	Stoniness, hardpan (Kingingham)
1280	Ricert-Oxcorel-Whirlo	Fan piedmont slopes and summits	60+	Gravelly sandy loam, clay loam, very gravelly sandy loam	2-8	Slight/slight	Salinity/alkalinity, hardpan
1410	Bojo-Stingdorn	Foothills	10	Sandy loam, clay loam, very cobbly clay loam	4-30	Slight/slight	Depth to rock
1453	Atlow-Colbar-Rock Outcrop	Foothills	20	Very gravelly loam , very cobbly clay loan	15-50	Moderate/slight	Stoniness, depth to rock
1600	Disturbed land	Various	Various	Various	Various	Various	
1680	Zineb gravelly loam	Fan skirts	60+	Gravelly loam, extremely cobbly loamy coarse sand	2-8	Slight/slight	Stoniness
2060	Oxcorel-Beoska-Whirlo	Fan piedmonts	60+	Clay loam, silt loam, very gravelly sandy loam	0-8	Slight/slight	Salinity/alkalinity, hardpan, stoniness
2062	Oxcorel-Orovada	Fan piedmonts, fan drainages	60+	Gravelly loam, clay, very gravelly loam, fine sandy loam	2-8	Slight/slight	Alkalinity, hardpan, stoniness below 3 feet
2065	Oxcorel-Oxcorel, moderately steep-Pineval	Fan piedmonts and shoulder slopes	60+	Gravelly loam, very gravelly sandy loam, clay	4-30	Slight/slight	Alkalinity, hardpan, stoniness
2098	Punchbowl-Clanalpine-Sumine	Mountains	10, 20-40	Very gravelly loam, very cobbly clay loam	15-50	Severe/slight	Depth to rock (Punchbowl), stoniness
2104	Grassval-Zineb-Izod	Piedmont slopes	10, 60+, 10	Very gravelly loam	4-15	Moderate/slight	Hardpan (Grassval), stoniness (Zineb), depth to rock (Izod)
2530	Perwick-Puett-Tulase	Foothills	20-40, 10, 60+	Sandy loam, gravelly loam, silt loam	15-50	Moderate/slight	Depth to rock (Puett)
2553	Laped-Stingdorn-Colbar	Foothills	20-30, <20	Cobbly loam, gravelly clay loam	4-30	Slight/slight	Stoniness, hardpan
2561	Puett-Genaw-Orovada	Hills	<20	Very gravelly loam, gravelly loam, fine sandy loam	15-30	Moderate/slight	Depth to rock
2791	Old Camp-Colbar-Rock Outcrop	Mountains	10-20, 20-40	Very cobbly loam	4-30	Slight/slight	Depth to rock, stoniness
2794	Old Camp-Kram Variant-Rock Outcrop	Hills	10-20	Very gravelly loam, very stony clay loam	15-50	Moderate/slight	Depth to rock, stoniness
2802	Old Camp-Rock Outcrop-Colbar, steep	Plateau sideslopes and cliffs	10-20, 20-40	Very cobbly loam, cobbly loam, gravelly clay loam	30-50	Slight/slight	Depth to rock, stoniness

Table 3.3-1 (Continued)

Map Symbol	Soil Association or Series	Dominant Physiographic Position	General Soil Depth (inches)	Dominant Soil Texture	Major Slope Range (percent)	Erosion Hazard (water/wind)	Other Characteristics
3156	Robson-Old Camp-Rock Outcrop	Foothills	10-20	Extremely cobbly loam, very cobbly clay loam	8-15	Slight/Slight	Depth to rock, stoniness
3650	McVegas-Old Camp-Kingingham	Foothills and fan piedmonts	10-20, 20-40	Very cobbly loam, very gravelly loam, gravelly clay loam	15-30	Slight/slight	Depth to rock, stoniness
3661	Dun Glen-Whirlo	Fan skirts and inset fans	60+	Fine sandy loam, very gravelly sandy loam	0-4	Slight/slight	Slight salinity, stoniness below 2 feet (Whirlo)
3691	Izod-Rock Outcrop	Mountains	10-20	Very gravelly loam, extremely cobbly loam	15-50	Slight/Slight	Depth to rock, stoniness
3742	Kelk-Ocala	Alluvial flats	60+	Silt loam, silty clay loam	0-2	Slight/slight	Salinity/alkalinity, seasonal depth to water, occasional flooding
3840	Jung-Norfork-Buffaran	Foothills	<20	Very gravelly loam, very cobbly clay, gravelly clay loam	8-30	Moderate/slight	Depth to rock, depth to hardpan, stoniness
3841	Jung-Itca-Roca	Mountains	10-20, 20-40	Very cobbly loam, very cobbly clay loam	15-50	Moderate/slight	Depth to rock (Jung, Itca), stoniness
3843	Jung, steep-Robson-Jung	Mountains	10-20	Very gravelly loam, very cobbly clay loam	30-50	Moderate/slight	Depth to rock, stoniness, slope

[1] Units located in Eureka County; all others are in Lander County.

Sources: SCS 1992, 1989.

Table 3.3-2
Soils in the Project Boundary

Soil Mapping Unit Symbol	Soil Series or Association Name	Total Acreage in Project Boundary
161	Batan silt loam	3,848
167	Batan-Wendane-Valmy	1,089
169	Batan-Ocala-Ocala rarely flooded	281
173	Beoska-Tenabo	746
230	Broyles fine sandy loam	2,509
282	Chiara-Orovada	241
290	Creemon silt loam	1,114
295	Creemon-Cren	2,854
296	Creemon-Hessing	316
412	Golconda-Dun Glen	3,556
631	McConel-Tulase	643
671[1]	Whirlo gravelly loam	98
706	Orvada-Wieland-Chiara	1,060
711	Paranat silty clay loam	12
855	Relley-Broyles	5,654
861[1]	Zineb gravelly loam	626
1091	Tulase silt loam	146
1092	Tulase-Bubus-McConnel	443
1160	Whirlo gravelly loam	418
1165	Whirlo-Creemon	90
1169	Whirlo-Broyles	1,173
1203[1]	Tulase-Bubus-McConnel	198
1233[1]	Perwick-Pewitt-Tulase	191
1240	Redflame-Kingingham	681
1280	Ricert-Oxcorel-Whirlo	302
1410	Bojo-Stingdorn	280
1453	Atlow-Colbar-Rock Outcrop	1,098
1600	Disturbed land	8,942
1680	Zineb gravelly loam	1,089
2060	Oxcorel-Beoska-Whirlo	3,297
2062	Oxcorel-Orovada	316
2065	Oxcorel-Oxcorel, moderately steep-Pineval	79
2098	Punchbowl-Clanalpine-Sumine	114
2104	Grassval-Zineb-Izod	1,422
2530	Perwick-Puett-Tulase	316
2553	Laped-Stingdorn-Colbar	411
2561	Puett-Genaw-Orovada	152
2791	Old Camp-Colbar-Rock Outcrop	277
2794	Old Camp-Kram Variant-Rock Outcrop	1,446
2802	Old Camp-Rock Outcrop- Colbar, steep	4
3156	Robson-Old Camp-Rock Outcrop	164
3650	McVegas-Old Camp-Kingingham	468
3661	Dun Glen-Whirlo	1,640
3691	Izod-Rock Outcrop	1,568
3742	Kelk-Ocala	73
3840	Jung-Norfork-Buffaran	3,083
3841	Jung-Itca-Roca	885
3843	Jung, steep-Robson-Jung	1,508

[1] These mapping units occur in Eureka County; all others are in Lander County.

Sources: SCS 1992, 1989.

CGM has implemented reclamation plans for disturbed areas at the existing facilities at the Pipeline Complex that are no longer active and has conducted concurrent revegetation and erosion control efforts at selected sites associated with ongoing activities. According to the BLM and NDEP, CGM reclamation efforts have been successful in the area, particularly with respect to revegetation and weed control on reclaimed areas, aesthetic landscape shaping and recontouring, and growth media management (Sherve 2006; Suessmith 2006).

3.3.2 Environmental Consequences

Issues related to soils and reclamation include the following:

- Potential erosional impacts
- Availability of suitable soils and growth media for revegetation
- Potential for successfully reclaiming mine-related disturbance

Environmental impacts to soils would be significant if the Proposed Action or other alternatives result in any of the following:

- Accelerated erosion in excess of soil loss tolerances on waste rock and heap leach facilities or other sloping surfaces.

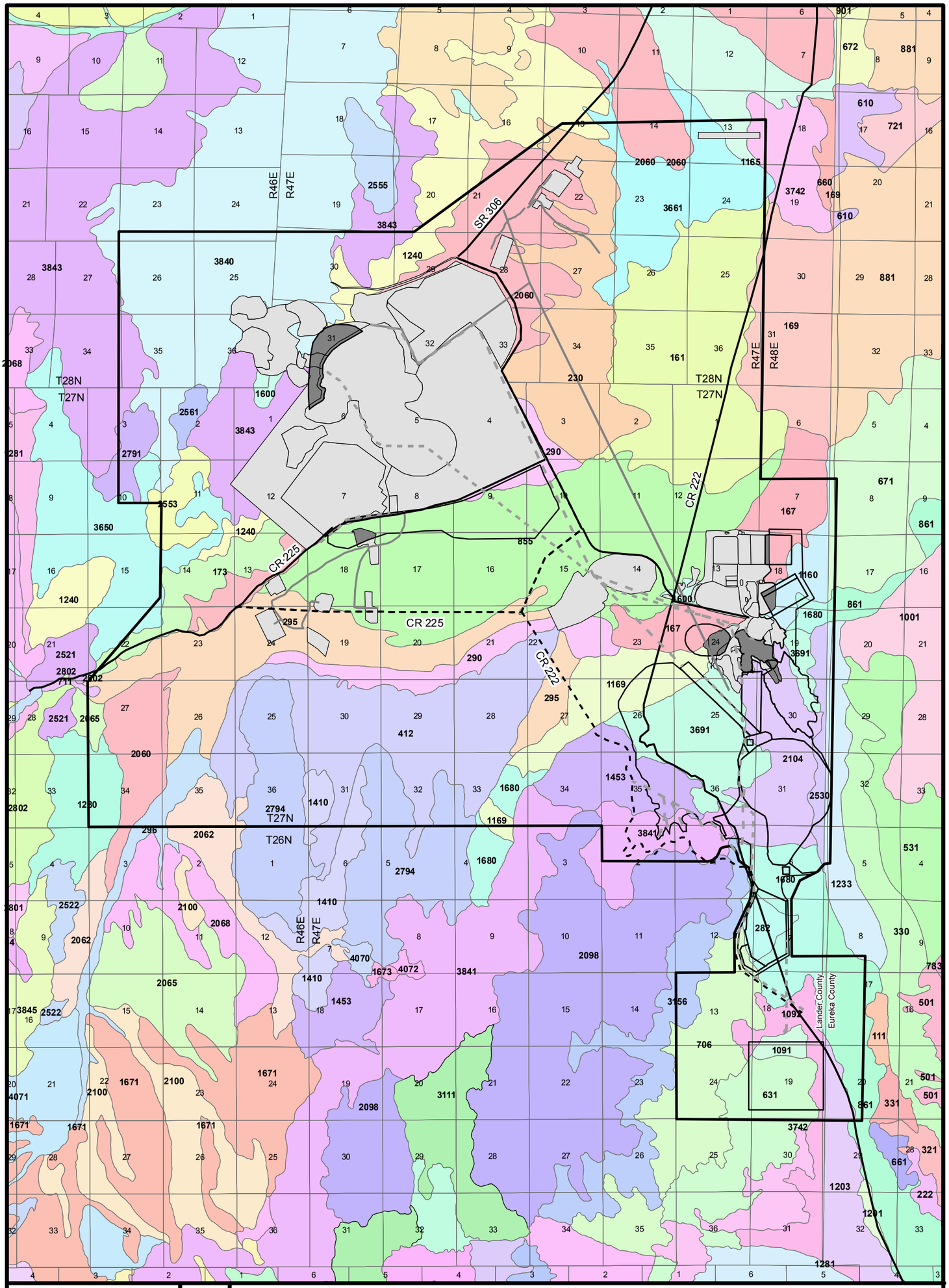
- Substantial decrease in the amount of overall site productivity from pre-mining to post-mining land uses.

- Loss of growth media during stockpiling or reclamation that would limit revegetation success.

During development of mining projects in Nevada, suitable soil resources and/or growth media substitutions are salvaged as land disturbance proceeds. These materials typically are stockpiled and protected for later use in seedbed reconstruction during agency-approved reclamation programs.

State and federal regulatory programs that would address project reclamation are administered by the NDEP and BLM. Within NDEP, the Bureau of Mining Regulation and Reclamation oversees reclamation planning and bonding for state and private lands as required under NAC Chapter 519A.010-519A.415. In addition, a MOU for Mining and Mineral Related Activities exists between NDEP, BLM, and the U.S. Forest Service (USFS) to coordinate the state and federal reclamation programs. Entered into in July 2002, this agreement ensures that adequate reclamation planning and programs address all affected lands within a project boundary.

Under the MOU and applicable regulations, mining companies must develop detailed reclamation plans and establish financial assurances for their successful implementation. Such plans address concurrent reclamation and stabilization practices that are implemented as a project proceeds, as well as post-mining practices that are implemented during the final stages of project completion. Concurrent reclamation typically consists of revegetation, erosion controls, and associated drainage practices that minimize the



Legend

- Project Boundary
- Existing Facilities
- Existing and Proposed Facilities Overlap
- Proposed Facilities
- Existing Roads
- Proposed Road Reroutes
- Existing Linear Features
- Proposed Linear Features

N

0 1 2 3 Miles

Source: NRCS 2006. Note: For key to mapping symbols, refer to **Table 3.3-1.**

Cortez Hills Expansion Project

Figure 3.3-1
NRCS Soil
Mapping Units

06/19/2007

impacts of clearing and accelerated erosion during project activities. Final reclamation is conducted following completion of mining and processing activities. Final reclamation programs are oriented to controlling accelerated erosion, sedimentation, and drainage, as well as protecting public safety and restoring an approved productive land use. Typically, to address this latter objective, productive vegetation communities must be successfully re-established as an outcome of recontouring, growth media reconstruction, and revegetation efforts. In order to achieve revegetation goals, suitable growth media are salvaged and stockpiled or directly redistributed.

As part of agency activities under the CWA, NDEP also administers the USEPA-approved state program to issue National Pollutant Discharge Elimination System (NPDES) permits. This program involves additional regulations for controlling accelerated erosion and sedimentation, stormwater drainage and discharges, and associated water quality. Plans and activities implemented under this program also avoid or minimize potential impacts to soil resources, and promote overall site stabilization as a project proceeds. Water quality regulations and related guidance for mining projects are administered by NDEP under NAC Chapter 445A. These regulations also form part of the inter-agency MOU for Mining and Mineral Related Activities.

3.3.2.1 Proposed Action

Potential impacts to soils as a result of the proposed project would consist of:

- Excavation and removal of existing native soil layers during project construction;
- Vehicle-related compaction of soil layers in unexcavated areas;
- Accelerated wind or water erosion of stockpiled growth media or soils adjacent to disturbed areas; and
- A decrease in soil quality and related vegetation productivity as a result of soil removal, growth media storage and mixing, compaction, or accelerated erosion.

Approximately 6,792 acres of new surface disturbance would result from project development activities under the Proposed Action (see **Table 2-1**). Soil mapping units that are located in proposed disturbance areas are shown in **Figure 3.3-1**. Much of the proposed disturbance in the area of the Cortez and Cortez Hills complexes would occur where the Grassval, Izod, and Zineb soils are mapped (JBR 2000b). There may be as much as 20 percent rock outcrop where the Izod–Rock Outcrop association occurs (e.g., most of the proposed Canyon Waste Rock Facility and the northwestern-most portion of the Cortez Hills Pit). The Izod soil is about 10 inches deep over hard bedrock, and contains extreme volumes of cobbles, gravels, and pebbles. At best, these materials are only marginally suited to salvage and re-use as reclamation growth media. Atlow and Colbar soils occupy the southwestern portion of the proposed Canyon Waste Rock Facility and generally have growth media suitability similar to the Izod-Rock outcrop association. Some deeper and less gravelly soil materials may be recovered from this unit. Approximately 10 percent rock outcrop is included with this unit in mapping.

Most of the proposed Cortez Hills Pit, North Waste Rock Facility, and the adjoining ancillary area are occupied by the Grassval–Zineb–Izod association. Soils in this unit could be salvaged as growth media to a depth of approximately 1 foot. Below this depth, large amounts of less suitable gravels and cobbles or resistant hardpan materials would be encountered. The Grassval soil is shallow (less than 20 inches deep) or very shallow (less than 10 inches deep) over an indurated duripan and has textures of sandy loam to gravelly clay loam. The Izod soil is shallow (less than 20 inches deep) over hard limestone and dolomite and has very gravelly loam textures. The Zineb soil is deep (greater than 40 inches to bedrock or duripan) and has textures of gravelly loam to extremely cobbly sand. All of these soils have thin topsoil layers and accumulations of calcium carbonates or similar salts. These characteristics limit the suitability of these soils for deeper salvage and re-use as seedbed material.

Most of the proposed Cortez Tailings Facility expansion area, and the undisturbed soils at the Cortez Waste Rock Facility expansion area, are occupied by the Batan-Wendane-Valmy soil association. These soils generally are silty, and have elevated salt concentrations. Soil chemistry would limit plant growth. The Wendane soil occasionally is flooded and may be wet during handling. In their natural setting, these soils generally have slight erosion hazards. However, if disturbed and used as growth media on sloping surfaces, these materials would be highly erodible. As a result, they would require minimal slope lengths and gradients, mulch applications, and use of revegetation plant species adapted to moderately or strongly saline/alkaline conditions. Mixing these soil materials with other sources during handling may somewhat alleviate their growth media limitations.

Immediately to the south, the dominant soil unit at the proposed Cortez Heap Leach Facility is the Whirlo gravelly loam. This soil may be salvaged to a depth of 1 foot and possibly up to 2 feet. This is a comparatively more suitable growth media source than most other soils on the nearby foothills and fans. Its main limitation for the growth of adapted plant species would be stoniness, which would limit water-holding capacity.

The soil mapping units that occur at the proposed South Waste Rock Facility would include the Grassval-Zineb-Izod association, Zineb gravelly loam, and the Perwick-Puett-Tulase association. The Grassval-Zineb-Izod association, and the Zineb soil loam, could be recovered to a depth of approximately 1 foot. Growth media materials could be recovered from the Perwick-Puett-Tulase association to depths of approximately 2 feet, where not limited by weathered bedrock. The Puett soil, which is 10 to 20 inches deep over bedrock, typically comprises approximately 30 percent of this mapping unit. Materials from this association generally would be medium to moderately coarse textured, nonsaline, and nonsodic. Where slope steepness allows their recovery, these soils would be comparatively well-suited for use as growth media.

At the proposed Grass Valley Heap Leach Facility, the dominant soil mapping unit is the Chiara-Orovada association. These are medium-textured (loamy) soils. The Chiara soil is shallow (over a durable hardpan) and the Orovada soil is deep. Both are non-saline and non-sodic within depths of approximately 1 foot, and would be suitable as growth media. At the proposed Grass Valley Borrow Area, the McConnel-Tulase soil association is the dominant mapping unit. These soils are loams, fine sandy loams, and silt loams in the upper foot, and are non-saline and non-sodic. Typically the McConnel soil is very gravelly to extremely gravelly below a depth of 1 foot. However, deeper materials may be salvaged where the Tulase soil occurs;

this soil makes up approximately 30 percent of the mapping unit. Either water or wind erosion may be severe on these materials when handled and replaced on project components as growth media. CGM's proposed reclamation practices as discussed in Section 2.4.12, Reclamation, would minimize these impacts.

At the proposed Pipeline Waste Rock Facility expansion area, the dominant soil mapping unit is the Relley-Broyles association. These soils are composed of silts or very fine sandy loams, and have hardpan features below depths of approximately 16 inches (Relley) to 22 inches (Broyles). In addition, coarser (more droughty) soil textures and salt accumulations occur below these depths. Either water or wind erosion may be severe on these materials when handled and replaced on project components as growth media. As described in Section 2.12, Reclamation, CGM's proposed approach for reclaiming the waste rock facilities would involve recontouring sideslopes to 2.5H:1V gradients, creating 15-foot-wide catchment benches spaced on 50- to 200-foot vertical lifts, conducting revegetation efforts, implementing BMPs (e.g., silt fences and sediment traps), and conducting post-reclamation monitoring and maintenance. As stated in Section 2.4.11, Applicant-committed Environmental Protection Measures, CGM would avoid the use of the native silty (Relley-Broyles) soil materials in reclaiming the Pipeline Waste Rock Facility expansion area due to its high erodibility.

Soils at the proposed North Gap Pit expansion area consist of the Redflame-Kingingham association (Mapping Unit Symbol 1240); Jung, steep-Robson-Jung association (Mapping Unit Symbol 3843); and disturbed lands (Mapping Unit Symbol 1600). These interspersed soil units are listed in **Table 3.3-1**, and their locations are shown in **Figure 3.3-1**. All of these units have medium to moderately-fine textured gravelly materials. Potential salvage depths are limited by the depth to bedrock or durable hardpan. The current extent and condition of native soil resources within Mapping Unit 1600 at the pit expansion area are unknown. This may limit the amount of recoverable growth media that occurs in the immediate locale. As a result, suitable growth media from other disturbed areas or existing stockpiles may need to be used for reclamation purposes. This is not expected to create significant impacts.

CGM proposes to salvage the available suitable topsoil materials and supplement them with suitable growth media from alluvial deposits in the proposed project disturbance area. As discussed in Section 2.4.13.3, Growth Media Stockpiling and Use, suitable growth media would be salvaged and stockpiled during the development of the open pits and during construction of the waste rock facilities and heap leach pads for subsequent use in reclamation. Alternately, suitable growth media may be salvaged and directly redistributed on mine-related surface disturbance areas undergoing concurrent reclamation (e.g., waste rock disposal facilities). Identification and protection of growth media stockpiles as required by state and federal regulations would limit the impacts from potential erosion losses due to wind or water to less than significant levels. Growth media recovery may occur along roads and other corridors if materials are not needed for construction of these features. The overall acreage of these features would be minor in comparison to other project components, and significant impacts to soil resources are not expected from their development.

Although the volume of available growth media would be verified during salvage operations, preliminary estimates for the Proposed Action indicate that approximately 9.7 million cubic yards of material could be salvaged from the proposed disturbance areas. The proposed heap leach pads and tailings facilities would

be covered with a minimum depth of 12 inches of growth media; all other facilities to be reclaimed would be covered to a depth of at least 6 inches. Approximately 4.7 million cubic yards of material would be required to cover the project facilities with growth media to these depths. Therefore, an excess of available growth media would be available for the Proposed Action for reclamation purposes.

In addition to growth media salvaged in areas prior to surface disturbance, a substantial quantity of colluvium overburden from the open pits would be available for reclamation. This material would be stockpiled for future reclamation use, or direct hauled and placed during concurrent reclamation.

CGM has investigated potential erosion losses from proposed project components using a Revised Universal Soil Loss Equation analysis (RUSLE) (CGM and SRK ***2008***). Initially developed by the U.S. Department of Agriculture and supplemented by research over several decades, the RUSLE has become an accepted tool for investigating erosion losses and comparing the effectiveness of different erosion control practices. Typically, soil loss tolerances for shallow, poorly developed soils in the western U.S. range from less than 1 to 2 tons per acre per year. Soil loss calculations for the project ranged from 4.1 tons per acre per year on waste rock or leach pad slopes to 0.05 ton per acre per year on the flatter tops of waste rock or heap leach facilities. The average calculated erosion loss for 750-foot-long waste rock or leach pad slopes was 3.0 tons per acre per year, whereas for 250-foot-long slopes, the average calculated erosion loss was 1.53 tons per acre per year. For the tops of waste rock facilities or heaps, the average calculated erosion loss was 0.08 ton per acre per year. From this general comparison, it can be noted that shorter and/or flatter slope lengths have a substantial beneficial effect for minimizing erosion losses.

It should be noted that inputs to any RUSLE analysis involve some degree of professional judgment. Since the equation multiplies the inputs for various factors, these inputs may dramatically influence the outcome. For this reason, the RUSLE is best used as a comparative tool to investigate erosion control practices, rather than as a quantitatively accurate means of predicting specific erosion losses. In several cases, the erodibility factors that were input to the project RUSLE analysis likely were relatively high for the actual growth media materials involved. Therefore, resulting loss estimates likely are conservative. In addition, it should be noted that proposed benches on slopes would capture much of the eroded material; therefore, the eventual sediment yield from a particular component would be less than the overall acreage would indicate. The erosion loss rates were calculated for the third year following reclamation, and it is anticipated that losses would decrease in subsequent years as vegetation becomes more established. Revegetation monitoring and ongoing maintenance and inspection of BMPs during the required reclamation monitoring period would facilitate successful control of accelerated erosion. Under these circumstances, no significant impacts from accelerated erosion are anticipated for most project components.

Overall site productivity is primarily a vegetation measure. Productivity varies with vegetation community, but more importantly, with land management objectives as they relate to which vegetation types are desirable or productive. In contrast, soil quality is an inherent soil resource characteristic involving aeration, permeability, texture, salinity and alkalinity, microbial populations, fertility, and other physical and chemical characteristics that are accepted as beneficial to overall plant growth and establishment. Based on this concept, there would be impacts to the existing quality of native soils from project-related disturbance. Growth media excavation, transport and storage, and redistribution would modify existing soil structure, generating adverse impacts relative to aeration and permeability. It is likely that some mixing of textural

zones would occur, as well as mixing of saline and/or alkaline materials with relatively salt-free materials. This may create adverse chemical impacts to soil quality for seedbeds. Whatever microbial populations currently exist likely would decrease during growth media stockpiling and storage. Due to these probable effects, the initial soil quality of reconstructed seedbeds and root zones would be less than that of the existing soil resources. In addition, compaction from vehicular traffic would occur during construction of proposed transmission line and conveyor routes, decreasing soil quality in those areas. Depending on soil amendment practices, these impacts are likely to persist for 10 years or more. A permanent loss of soil productivity would occur on approximately 1,000 acres in association with development of the proposed Cortez Hills Pit and county road reroutes, which would not be reclaimed. Although the Cortez Pit would not be reclaimed, the proposed additional mining in this pit would be conducted within the existing disturbance footprint. Associated effects to soils as a result of the early Cortez Pit development were addressed in previous NEPA analyses.

Over time, these impacts would be reduced based on CGM's commitment to reclaim project components and successfully restore productive post-mining land uses. These objectives would be attained through the use of BMPs, as well as the use of site-adapted plant species for reseeding, and the application of soil amendments as needed. In addition, state and federal reclamation requirements require revegetation monitoring in comparison with established quantitative standards for the locale. A period of overall reclamation monitoring (and maintenance, as necessary) also is required prior to agency approval of reclamation bond release. Based on these requirements, it is likely that short- to long-term (e.g., up to 10 years or more) decreases in soil quality would not limit the attainment of overall post-mining land use objectives. Over time, soil quality on reclaimed and revegetated sites would resemble pre-mining conditions. Significant effects on the desired post-mining site productivity from soil quality impacts are not anticipated.

3.3.2.2 Grass Valley Heap Leach Alternative

Under this alternative, the proposed Grass Valley Heap Leach Facility would be moved approximately 1.5 miles south of the location under the Proposed Action (**Figure 2-12**). The size and configuration of the alternative heap leach facility generally would be similar to those described for the Proposed Action; however, the ancillary facilities area at the Cortez Hills Complex would increase in size. Under this alternative, soil resources on approximately 7,579 acres would be disturbed, approximately 787 more acres than under the Proposed Action. The types of potential impacts to soil resources would be the same as those described for the Proposed Action. However, the soil in the alternative heap leach area and enlarged ancillary area dominantly consists of the Zineb gravelly loam. This soil is comparatively well-suited to salvage for growth media to a depth of approximately 1 foot. It is likely to be less erodible, but more droughty, than the soils (Chiara, Orovada) occurring at the proposed heap leach facility location. No substantial differences in impacts to soil resources would occur under this alternative in comparison to the Proposed Action.

3.3.2.3 Crescent Valley Waste Rock Alternative

Under this alternative, the Canyon Waste Rock Facility would not be constructed. Alternately, a waste rock facility would be developed in Crescent Valley (**Figure 2-14**). The total disturbance to soils resources under

this alternative would be approximately 6,830 acres, approximately 38 acres more than under the Proposed Action. A variety of deep soils occur on the alluvial fan system at the location of the Crescent Valley Waste Rock Facility (see **Figure 3.3-1**). The most extensive soil mapping units in the undisturbed portion of the locale include Batan-Wendane-Valmy association, Creemon silt loam, Creemon-Cren, Golconda-Dun Glen association, Relley-Broyles association, and Whirlo-Broyles association.

Substantial wind and water erosion hazards are associated with all of these units when handled. However, all of these soils could be recovered to depths of 6 to 18 inches and used for growth media in the reclamation program. Below approximately 5 to 8 inches, the Batan-Wendane-Valmy association has substantial salt accumulations that would limit plant growth. Creemon and Cren soils could be salvaged to depths of approximately 1.5 feet before more limiting salt accumulations in the soils would be recovered in the salvaged growth media. Substantial salinity and alkalinity normally is present in the Golconda soil below a depth of 10 inches, and this would limit the volume of the Golconda-Dun Glen association that could be recovered for growth media purposes. The Relley and Broyles soils are composed of silts or very fine sandy loams, and have hardpan features below depths of approximately 16 inches (Relley) to 22 inches (Broyles). In addition, coarser (more droughty) soil textures and salt accumulations occur below these depths. The Whirlo soil is moderately saline and sodic below depths of approximately 24 inches.

All of these soil materials have silt or very fine sandy loam textures and relatively soft, friable aggregate structure. As a result, they are prone to becoming powder when handled. This characteristic would make growth media recovery and restoration more difficult under this alternative. In addition, the severe hazard of soil erosion from wind and water would be considered a significant impact and likely would require modification of CGM's committed environmental protection measures in order to achieve site stabilization and revegetation success. Impacts to other project components under this alternative would be the same as those described for the Proposed Action.

3.3.2.4 Cortez Hills Complex Underground Mine Alternative

Under this alternative, the disturbance of existing soil resources (approximately 1,790 acres) would be substantially less (by approximately 5,002 acres) than under the Proposed Action, as the surface facilities at the Cortez Hills Complex would not be developed. The soil resources and potential growth media salvage at the expanded Pipeline Waste Rock Facility, expanded Cortez Waste Rock Facility, Cortez Heap Leach Facility, and expanded Cortez Tailings Facility would be the same as those described for the Proposed Action. No significant impacts to soil resources are anticipated from this alternative, and the extent of less-than-significant impacts would be much smaller than under the Proposed Action.

3.3.2.5 Revised Cortez Hills Pit Design Alternative

Under the Revised Cortez Hills Pit Design Alternative, the overall soils disturbance area would be reduced by approximately 159 acres relative to the Proposed Action. The total soils disturbance associated with the Cortez Hills Pit and the Canyon, North, and South waste rock facilities would be reduced by a total of approximately 318 acres (or a reduction of 88, 186, 39, and 5 acres, respectively). The portion of this acreage internal to the Cortez and Cortez Hills complexes would be used as part of the ancillary facilities areas (see Figure 2-21). As a result, the total soils disturbance

in the ancillary facilities areas at the Cortez and Cortez Hills complexes would increase by approximately 159 acres. Most of the soils in these areas are relatively shallow and rocky. Under this alternative, the types of impacts to soil resources would be similar to those described for the Proposed Action. The effects on overall soil quality or growth media characteristics would not change substantially from those described for the Proposed Action.

3.3.2.6 No Action Alternative

Under the No Action Alternative, the proposed Cortez Hills Expansion Project would not be developed, and associated impacts to soils from further mining or processing components would not occur. Under this alternative, the existing Pipeline/South Pipeline Project and Cortez Underground Exploration Project would continue to operate as currently authorized. Ample growth media resources have been salvaged during current mining activities, and reclamation progress has been satisfactory under approved state and federal permits (Sherve 2006; Suessmith 2006). As a result, no significant impacts to soils resources are anticipated under this alternative.

3.3.3 Cumulative Impacts

The cumulative effects study area for soils is shown in **Figure 3.1-10**. Past and present actions and RFFAs are identified in **Table 2-*18*** and shown in **Figure 2-*26***. These actions have resulted, or would result, in approximately 132,912 acres of soil disturbance, approximately half of which is associated with mining-related activities. The Proposed Action incrementally would increase soil disturbance and related impacts in the cumulative effects study area by approximately 6,792 additional acres, resulting in an overall disturbance to soils of 139,704 acres. It is assumed that portions of past mining-related disturbances have been reclaimed, and ongoing reclamation at existing operations would continue to reduce impacts to soils. The incremental addition of soils impacts as a result of the Proposed Action would be temporary in nature for the majority of the project facilities, pending completion of successful reclamation. Based on permitting requirements relative to reclamation, it is assumed that the majority of the soil disturbance and associated impacts as a result of future operations also would be reclaimed and, therefore, temporary.

Cumulative impacts to soil resources under the other action alternatives would be similar to cumulative impacts of the Proposed Action. The cumulative impacts associated with the Grass Valley Heap Leach Alternative would be essentially the same with an incremental increase in cumulative soil disturbance of 787 acres for this alternative. Under the Crescent Valley Waste Rock Alternative, there would be a slight incremental increase in cumulative soil disturbance of approximately 38 acres. ***Under the Revised Cortez Hills Pit Design Alternative, there would be an incremental decrease in cumulative soil disturbance of approximately 159 acres.*** There would be an incremental decrease in cumulative soil disturbance of approximately 5,002 acres associated with the Cortez Hills Complex Underground Mine Alternative.

3.3.4 Monitoring and Mitigation Measures

No monitoring or mitigation is recommended for soils.

3.3.5 Residual Adverse Effects

Residual adverse effects to soils would include the long-term loss of soil productivity from approximately 999 acres of soils associated with the Cortez Hills Pit and county road reroutes, which would not be reclaimed. Following the completion of mining and associated dewatering, groundwater would enter the pit, resulting in the formation of a pit lake.

3.4 Vegetation

3.4.1 Affected Environment

The study area for direct and indirect impacts for vegetation (including special status plants, ethnobotanical plants, invasive and non-native species, and woodland products) includes the ***area within the*** proposed project boundary and riparian or wetland vegetation, if any, within the projected project-related 10-foot groundwater drawdown area. The cumulative effects study area encompasses the project boundary and includes surface disturbance associated with past and present actions and RFFAs within a 30-mile radius of the proposed project and riparian and wetland vegetation within the projected cumulative 10-foot groundwater drawdown area. Potential cumulative effects to plant species of Tribal significance, including harvestable piñons, are discussed in Section 3.9, Native American Traditional Values.

Vegetation types within the study area were identified using a variety of information sources including vegetation type maps provided in the Cortez Gold Mine Expansion Project Draft EIS (BLM 1992), Cortez Pipeline Gold Deposit Draft EIS (BLM 1994), and South Pipeline Project Final EIS (BLM 2000b); vegetation type maps developed by JBR (2005c); and review of USGS orthophotographs (ENSR 2006). General vegetation types that occur within the majority of the study area were based on maps provided in the existing EISs. More detailed mapping of vegetation types was completed for the southeastern portion of the study area where the majority of the project-related proposed disturbance would occur. Vegetation baseline surveys were conducted in the southeastern portion of the study area by JBR in August 2000 and May/June 2005 (JBR 2005c, 2000a). These surveys included quantitative site assessments within representative vegetation types and provided information regarding their floristic and habitat-related attributes. The vegetation types in the study area are presented in **Figure 3.4-1**.

The locations of vegetation types within a landscape are dictated by several environmental factors including elevation, soil type and soil depth, slope, aspect, and precipitation levels. Variations in species composition, densities, and foliar cover within each vegetation type also are affected by minor differences in these environmental factors. The existing disturbed area primarily consists of previously altered vegetation types that have been subjected to various degrees of surface disturbance associated with roads and previously mined land. Some of these areas have been reclaimed and support a diversity of native and introduced species; other areas are sparsely vegetated with native and invasive, non-native species.

3.4.1.1 General Vegetation Types

Three general vegetation types occur in the majority of the study area including shadscale/black greasewood, shadscale/budsage, and sagebrush/grass. Disturbed land also occurs in the study area. The general vegetation types are described in the following sections.

<u>Shadscale/Black Greasewood</u>

This vegetation type occupies approximately 3,000 acres within the study area and occurs in the valley bottoms of Crescent Valley at approximately 5,000 feet amsl. Precipitation in this area is approximately

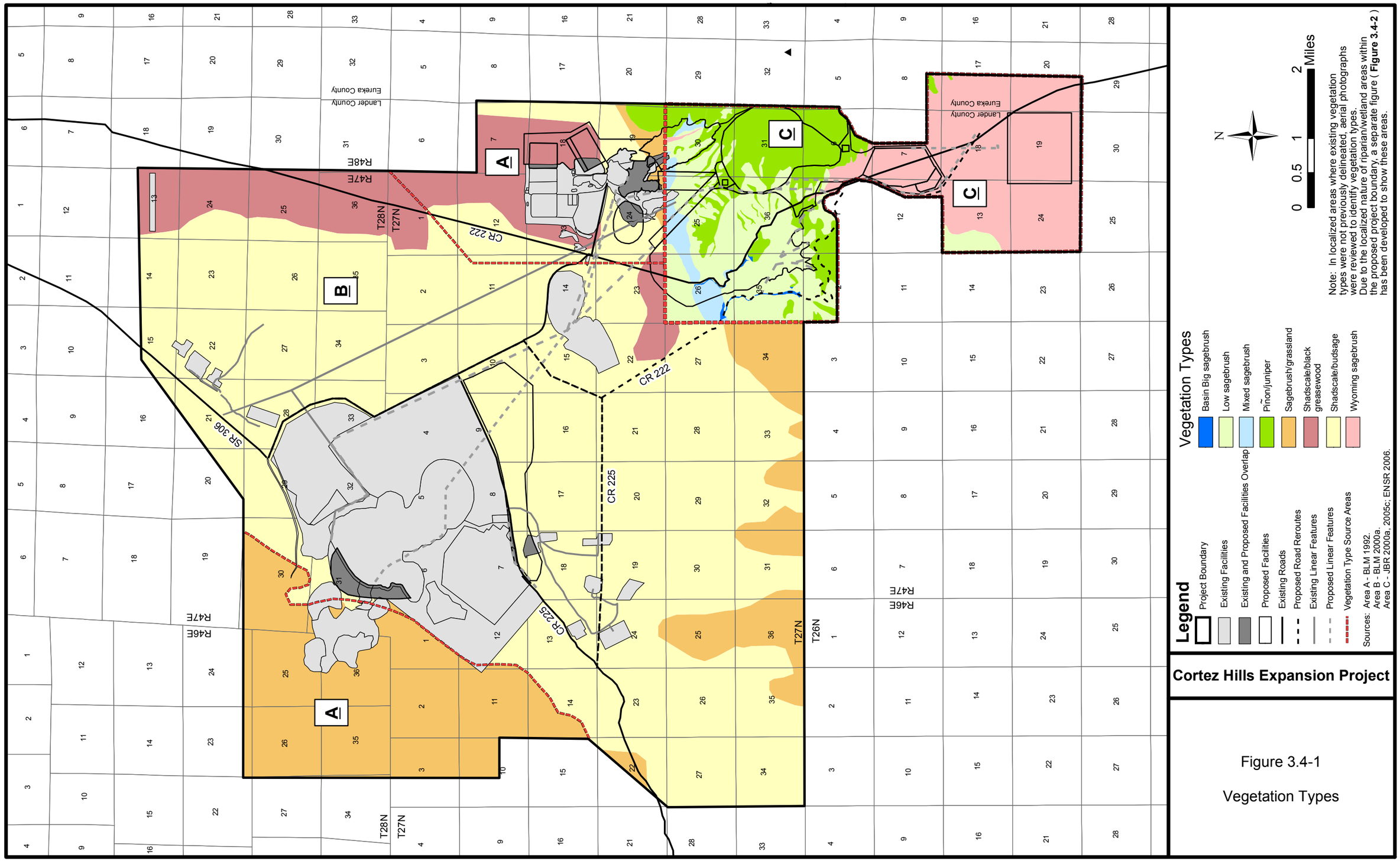
7 inches per year, and soils are strongly alkaline or sodic (i.e., high levels of sodium). This vegetation type is dominated by shrubs and understory vegetation primarily consisting of salt- and sodium-tolerant grass species. Dominant shrubs within this vegetation type include shadscale (*Atriplex confertifolia*), black greasewood (*Sarcobatus vermiculatus*), rubber rabbitbrush (*Chrysothamnus nauseous*), and Nuttall saltbush (*Atriplex nuttalii*). Dominant grass species within the herbaceous understory include basin wildrye (*Elymus cinereus*), alkali sacaton (*Sporobolus airoides*), inland saltgrass (*Distichlis stricta*), bottlebrush squirreltail (*Sitanion hystrix*), and cheatgrass (*Bromus tectorum*). Where disturbed, invasive species that occur in association with this type include Russian thistle (*Salsola iberica*), annual mustards, and halogeton (*Halogeton glomeratus*).

Shadscale/Budsage

This vegetation type occupies approximately 45,000 acres within the study area and occurs within and along the edges of Crescent Valley, which may extend up to 6,000 feet amsl. Annual average precipitation is approximately 7 inches, and soils typically are neutral to strongly alkaline. Indurated duripans (i.e., strongly cemented silica hardpans) are commonly found in many soils associated with this type. This type is dominated by shrubs, such as shadscale and budsage (*Ambrosia dumosa*), and also includes an herbaceous understory primarily consisting of grass species, such as bottlebrush squirreltail (*Sitanion hystrix*), Indian ricegrass (*Oryzopsis hymenoides*), and bluegrass (*Poa* spp.). Common invasive species on disturbed sites within this vegetation type include cheatgrass (*Bromus secalinus*), western tansymustard (*Descurania pinnata*), and halogeton. Other species that may occur less frequently within this type include Mormon tea (*Ephedra viridis*), common sunflower (*Helianthus annuus*), wild onion species (*Allium* spp.), and Indian spinach (*Stanleya pinnata*).

Sagebrush/Grass

This vegetation type occupies approximately 5,000 acres within the study area and occurs along the southern portion of the study area on alluvial fans and in mountains and foothills, which range from approximately 5,000 to 8,500 feet amsl. Average annual precipitation in this zone ranges from 8 to 10 inches and soil types are quite variable. Soils may be neutral to alkaline, shallow to deep, and may or may not be affected by hardpan. This vegetation type is dominated by a variety of shrubs including basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), black sagebrush (*Artemisia arbuscula* ssp. *nova*), low sagebrush (*Artemisia arbuscula* ssp. *arbuscula*), shadscale, Douglas rabbitbrush (*Chrysothamnus viscidiflorus*), and antelope bitterbrush (*Purshia tridentata*). Dominant forb species within the herbaceous understory include phlox (*Phlox* spp.), lupine (*Lupinus* spp.), and arrowleaf balsamroot (*Balsamorhiza sagittata*). Dominant grass species within the herbaceous understory include Indian ricegrass, bluebunch wheatgrass (*Agropyron spicatum*), bluegrass, Idaho fescue (*Festuca idahoensis*), Thurber needlegrass (*Stipa thurberiana*), basin wildrye, and cheatgrass. In addition to cheatgrass, Russian thistle, and halogeton also may invade localized areas within this vegetation type if excessively utilized by livestock or disturbed.


Legend
Project Boundary
Existing Facilities
Existing and Proposed Facilities Overlap
Proposed Facilities
Existing Roads
Proposed Road Reroutes
Existing Linear Features
Proposed Linear Features
Vegetation Type Source Areas
Sources: Area A - BLM 1992.
Area B - BLM 2000a.
Area C - JBR 2000a, 2005c; ENSR 2006.
Vegetation Types
Basin Big sagebrush
Low sagebrush
Mixed sagebrush
Piñon/juniper
Sagebrush/grassland
Shadscale/black greasewood
Shadscale/budsage
Wyoming sagebrush
N
0 0.5 1 2 Miles
Note: In localized areas where existing vegetation types were not previously delineated, aerial photographs were reviewed to identify vegetation types. Due to the localized nature of riparian/wetland areas within the proposed project boundary, a separate figure (Figure 3.4-2) has been developed to show these areas.
Cortez Hills Expansion Project
Figure 3.4-1
Vegetation Types
03/08/2008
A
B
C
SR 306
CR 222
CR 225
T28N
T27N
T26N
R46E
R47E
R48E
Lander County
Eureka County

3.4.1.2 Detailed Vegetation Types

Six detailed vegetation types were identified within the southeastern portion of the study area including low sagebrush, mixed sagebrush, Wyoming sagebrush, basin big sagebrush, piñon-juniper woodland and riparian areas. Disturbed land also occurs in this portion of the study area. The low sagebrush, mixed sagebrush, Wyoming sagebrush, and basin big sagebrush vegetation types that occur in the southeastern portion of the study area correspond with the general sagebrush/grass type that occurs in the south-central portion of the study area.

Low Sagebrush

This vegetation type occupies approximately 2,698 acres within the study area and occurs on alluvial fans and in mountains and foothills above 6,500 feet amsl. It occurs on slopes of all aspects and ridges, but mostly on volcanically derived soils (JBR 2005c). The low sagebrush community type is dominated by stands of low sagebrush and other shrub species including rubber rabbitbrush, matted buckwheat (*Eriogonum caespitosum*), and sulfur buckwheat (*Eriogonum umbellatum*). The understory is primarily composed of Sandberg's bluegrass (*Poa sandbergii*), bottlebrush squirreltail, rayless daisy (*Stenotus acaulis*), desert parsley (*Cymopterus ibapensis*), bitterroot (*Lewis rediviva*), Hood's phlox (*Phlox hoodii*), King's penstemon (*Penstemon kingii*), and long-leaf phlox (*Phlox longifolia*) (JBR 2005c). The total foliar cover for this type is approximately 31 to 33 percent.

Mixed Sagebrush

This vegetation type occupies approximately 395 acres within the study area and occurs on north-facing hillsides at elevations ranging from 5,000 to 6,500 feet amsl. Mixed sagebrush generally occurs with the black sagebrush community and is found primarily on soils derived from sedimentary limestone (JBR 2005c). This type is dominated by dense stands of basin big sagebrush, desert peach (*Prunus andersonii*), bitterbrush, and rubber rabbitbrush. The sparse understory primarily consists of cheatgrass, Sandberg's bluegrass, western tansymustard, and annual stickseed (*Lappula redowski*). The total foliar cover for this vegetation type is approximately 44 percent, with the majority of the cover consisting of black sagebrush and Sandberg's bluegrass.

Basin Big Sagebrush

This vegetation type occupies approximately 25 acres within the study area and occurs at elevations ranging between 4,500 and 6,500 feet amsl. The basin big sagebrush type generally occurs in valley bottoms due to the deep loamy soils and the more mesic conditions (i.e., higher water table) afforded by these topographic positions (JBR 2005c). This type is dominated by dense stands of basin big sagebrush and rabbitbrush. Other shrubs in the overstory include black greasewood and green rabbitbrush (*Chrysothamnus viscidiflorus*). The sparse understory is composed mainly of weedy grasses and forbs, including cheatgrass, povertyweed (*Iva axillaries*), clasping peppergrass (*Lepidium perfoliatum*), western tansymustard, and desert alyssum (*Alyssum desertorum*). An occasional basin wildrye can be observed in this vegetation type, but this native species has substantially declined from expected levels due to past

grazing pressure. The total foliar cover for this vegetation type is approximately 32 to 60 percent, with the majority of the cover consisting of basin big sagebrush and Sandberg's bluegrass.

Wyoming Big Sagebrush

This vegetation type occupies approximately 3,881 acres within the study area and occurs at elevations ranging between 5,700 and 6,500 feet amsl. The Wyoming big sagebrush type is located on alluvial fans, flats, and low slopes in deep soils with high organic matter content (JBR 2005c). The Wyoming big sagebrush community is dominated by stands of Wyoming big sagebrush, rubber rabbitbrush, snakeweed (*Gutierrezia glomeratus*), and green rabbitbrush. The understory is dominated by Sandberg's bluegrass, basin wildrye, balsamroot, Pursh's milkvetch (*Astragalus purshii*), and Hood's phlox (JBR 2005c). The total foliar cover for this vegetation type is approximately 37 percent, with the majority of the cover consisting of Wyoming sagebrush and Sandberg's bluegrass.

Piñon-juniper Woodlands

This vegetation type occupies approximately 2,239 acres within the study area and occurs at elevations ranging from 5,700 to 6,500 feet amsl. The piñon-juniper vegetation type can be found on both north- and south-facing slopes on all types of substrate including limestone, basalt, and chert. In general, the lower elevation south-facing slopes exhibit the lowest vegetative cover and the highest mortality rate. The piñon-juniper type is dominated by Utah juniper (*Juniperus osteosperma*) and singleleaf piñon (*Pinus monophylla*). In addition to these tree species, shrubs in the understory include snowberry (*Symphoricarpus oreophilus*), serviceberry (*Amelanchier alnifolia*), rubber rabbitbrush, green rabbitbrush, low sagebrush, mountain sagebrush, and Wyoming big sagebrush. The sparse understory contains bulbous woodland-star (*Lithophragma glabrum*), silver lupine (*Lupinus argenteus*), Hood's phlox, Thurber needlegrass, and desert allysum (JBR 2005c). This type has an average overstory cover of approximately 15 percent with a range between 4 and 34 percent. Average basal cover of herbaceous species is approximately 4 percent. Other species that may occur within this type less frequently include currants (*Ribes* spp.), chokecherry (*Prunus virginiana*), giant lomatium (*Lomatium dissectum*), foothills deathcamas (*Zigadenus paniculatus*), Bolender's yampah (*Perideridia bolandeii*), stickleaf species (*Mentzelia* spp.), mulesear (*Wyethia amplexicaulis*), and arrowleaf species balsamroot (*Balsamorhiza sagittata*).

Piñon-juniper woodlands throughout the Great Basin and western U.S. have experienced high singleleaf piñon mortality or die-off in the past 10 years. This mortality is due to a number of factors, such as disease, insect herbivory, drought, and past disturbances. The mortality rate of the singleleaf piñon ranged from 70 percent at the lower elevations with considerable past disturbance and poor soils to only 5 to 10 percent at higher elevations on the north-facing slopes with minimal to no past disturbance (JBR 2005c). In general, the north-facing areas that may be less affected by recent drought conditions had lower piñon mortality. Also, areas with less dense piñon-juniper cover had lower mortality rates. The shading and moisture retention of north-facing areas and the less crowded conditions of less dense stands decreases competition for resources and thus, the stress on individual trees. Areas with past disturbance often have more even-aged stands and have greater competition for resources, causing greater die off at those locations.

Both pitch mass borers and pine bark beetles were observed in the study area during the field surveys (JBR 2005c).

Wetland/Riparian

This vegetation type occupies approximately 5 acres within the study area and is associated with seeps and springs. Wetland/riparian areas that occur in the southeastern portion of the study area are illustrated in **Figure 3.4-2**. Dominant hydrophytic species in these wetland/riparian habitats include Baltic rush (*Juncus balticus*) and Nevada bluegrass (*Poa secunda* ssp. *juncifolia*). Along the seep banks, sandbar willow (*Salix exigua*), yellow willow (*Salix lutea*), and elm (*Ulmus* spp.) often were observed. Perennial stream reaches, seeps, and springs in other portions of the study area that support wetland/riparian vegetation are discussed in Section 3.2.1.2, Surface Water Resources, and shown in **Figure 3.2-1**. Cattail species (*Typha* spp.) also may occur in some of the seep and spring areas.

Disturbed

Disturbed areas cover approximately 1,000 acres within the study area. This type is composed of all previously disturbed areas, of which some have been revegetated either naturally or via reclamation. Although the disturbed areas do not comprise a natural vegetation type, the species composition in these areas is different than the adjacent vegetation types. The reclaimed areas are dominated by both native and introduced species. Four-winged saltbrush (*Atriplex canescens*), shadscale, and green rabbitbrush occur along the reclaimed roads. The naturally revegetated road supports pioneering shrub species including Wyoming big sagebrush, green rabbitbrush, and rubber rabbitbrush. Other species observed within previously disturbed areas include cheatgrass, western tansymustard, white-stem blazing star (*Mentzelia albicaulis*), Pursh's milkvetch, desert allysum, crested wheatgrass (*Agropyron cristatum*), hoary cress (*Cardaria draba*), filaree (*Erodium cicutarium*), curly cup gumweed (*Grindelia squarrosa*), basin wildrye, bottlebrush squirreltail, and Sandberg's bluegrass.

3.4.1.3 Special Status Plant Species

Special status plant species include species that are protected under the Endangered Species Act (ESA), species of concern as identified by the U.S. Fish and Wildlife Service (USFWS), and species that are designated as sensitive by the BLM. These species are afforded an additional level of protection by law, regulation, or policy by state or federal agencies.

As defined by the ESA, an endangered species is any species that is in danger of extinction throughout all or a substantial portion of its range. A threatened species is any species that is likely to become endangered within the foreseeable future throughout all or a substantial portion of its range. Proposed species are those that are proposed in the Federal Register by the USFWS to be listed as threatened or endangered. Species of concern are those for which existing information indicates that listing may be warranted, but for which substantial biological information to support a proposed rule is lacking. Species of concern are not specifically afforded the same protection under the ESA as threatened or endangered species, but federal agencies are required to consider them in the agency's planning and decision-making processes. The BLM

also maintains a list of plant and animal species that are designated as sensitive for which population viability is a concern, as warranted by a downward trend in population numbers, density, or habitat conditions that would reduce a species' existing distribution.

Based on correspondence received from the USFWS (2006), BLM Battle Mountain Field Office (2004a), and Nevada Natural Heritage Program (NNHP 2005), no federally threatened, endangered, or proposed plant species potentially occur in or near the study area; however, six BLM sensitive species (three of which also are USFWS species of concern) were identified as potentially occurring in the study area. These species, their associated habitat, and their potential for occurrence in the study area are presented in **Table 3.4-1**. Occurrence potential within the study area was evaluated for each of these six species based on habitat requirements and/or known distribution. Based on these evaluations, two special status plant species (Tiehm's beardtongue and Colorado feverfew) were eliminated from detailed analysis. No state sensitive species have been recorded within the study area (NNHP 2005).

Field surveys were conducted for the Elko rockcress, Nevada willowherb, and windloving buckwheat within the southeastern portion of the study area during June 2000 and May/June 2005 (JBR 2005c; 2000a). None of these species were observed within this portion of the study area. Habitat evaluations and field surveys also were conducted within proposed disturbance areas in other portions of the study area (i.e., Pipeline Waste Rock Facility, proposed new disturbance at the Cortez Complex, conveyor corridor, and CR 222 and CR 225 reroutes) for Eastwood's milkweed and Elko rockcress in 2007 (JBR 2007b). Eastwood's milkweed and Elko rockcress were not observed within the study area (JBR 2007b). Prior to conducting habitat evaluations and field surveys, a request for known occurrences of special status plant species within areas not previously surveyed in 2000 and 2005 was submitted to the NNHP (JBR 2007a). In response to this request, the NNHP would provide the locations of these occurrences, if any, to CGM and the BLM.

3.4.1.4 Ethnobotanical Plant Species

Lomatium dissectum, commonly referred to as desert parsley, bisquitroot, Indian carrot, fern leaf lovage, and giant lomatium, has been valued and harvested for its medicinal properties by Native Americans throughout the west and northwest for centuries (JBR 2002a). More recently this plant species has been harvested commercially for medicinal products. Conditions in the Cortez Mountains provide optimum habitat for *Lomatium dissectum*, and the plant grows in abundance in numerous canyons throughout the range. Surveys were conducted by JBR in 2000 and 2002 for *Lomatium dissectum*; no plant occurrences were observed within the study area (JBR 2002a, 2000a). This species was observed primarily in the upper elevations of the Cortez Mountains (east-northeast of the study area).

3.4.1.5 Invasive and Non-native Species

Following disturbance to the soil, plant communities can be susceptible to infestations of invasive or non-native plant species. These species are most prevalent in areas of prior surface disturbance, such as agricultural areas, roadsides, existing utility ROWs, and livestock concentration areas (e.g., watering troughs and feeding grounds). Preventing the spread or introduction of invasive and non-native species is a

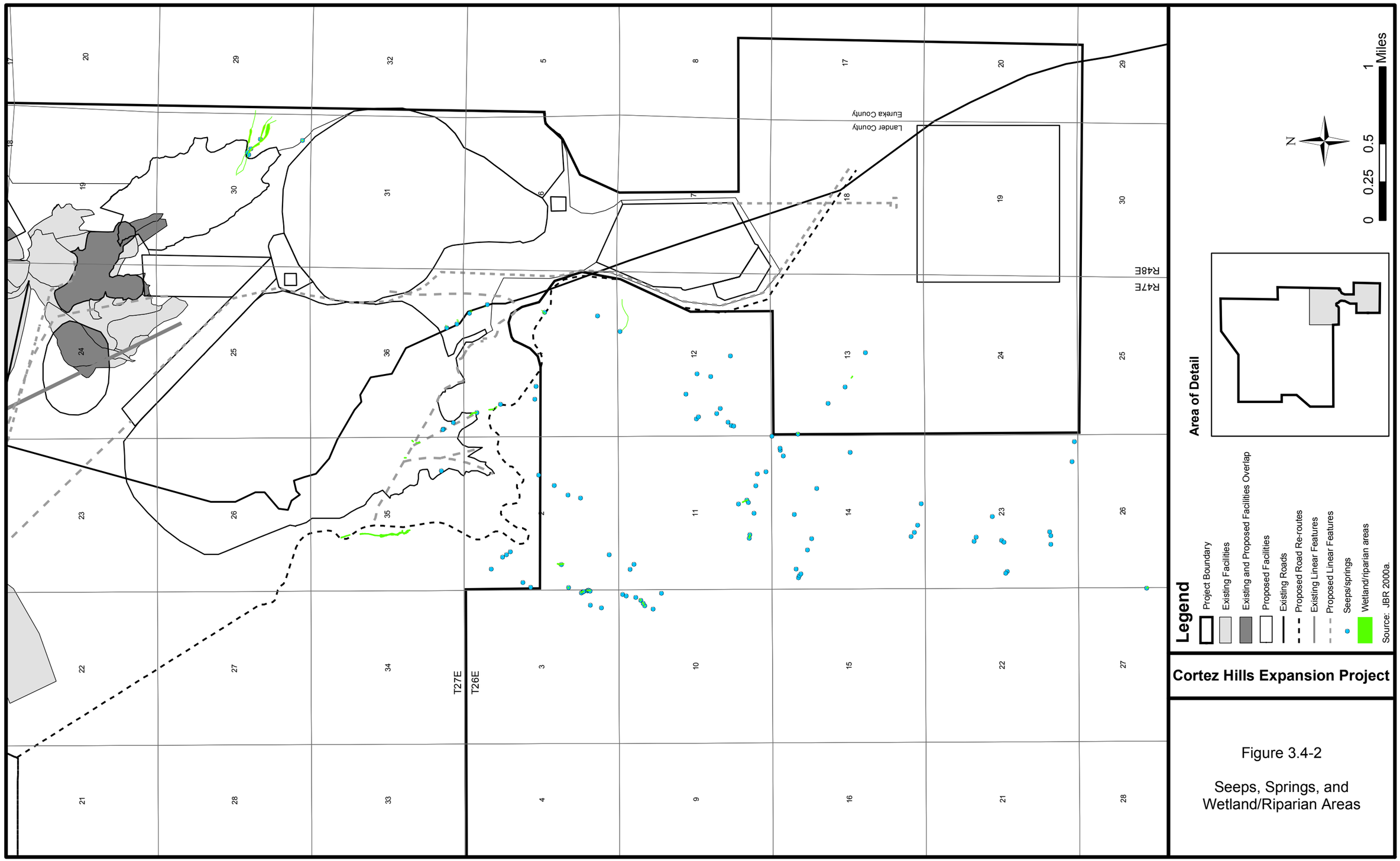


Figure 3.4-2

Seeps, Springs, and Wetland/Riparian Areas

Table 3.4-1
Special Status Plant Species Potentially Occurring within the Study Area

Common Name/Scientific Name	Status[1]	Range Habitat Requirements	Potential for Occurrence in or Near the Study Area	Eliminated from Detailed Analysis
Elko rockcress/ *Arabis falcifructa*	SOC; BLM	This species inhabits dry, densely vegetated, relatively undisturbed light-colored silty soils with high cover of moss. Typically found on moderately steep north-facing slopes at elevations between 5,300 and 6,100 feet amsl. Known to occur in Elko and Lander counties. The closest known occurrence is 50 miles to the southwest in Lander County (NNHP 2001).	Moderate. No documented occurrences were reported during the 2005 surveys and 2007 in suitable habitat within the study area.	No.
Eastwood's milkweed/ *Asclepias eastwoodiana*	SOC; BLM	This species inhabits open areas on a wide variety of basic soils, including calcareous clay knolls, sand, carbonate or basaltic gravels, or shale outcrops, generally barren and lacking competition, frequently in small washes or other moisture-accumulating microsites. Common in shadscale, mixed-shrub, sagebrush, and lower piñon-juniper zones, at elevations between 4,680 and 7,080 feet amsl. Known to occur in Esmeralda, Lander, Lincoln, and Nye counties (NNHP 2001).	Moderate. No potential habitat was observed in the southeastern portion of the study area during the 2005 surveys. Potential habitat was observed in other portions of the study area in 2007. No documented occurrences were reported during the 2007 surveys.	No.
Nevada willowherb/ *Epilobium nevadense*	BLM	This species inhabits rocky limestone slopes, rock outcrops, and talus at elevations between 6,000 and 8,930 feet amsl. Known to occur in Eureka, Clark, and Lincoln counties, Nevada and Utah. The closest known occurrence to the study area is over 20 miles to the east in the Diamond Mountains (NNHP 2001).	Moderate. No documented occurrences were reported during the 2005 surveys in suitable habitat within the study area.	No.
Windloving buckwheat/ *Eriogonum anemophilum*	SOC; BLM	This species is typically found at higher elevations, up to 9,836 feet amsl on exposed ridges and slopes in loose gravel of limestone or on volcanic outcrops. Known to occur in Churchhill, Humboldt, Lander, Pershing, and Washoe counties, Nevada. The closest known occurrence is over 30 miles to the west along Highway 305 (NNHP 2001).	Moderate. No documented occurrences were reported during the 2005 surveys in suitable habitat within the study area.	No.
Colorado feverfew/ *Parthenium ligulatum*	BLM	This species inhabits barren shale knolls at elevations between 5,400 and 6,500 feet amsl.	Low. Based on the 2005 and 2007 surveys, no suitable habitat occurs within the study area.	Yes.
Tiehm's beardtongue/ *Penstemon tiehmii*	BLM	This species inhabits neutral sandy-loam soil pockets on steep, southerly-facing volcanic talus and scree slopes at elevations between 7,500 and 9,600 feet amsl. Known to occur in Lander County near one mountain peak and in a canyon leading to the west (NNHP 2001).	Low. No suitable habitat occurs within or near the study area.	Yes.

[1] SOC – USFWS Species of Concern
BLM – BLM Sensitive Species

Sources: BLM 2004a; JBR 2007a, 2005c, 2000a; NNHP 2005, 2001; USFWS 2006.

high priority to federal and state agencies and nearby communities. Under Executive Order (EO) 13112 of February 3, 1999 – Invasive Species, federal agencies shall not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species in the U.S. or elsewhere unless it has been determined that the benefits of such actions outweigh the potential harm caused by invasive species and that all feasible and prudent measures to minimize the risk of harm will be taken in conjunction with the actions.

In addition to federally mandated invasive species control, Nevada's Department of Agriculture (NDA) maintains a list of regulated and prohibited noxious weed species, some of which may occur within the study area. In general, a noxious weed is any species of plant which is, or is likely to be, detrimental or destructive and difficult to control or eradicate (NDA 2007). According to the NDA's Plant Industry Division, noxious weeds are classified as Category A, B, or C under the Nevada Weed Abatement Statutes, Nevada Revised Statutes (NRS) 555.010. Each list has specific control requirements, with the most stringent requirements for those species found in Category A. If these species were found within the disturbance areas, CGM would be required to follow the prescribed management techniques stipulated by the NRS. A list of noxious weeds designated by the State of Nevada and invasive plants designated by the BLM Battle Mountain Field Office is provided in **Table 3.4-2**.

Noxious weed and invasive species surveys have not been conducted within the majority of the study area. However, noxious weed and invasive species surveys were conducted within the southeastern portion of the study area in 2000 and 2005 (JBR 2005c; 2000a). A total of three invasive, non-native species have been observed within this area including Scotch thistle (*Onopordum acanthium*), salt cedar (*Tamarix* spp.), and hoary cress (*Cardaria draba*) (**Figure 3.4-2**). Additional invasive, non-native species that have the potential to occur in the area include spotted knapweed (*Centaurea maculosa*), diffuse knapweed (*Centaurea diffusa*), yellow starthistle (*Centaurea solstitialis*), and leafy spurge (*Euphorbia esula*) (BLM 2000a). Noxious weeds and invasive species that have been observed in Lander County by the Cooperative Extension and Lander County Conservation District (CELCCD) and Eureka County by the Diamond Valley Weed District (DVWD) also have been identified in **Table 3.4-2** (CELCCD 2007; DVWD 2007).

Halogeton, cheatgrass, and bull thistle (*Cirsium vulgare*) occur onsite and often are considered undesirable by rangeland managers (Ratliff 1999). Musk thistle, Scotch thistle, hoary cress, and Russian knapweed were classified as high risk, whereas the other species were given a risk assignment of moderate. This rating process is consistent with BLM Manual 9015 – Integrated Weed Management (1992). The presence of Class B noxious weed species requires that management measures for control be developed and implemented along with a monitoring system.

Although not formally designated as an invasive, non-native species, cheatgrass is one of the most problematic undesirable plant species in the West, especially in northern Nevada. It is extremely difficult and/or expensive to control through conventional means. Levels of cheatgrass fluctuate based on the amount, timing, and duration of annual precipitation.

Table 3.4-2
Designated Noxious and Invasive Plant Species

Common Name	Scientific Name	Status	Present in Study Area?[1]	Present in Lander County	Present in Eureka County
African rue	*Peganum harmala*	Noxious	No	No	No
Anchored water hyacinth	*Eichhornia azurea*	Invasive	No	No	No
Austrian fieldcress	*Rorippa austriaca*	Noxious	No	No	No
Austrian peaweed	*Sphaerophysa salsula/ Swainsona salsula*	Noxious	No	No	No
Black henbane	*Hysocyamus niger*	Noxious	No	No	Yes
Broom snakeweed	*Gutierrezia sarothrae*	Invasive	No	No	No
Brassica	*Brassica elongata*	Invasive	No	No	No
Bull thistle	*Cirsium vulgare*	Invasive	No	No	No
Camelthorn	*Alhagi camelorum*	Invasive	No	No	Yes
Canada thistle	*Cirsium arvense*	Noxious	No	No	Yes
Carolina horse nettle	*Solanum carolinense*	Noxious	No	No	No
Cheatgrass	*Bromus tectorum*	Invasive	Yes	No	No
Common cocklebur	*Xanthium strumarium*	Invasive	No	No	No
Common crupina	*Crupina vulgaris*	Noxious	No	No	No
Dalmation toadflax	*Linaria dalmatica*	Noxious	No	No	No
Diffuse knapweed	*Centaurea diffusa*	Noxious	No	No	Yes
Dyer's woad	*Isatis tinctoria*	Invasive	No	No	No
Eurasian watermilfoil	*Myriophyllum spicatum*	Noxious	No	No	No
Field bindweed	*Convolvulus arvensis*	Invasive	No	No	No
Field dodder	*Cuscuta campestris*	Invasive	No	No	No
Foxtail barley	*Hordeum jubatum*	Invasive	No	No	No
Giant reed	*Arundo donax*	Noxious	No	No	No
Giant salvinia	*Salvinia molesta*	Noxious	No	No	No
Goats rue	*Galega officinalis*	Noxious	No	No	No
Green fountain grass	*Pennisetum setaceum*	Noxious	No	No	No
Green foxtail	*Setaria viridis*	Invasive	No	No	No
Halogeton	*Halogeton glomeratus*	Invasive	Yes	No	No
Hoary cress	*Cardaria draba*	Noxious	Yes	Yes	Yes
Houndstongue	*Cynoglossum officinale*	Noxious	No	No	No
Hydrilla	*Hydrilla verticillata*	Invasive	No	No	No
Iberian starthistle	*Centaurea iberica*	Noxious	No	No	No
Johnsongrass	*Sorghum halepense*	Noxious	No	No	No
Juniper	*Juniperus* spp.	Invasive	No	No	No
Klamath weed	*Hypericum perforatum*	Noxious	No	No	No
Kochia	*Kochia scoparia*	Invasive	No	No	No
Larkspur	*Delphinium* spp.	Invasive	No	No	No
Leafy spurge	*Euphorbia esula*	Noxious	No	Yes	Yes
Malta starthistle	*Centaurea melitensis*	Noxious	No	No	No
Mayweed chamomile	*Anthemis cotula*	Noxious	No	No	No
Musk thistle	*Carduus nutans*	Noxious	No	Yes	Yes
Mediterranean sage	*Salvia aethiopis*	Noxious	No	No	No
Medusahead	*Taeniatherum caput-medusae*	Invasive	No	No	No
Perennial pepperweed	*Lepidium latifolium*	Noxious	No	Yes	Yes
Poison hemlock	*Conium maculatum*	Invasive	No	No	Yes
Puncturevine	*Tribulus terrestris*	Noxious	No	No	Yes
Purple loosestrife	*Lythrum salicaria, Lythrum virgatum* and their cultivars	Invasive	No	No	No
Purple starthistle	*Centaurea calcitrapa*	Noxious	No	No	No
Quackgrass	*Agropyron repens*	Invasive	No	No	No
Rush skeletonweed	*Chondrilla juncea*	Invasive	No	No	No
Russian knapweed	*Centaurea repens*	Noxious	No	Yes	Yes

Table 3.4-2 (Continued)

Common Name	Scientific Name	Status	Present in Study Area?[1]	Present in Lander County	Present in Eureka County
Russian olive	*Elaeagnus angustifolia*	Invasive	No	No	No
Russian thistle	*Salsola kali* *Salsola iberica*	Invasive	No	No	No
Sahara mustard	*Brassica tournefortii*	Noxious	No	No	No
Saltcedar	*Tamarix ramosissima, T. parviflora*	Invasive	Yes	Yes	Yes
Scotch thistle	*Onopordum acanthium*	Noxious	Yes	Yes	Yes
Silky crazyweed	*Oxytropis sericea*	Invasive	No	No	No
Sixweek fescue	*Vulpia octoflora*	Invasive	No	No	No
Sow thistle	*Sonchus arvensis*	Noxious	No	No	No
Spotted knapweed	*Centaurea maculosa*	Noxious	No	No	Yes
Squarrose knapweed	*Centaurea virgata* var. *squarrosa*	Noxious	No	No	No
St. Johnswort	*Hypericum perforatum*	Noxious	No	No	No
Sulfur cinquefoil	*Potentilla recta*	Noxious	No	No	No
Syrian bean caper	*Zygophyllum fabago*	Noxious	No	No	No
Water hemlock	*Cicuta maculata*	Noxious	No	No	Yes
Water hyacinth	*Eichhornia crassipes*	Invasive	No	No	No
Water lettuce	*Pistia stratiotes*	Invasive	No	No	No
Western waterhemlock	*Cicuta douglasii*	Invasive	No	No	No
White horse nettle	*Solanum elaeagnifolium*	Noxious	No	No	No
Yellow foxtail	*Setaria glauca*	Invasive	No	No	No
Yellow starthistle	*Centaurea solstitialis*	Noxious	No	No	No
Yellow toadflax	*Linaria vulgaris*	Noxious	No	No	No

[1] Based on field surveys conducted within the southeastern portion of the study area (JBR 2005c; 2000a).

Sources: NDA-PID 2006; CELCCD 2007; DVWD 2007.

3.4.1.6 Woodland Products

Singleleaf piñon and Utah juniper woodlands provide the majority of the forest resources occurring in the BLM Battle Mountain Field Office area. Piñon-juniper woodlands currently occur in the southeastern portion of the study area and are not part of a designated greenwood (i.e., live tree) cutting area. Therefore, the cutting of live trees for fence posts or firewood is not permitted within this area. However, dead wood may be cut for firewood, ***except in WSAs,*** and pine nuts may be harvested from live trees within the study area and other portions of the BLM Battle Mountain Field Office area (Ratliff 2006).

In 2003, a piñon pine study was completed within piñon-juniper woodland areas located in the southeastern portion of the study area and in areas adjacent to the study area (JBR 2003). Information collected during the study focused on specific woodland attributes (e.g., densities of trees, abundance within various age classes, basal diameters of trunks, widths of canopies), which were used to assess and compare the overall health and stand structures of piñon-juniper woodlands within these areas. Piñon-juniper woodlands within the study area consisted of a prevalence of young and mature trees (77 percent of the Utah junipers and 48 percent of the piñon pine). **Table 3.4-3** lists the growth stage categories and average densities, heights, trunk basal diameters, and canopy widths associated with the piñon-juniper woodlands within the study area.

Table 3.4-3
Attributes Associated with Piñon-juniper Woodlands in the Study Area

Tree Growth Stage	Average Density of Utah Juniper[1]	Average Density of Piñon Pine[1]	Average Height (feet)	Average Trunk Basal Diameter (inches)	Average Canopy Maximum Diameter (feet)
Seedling	4.8	86.4	NA	NA	NA
Sapling	42.4	41.6	5.1	3.4	3.7
Young	84.8	50.4	12.8	5.7	6.0
Mature	97.6	85.6	19.1	10.3	10.1
Dead	2.4	20.8	13.9	6.9	NA
Total	**232.0**	**284.8**	**NA**	**NA**	**NA**

[1] Average densities of trees listed in numbers of trees per acre.

Source: JBR 2003.

3.4.2 Environmental Consequences

The primary issues associated with vegetation resources include potential impacts to special status species, wetland/riparian vegetation, harvestable piñons and ethnobotanical plant species, and forage production rates in rangeland areas, as well as impacts associated with the potential establishment of invasive or non-native species.

Environmental impacts to vegetation would be significant if the Proposed Action or other alternatives result in any of the following (see Section 3.9, Native American Traditional Values, relative to significance criteria for pine nut harvesting):

- Impacts to USFWS species of concern or BLM sensitive species that would contribute to their being listed as either federally threatened or endangered.

- Removal or loss through surface disturbance or dewatering of unique plant communities, such as natural wetlands or riparians or ethnobotanical plant species.

- Failure of reclamation efforts to achieve a stable, perennial vegetation cover that protects disturbed soil surfaces against erosion.

- Establishment of invasive or non-native plant species that would compromise the establishment and growth of desirable plant species for post-mining land uses or would adversely affect existing plant communities.

3.4.2.1 Proposed Action

Surface Disturbance

General Vegetation. Under the Proposed Action, mine development and operation would disturb or remove a total of approximately 6,792 acres of vegetation, the majority (approximately 5,793 acres) of which subsequently would be reclaimed (**Table 3.4-4**). The project-related activities would result in the conversion of tree- and shrub-dominated vegetation types to grass/forb-dominated vegetation types in the short term. Over the long term, shrubs and trees would become re-established and increase in abundance within the majority of disturbed areas as a result of reclamation and natural recolonization.

Table 3.4-4
Acres of Vegetation Disturbed or Removed Under the Proposed Action

Vegetation Types	Open Pits	Underground Operations[1]	Waste Rock Facilities	Processing Facilities	Ancillary Support Facilities	Road Reroutes	Total Disturbance Acreage
Piñon-juniper	809	0	474	60	261	8	**1,612**
Sagebrush/Grass	0	0	57	18	28	0	**103**
Mixed Sagebrush	0	0	225	52	6	1	**284**
Basin Big Sagebrush	0	0	7	0	0	5	**12**
Low Sagebrush	114	0	1,304	123	146	8	**1,695**
Wyoming Sagebrush	0	0	13	327	781	11	**1,132**
Shadscale/Black Greasewood	0	0	55	168	157	0	**380**
Shadscale/Budsage	0	0	1,009	114	108	43	**1,274**
Wetland/Riparian	0	0	0.6	0	0.1	0	**0.7**
Exploration Disturbance	NA	NA	NA	NA	NA	NA	**300[2]**
Total Disturbance	**923**	**0**	**3,144**	**862**	**1,487**	**76**	**6,792[2]**

[1] Proposed activities would occur within the existing disturbance footprint.
[2] Up to 300 acres of exploration disturbance may occur under the Proposed Action. Site-specific environmental reviews/approvals would be coordinated with the BLM.

Approximately 1,612 acres of the total proposed disturbance would occur in areas currently occupied by piñon-juniper woodland that consist primarily of ***im***mature Utah juniper and singleleaf piñon trees. CGM has committed to evaluate the planting of singleleaf piñon seedlings in suitable areas within the proposed disturbance areas. In addition, the natural re-colonization of mine-related disturbance areas with Utah juniper and singleleaf piñon seedlings would be allowed to occur over the long term. Therefore, the removal of trees from these woodland areas would be a long-term impact, since it would take approximately 75 to 100 years for mature Utah juniper and singleleaf piñon trees to become re-established in the disturbance areas. Of the 1,612 acres of total disturbance in piñon-juniper woodland areas, approximately 817 acres of piñon-juniper woodland would be permanently lost due to the development of the Cortez Hills Pit and relocation of county road segments.

Project-related development also would remove approximately 4,880 acres of shrub-dominated vegetation communities. This loss would represent a long-term impact as it would take up to 25 years following

reclamation for mature shrub species to re-establish. A permanent loss of 182 acres of shrub-dominated habitats would occur under this alternative.

Approximately 0.7 acre of wetland/riparian vegetation would be removed or disturbed as a result of the proposed project. The removal of these unique plant communities by mine-related activities would be considered a significant impact. Mine development and operation also would result in the filling and excavation of small intermittent drainages that support upland vegetation.

Reclamation would be completed on approximately 5,793 acres (approximately 85 percent) of the total proposed disturbance area. As discussed in Section 2.4.13, Reclamation, the Cortez Hills and Cortez pits and county road reroutes are the only project components that would not be reclaimed. To minimize mine-related impacts to vegetation, reclamation would be conducted as soon as practical, with concurrent reclamation implemented to the extent possible as discussed in Section 2.4.12, Applicant-committed Environmental Protection Measures. Seed mixes, as described in Section 2.4.13.4, Seed Mixes, would be used for revegetation activities. Successful revegetation of mine-related disturbance areas is anticipated to occur approximately 3 to 5 years following reclamation. After 3 to 5 years, the reclaimed plant communities likely would consist of adequate herbaceous plant cover with sufficient diversity to substantially reduce the potential for soil erosion and provide forage for use by livestock and wildlife.

Special Status Species. Based on habitat requirements and/or known distribution, four special status plant species were identified as potentially occurring in the study area (see **Table 3.4-1**). As discussed in Section 3.4.1.3, Special Status Plant Species, field surveys were conducted in the southeastern portion of the study area in 2000 and 2005 for three (Elko rockcress, Nevada willowherb, and windloving buckwheat) of the four species. Habitat evaluations and field surveys were conducted for Eastwood's milkweed and Elko rockcress within proposed disturbance areas in other portions of the study area (i.e., Pipeline Waste Rock Facility, proposed new disturbance at the Cortez Complex, conveyor corridor, and CR 222 and CR 225 reroutes). Eastwood's milkweed and Elko rockcress were not observed in the study area (JBR 2007b). Therefore, significant impacts to these species are not anticipated as a result of mine development and operation, assuming no known occurrences are identified by the NNHP.

Ethnobotanical Plant Species. As discussed in the Section 3.4.1.4, Ethnobotanical Plant Species, *Lomatium dissectum* was not observed within the study area. Therefore, impacts to this species are not anticipated as a result of the proposed project.

Invasive and Non-native Species. Implementation of CGM's weed control program in conjunction with the reclamation plan, as described in Section 2.4.12, Reclamation, substantially would reduce the potential for noxious weed establishment in the study area. However, minor populations of weedy annual species (e.g., halogeton, cheatgrass) may become established in localized areas for short periods of time.

As discussed in Section 3.4.1.5, Invasive and Non-native Species, three invasive, non-native species (i.e., Scotch thistle, salt cedar, and hoary cress) have been observed within the study area. Noxious and invasive species readily invade areas that have been subject to surface disturbance, which typically lack, or have minimal vegetative cover. Development and operation of the proposed project would remove or disturb

approximately 6,792 acres of vegetation, of which 923 acres associated with the proposed Cortez Hill Pit would not be reclaimed. The proposed additional mining in the Cortez Pit would occur within the existing disturbance footprint. The permanent loss of vegetation as a result of the earlier Cortez Pit development was addressed in previous NEPA analysis. Growth media stockpiles would be reclaimed with an interim seed mix to stabilize the growth media, reduce soil erosion, and minimize the potential for the establishment of noxious or invasive species. In addition, the design and construction of the proposed mine facilities would facilitate concurrent reclamation to the extent possible. Successful reclamation of mine-related disturbance areas (including pit backfill areas) would result in the establishment of a permanent vegetative cover, which would minimize the potential establishment of noxious and invasive species in the long term. Although the proposed Cortez Hills Pit and proposed Cortez Pit expansion area would not be reclaimed, invasive and non-native species would not likely become established in the pits due to the absence of soil and the formation of pit lakes in the long term. As described in Section 2.4.12, Applicant-committed Environmental Protection Measures, certified weed-free seed mixes would be used for reclamation. If noxious weeds become established in project-related disturbance areas, a weed removal or spraying program would be implemented. As described in Section 2.4.13.5, Noxious Weed Management, weed control practices would be implemented during vegetation establishment to limit the growth and spread of noxious weeds and facilitate successful revegetation with the proposed seed mixes. Weed control practices would be implemented in coordination with the BLM and Lander County Conservation District to limit the spread of noxious weeds in the study area.

Woodland Products. The Proposed Action would result in the long-term loss of productivity on approximately 1,612 acres of piñon/juniper woodlands. The primary woodland impact would result from the construction of the North and Canyon waste rock facilities, mill stockpile crusher and loadout, and Grass Valley Heap Leach Facility. Of the 1,612 acres of total disturbance in piñon-juniper woodland areas, approximately 817 acres of piñon-juniper woodland would be permanently lost due to the development of the Cortez Hills Pit and relocation of county road segments.

All of the 1,612 acres of piñon-juniper woodland that would be removed under the Proposed Action would occur on BLM-administered land. As discussed in Section 3.4.1.6, Woodland Products, BLM-administered lands in the project boundary are open for the collection of dead wood for firewood and the harvesting of pine nuts from live trees. To help off-set the loss of these resources in the proposed disturbance areas, CGM has committed to clearing piñon and juniper trees in advance of mine development in a manner that would allow utilization of the resource to the extent possible. In addition, funding for the value of the removed firewood would be provided by CGM as a contribution to an off-site BLM or NDOW revegetation project (see Section 2.4.11, Applicant-committed Environmental Protection Measures).

The long-term change in vegetation and loss of woodland product productivity would not result in significant impacts to woodland products since the Proposed Action is located in an area where abundant piñon-juniper woodlands exist on public lands. As discussed above under general vegetation, approximately 75 to 100 years would be required for mature piñon and juniper trees to re-establish in mine-related disturbance areas.

Water Management Activities

General Vegetation. It is anticipated that mine-related groundwater drawdown would not result in direct impacts to upland vegetation within the 10-foot drawdown contour. Piñon and juniper trees, as well as herbaceous plant species, have shallow to moderately deep root systems and predominantly rely on soil moisture from precipitation.

Potential impacts to riparian or wetland vegetation could occur where gaining stream flow is sustained by groundwater sources within the projected mine-related 10-foot drawdown contour. As discussed in Section 3.2, Water Resources and Geochemistry, a measurable decrease in groundwater baseflow of gaining stream reaches is not anticipated where the groundwater drawdown is projected to be 10 feet or less; therefore, impacts to the vegetation associated with these reaches are not anticipated. Within the estimated 10-foot drawdown contour, flows associated with one potential perennial stream (Mill Creek) potentially could decrease, thereby reducing the amount of available water for wetland and riparian vegetation. This reduction in available water may result in the partial loss of herbaceous riparian and wetland vegetation.

As discussed in Section 3.2, Water Resources and Geochemistry, groundwater level changes potentially may affect perennial seeps and springs. Riparian and wetland vegetation associated with 22 known springs or seeps (approximately 3.5 acres [see **Table 3.2-12**]) and one perennial stream reach (i.e., Mill Creek) that occur within the projected mine-related 10-foot drawdown area likely would experience long-term adverse effects as a result of groundwater drawdown. This would be considered a significant impact.

Special Status Species. Special status species would not be affected by mine-related groundwater drawdown, since potential habitat for the species potentially occurring in the study area includes upland areas that rely on precipitation to provide adequate soil moisture.

Ethnobotanical Plant Species. *Lomatium dissectum*, located adjacent to the study area, would not be affected by mine-related groundwater drawdown since this species occurs in upland areas, which rely on precipitation to provide adequate soil moisture.

Invasive and Non-native Species. A decrease or cessation of flow in perennial waters within the projected mine-related 10-foot drawdown area may reduce the likelihood of the potential establishment of invasive and non-native species known to invade wetland/riparian habitats. However, the reduction or loss of flow may provide for the potential invasion of invasive/non-native species that prefer drier habitats.

Woodland Products. Piñon and juniper trees would not be affected by mine-related groundwater drawdown since these trees rely on precipitation for adequate soil moisture for survival. As a result, no related impact to woodland products would occur.

3.4.2.2 Grass Valley Heap Leach Alternative

Surface Disturbance

Under the Grass Valley Heap Leach Alternative, potential surface disturbance-related impacts to special status plant species and ethnobotanical plants, as well as potential impacts related to invasive and non-native species, would be the same as described under the Proposed Action. Potential impacts to general vegetation and woodland products would be the same as described for the Proposed Action, with the following exceptions (see **Table 3.4-5**).

Table 3.4-5
Acres of Vegetation Disturbed or Removed Under the Grass Valley Heap Leach Alternative

Vegetation Types	Open Pits	Underground Operations[1]	Waste Rock Facilities	Processing Facilities	Ancillary Support Facilities	Road Reroutes	Total Disturbance Acreage
Piñon-juniper	809	0	474	56	261	8	**1,608**
Sagebrush/Grass	0	0	57	18	28	0	**103**
Mixed Sagebrush	0	0	225	52	6	1	**284**
Basin Big Sagebrush	0	0	7	0	0	5	**12**
Low Sagebrush	114	0	1,304	123	146	8	**1,695**
Wyoming Sagebrush	0	0	13	328	1,565	13	**1,919**
Shadscale/Black Greasewood	0	0	55	168	157	0	**380**
Shadscale/Budsage	0	0	1,009	114	108	47	**1,278**
Wetland/Riparian	0	0	0.6	0	0.1	0	**0.7**
Exploration Disturbance	NA	NA	NA	NA	NA	NA	**300[2]**
Total Disturbance	**923**	**0**	**3,144**	***859***	**2,271**	**82**	**7,579[2]**

[1] Proposed activities would occur within the existing disturbance footprint.
[2] Up to 300 acres of exploration disturbance may occur under this alternative. Site-specific environmental reviews/approvals would be coordinated with the BLM.

Under this alternative, mine development would disturb or remove a total of approximately 7,579 acres of vegetation, the majority (approximately 6,580 acres) of which (approximately 87 percent of the disturbance) subsequently would be reclaimed. Approximately 1,608 acres of piñon-juniper woodland and 5,671 acres of shrub-dominated vegetation communities would be disturbed as a result of mine development. The removal of tree- and shrub-dominated communities would be a long-term impact. Of the 1,608 acres, the permanent loss of approximately 817 acres piñon-juniper woodland would occur under this alternative. A permanent loss of approximately 188 acres of shrub-dominated habitats also would occur.

Water Management Activities

Under this alternative, potential impacts to general vegetation, special status plant species, ethnobotanical plant species, and woodland products as a result of mine-related groundwater drawdown would be the same as described for the Proposed Action. Potential impacts associated with invasive and non-native species as a result of mine-related groundwater drawdown also would be the same as described for the Proposed Action.

3.4.2.3 Crescent Valley Waste Rock Alternative

Surface Disturbance

Under the Crescent Valley Waste Rock Alternative, potential surface disturbance-related impacts to special status plant species and ethnobotanical plants, as well as potential impacts related to invasive and non-native species, would be the same as described for the Proposed Action. Potential impacts to general vegetation and woodland products would be the same as described for the Proposed Action, with the following exceptions (see **Table 3.4-6**).

Table 3.4-6
Acres of Vegetation Disturbed or Removed Under the Crescent Valley Waste Rock Alternative

Vegetation Types	Open Pits	Underground Operations[1]	Waste Rock Facilities	Processing Facilities	Ancillary Support Facilities	Road Reroutes	Total Disturbance Acreage
Piñon-juniper	809	0	239	60	261	0	**1,369**
Sagebrush/Grass	0	0	56	18	28	0	**103**
Mixed Sagebrush	0	0	40	52	6	1	**98**
Basin Big Sagebrush	0	0	0	0	0	0	**0**
Low Sagebrush	114	0	135	123	146	3	**521**
Wyoming Sagebrush	0	0	13	328	781	0	**1,122**
Shadscale/Black Greasewood	0	0	308	168	157	0	**633**
Shadscale/Budsage	0	0	2,413	114	108	50	**2,685**
Wetland/Riparian	0	0	0.4	0	0	0	**0.4**
Exploration Disturbance	NA	NA	NA	NA	NA	NA	**300[2]**
Total Disturbance	**923**	**0**	**3,204**	**863**	**1,487**	**53**	**6,830[2]**

[1] Proposed activities would occur within the existing disturbance footprint.
[2] Up to 300 acres of exploration disturbance may occur under this alternative. Site-specific environmental reviews/approvals would be coordinated with the BLM.

Under this alternative, mine development would disturb or remove a total of approximately 6,830 acres of vegetation, the majority (approximately 5,854 acres) of which (86 percent) subsequently would be reclaimed. Approximately 1,369 acres of piñon-juniper woodland and 5,161 acres of shrub-dominated communities would be disturbed as a result of mine development. The removal of tree- and shrub-dominated communities would be a long-term impact. Of the total disturbance in piñon-juniper woodland, approximately 809 acres piñon-juniper woodland would be permanently lost due to the development of the Cortez Hills Pit. Approximately 0.4 acre of wetland/riparian vegetation would be removed or disturbed by this alternative.

Under this alternative, a long-term loss of productivity from approximately 1,369 acres of piñon/juniper woodlands on BLM-administered land would occur as a result of mine development, 243 fewer acres than under the Proposed Action. Of the 1,369 acres of total disturbance in piñon-juniper woodland areas, approximately 809 acres piñon-juniper woodland would be permanently lost due to the development of the Cortez Hills Pit.

Water Management Activities

Under this alternative, potential impacts to general vegetation, special status plant species, ethnobotanical plant species, and woodland products as a result of mine-related groundwater drawdown would be the same as described for the Proposed Action. Potential impacts associated with invasive and non-native species as a result of mine-related groundwater drawdown also would be the same as described for the Proposed Action.

3.4.2.4 Cortez Hills Complex Underground Mine Alternative

Surface Disturbance

Under the Cortez Hills Complex Underground Mine Alternative, the types of potential surface disturbance-related impacts to special status plant species and ethnobotanical plants, as well as potential impacts related to invasive and non-native species, would be the same as described for the Proposed Action. The types of potential impacts to general vegetation would be the same as described for the Proposed Action, with the following exceptions (see **Table 3.4-7**).

Under this alternative, mine development would disturb or remove a total of approximately 1,790 acres of shrub-dominated vegetation, the majority (approximately 1,758 acres) of which (approximately 98 percent) subsequently would be reclaimed. Piñon-juniper woodland and wetland/riparian vegetation would not be affected by surface disturbance activities. The removal of shrub-dominated communities would represent a long-term impact.

Table 3.4-7
Acres of Vegetation Disturbed or Removed Under the Cortez Hills Complex Underground Mine Alternative

Vegetation Types	Open Pits	Underground Operations[1]	Waste Rock Facilities	Processing Facilities	Ancillary Support Facilities	Road Reroutes	Total Disturbance Acreage
Piñon-juniper	0	0	0	0	0	0	***0***
Sagebrush/Grass	0	0	0	0	20	0	***20***
Mixed Sagebrush	0	0	0	0	0	0	***0***
Basin Big Sagebrush	0	0	0	0	0	0	***0***
Low Sagebrush	0	0	0	0	0	0	***0***
Wyoming Sagebrush	0	0	0	0	0	0	***0***
Shadscale/Black Greasewood	0	0	0	169	157	0	***326***
Shadscale/Budsage	0	0	999	4	108	32	***1,144***
Wetland/Riparian	0	0	0	0	0	0	***0***
Exploration Disturbance	NA	NA	NA	NA	NA	NA	***300***[2]
Total Disturbance	**0**	**0**	***999***	**173**	***286***	**32**	**1,790**

[1] Proposed activities would occur within the existing disturbance footprint.
[2] Up to 300 acres of exploration disturbance may occur under this alternative.

Water Management Activities

Under this alternative, potential impacts to general vegetation, special status plant species, ethnobotanical plant species, and woodland products as a result of mine-related groundwater drawdown would be the same as described for the Proposed Action, with the following exception. Mine-related groundwater drawdown could affect approximately 2.6 acres of wetland/riparian vegetation associated with 25 potentially affected seeps and springs (see **Table 3.2-12**). Potential impacts associated with invasive and non-native species as a result of mine-related groundwater drawdown also would be the same as described for the Proposed Action.

3.4.2.5 Revised Cortez Hills Pit Design Alternative

Surface Disturbance

Under the Revised Cortez Hills Pit Design Alternative, potential surface disturbance-related impacts to special status plant species and ethnobotanical plants, as well as potential impacts related to invasive and non-native species, would be the same as described for the Proposed Action. Potential impacts to general vegetation and woodland products would be the same as described for the Proposed Action, except approximately 159 fewer acres would be disturbed (see Table 3.4-8).

Table 3.4-8
Acres of Vegetation Disturbed or Removed Under the Revised Cortez Hills Pit Design Alternative

Vegetation Types	*Open Pits*	*Underground Operations[1]*	*Waste Rock Facilities*	*Processing Facilities*	*Ancillary Support Facilities*	*Road Reroutes*	*Total Disturbance Acreage*
Piñon-juniper	*786*	*0*	*458*	*60*	*334*	*8*	*1,646*
Sagebrush/Grass	*0*	*0*	*51*	*18*	*36*	*0*	*105*
Mixed Sagebrush	*0*	*0*	*195*	*52*	*10*	*1*	*258*
Basin Big Sagebrush	*0*	*0*	*7*	*0*	*0*	*5*	*12*
Low Sagebrush	*49*	*0*	*1,189*	*123*	*231*	*8*	*1,600*
Wyoming Sagebrush	*0*	*0*	*13*	*327*	*776*	*11*	*1,127*
Shadscale/Black Greasewood	*0*	*0*	*0*	*168*	*151*	*0*	*319*
Shadscale/Budsage	*0*	*0*	*1,001*	*114*	*108*	*43*	*1,266*
Wetland/Riparian	*0*	*0*	*0.6*	*0*	*0.1*	*0*	*0.7*
Exploration Disturbance	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*300[2]*
Total Disturbance	*835*	*0*	*2,915*	*862*	*1,646*	*76*	*6,633[2]*

[1] Proposed activities would occur within the existing disturbance footprint.
[2] Up to 300 acres of exploration disturbance may occur under this alternative.

Under this alternative, mine development would disturb or remove a total of approximately 6,633 acres of vegetation, the majority (approximately 5,722 acres) or 86 percent of the disturbance subsequently would be reclaimed. Approximately 1,646 acres of piñon-juniper woodland and 4,687 acres of shrub-dominated communities would be disturbed as a result of project development. The removal of tree- and shrub-dominated communities would be a long-term impact. Of the total disturbance in piñon-juniper woodland (approximately 1,646 acres), approximately 786 acres of

piñon-juniper woodland would be permanently lost due to the development of the Cortez Hills Pit, approximately 23 fewer acres than under the Proposed Action. Approximately 0.7 acre of wetland/riparian vegetation would be removed or disturbed by this alternative.

Water Management Activities

Under this alternative, potential impacts to general vegetation, special status plant species, ethnobotanical plant species, and woodland products as a result of mine-related groundwater drawdown would be the same as described for the Proposed Action. Potential impacts associated with invasive and non-native species as a result of mine-related groundwater drawdown would be the same as described for the Proposed Action.

3.4.2.6 No Action Alternative

Under the No Action Alternative, the proposed Cortez Hills Expansion Project would not be developed and associated impacts to vegetation would not occur. The existing Pipeline/South Pipeline Project and Cortez Mine Underground Exploration Project would continue to operate under existing authorizations.

Surface Disturbance

General Vegetation. No additional surface disturbance beyond that currently authorized, or related impacts to vegetation, would occur under the No Action Alternative. Ongoing reclamation would help to minimize existing impacts to vegetation in mine-related disturbance areas (with the exception of the portions of the mine pits that would not be backfilled), with resulting short-term impacts to herbaceous species and long-term impacts to woody species.

Special Status Species. No additional surface disturbance beyond that previously authorized would occur in association with ongoing existing operations. As a result, there would be no additional impact to potential habitat for special status species under this alternative.

Ethnobotanical Plant Species. Potential impacts to *Lomatium dissectum* would not occur under this alternative as no additional surface disturbance beyond that currently authorized would occur in association with ongoing operations at the existing mine.

Invasive and Non-native Species. Under the No Action Alternative, existing weed control measures would continue to be implemented to prevent the establishment of new populations and to control existing populations in mine-related disturbance areas.

Woodland Products. Impacts to piñon-juniper woodlands would not occur under this alternative as no additional surface disturbance beyond that currently authorized would occur in association with ongoing operations at the existing mine.

Water Management Activities

General Vegetation. Under the No Action Alternative, no additional potential impacts to vegetation as a result of existing and ongoing mine-related groundwater drawdown would occur. Riparian and wetland vegetation located within the projected 10-foot drawdown contour, including vegetation associated with 20 seeps or springs and segments of Indian, Feris, and Mill creeks could be affected. Upland vegetation would not be affected by groundwater drawdown.

Special Status Species. Under the No Action Alternative, potential impacts to special status species as a result of groundwater drawdown associated with the existing mine dewatering program would be the same as described for the Proposed Action (i.e., special status species would not be affected by mine-related groundwater drawdown).

Ethnobotanical Plant Species. Under the No Action Alternative, potential impacts to *Lomatium dissectum* as a result of groundwater drawdown associated with the existing mine dewatering program would be the same as described for the Proposed Action.

Invasive and Non-native Species. Under the No Action Alternative, potential impacts associated with invasive and non-native species as a result of groundwater drawdown associated with the existing dewatering program would be the same as described for the Proposed Action.

Woodland Products. As piñon and juniper trees rely on precipitation for adequate soil moisture for survival, no impacts to woodland products as a result of mine-related groundwater drawdown have or would occur under this alternative.

3.4.3 Cumulative Impacts

The cumulative effects study area for vegetation is shown in **Figure 3.1-10**. Past and present actions and RFFAs are identified in **Table 2-*18*** and shown in **Figure 2-*26***.

Surface Disturbance

General Vegetation. Past and present actions and RFFAs, including wildland fires, within the cumulative effects study area have resulted in approximately 132,912 acres of disturbance to vegetation. The Proposed Action incrementally would increase surface disturbance and related impacts to vegetation in the cumulative effects study area by approximately 6,792 additional acres, resulting in an overall disturbance to vegetation on 139,704 acres. It is assumed that portions of past disturbances have been reclaimed, and ongoing reclamation at the existing Pipeline/South Pipeline Project would continue to reduce the impacts to vegetation. Pending completion of successful reclamation, the incremental additional impacts to vegetation as a result of the Proposed Action would be temporary in nature for the majority of the project disturbance area (with the exception of the Cortez Hills Pit and county road reroutes), and the loss of mature trees and shrubs would be minimal relative to the total acreage of woody species communities that occur in the cumulative effects study area. The removal of trees from these areas would result in a long-term change in

vegetative structure since it would take 75 to 100 years for trees, and up to 25 years for shrub species, of similar stature to become re-established in these areas.

Special Status Species. Based on field surveys conducted by JBR (2005c, 2000a) in the southeastern portion of the project boundary and habitat evaluations and field surveys conducted in proposed disturbance areas in other portions of the study area in 2007 (JBR 2007b), impacts to special status plant species are not anticipated from proposed project development. Therefore, cumulative impacts to special status plant species would not occur.

Ethnobotanical Plant Species. Cumulative impacts to *Lomatium dissectum* would not occur since this species would not be affected by the Proposed Action.

Invasive and Non-native Species. It is assumed that the majority of the surface disturbance within the cumulative effects study area would be reclaimed, which would minimize the establishment of invasive and non-native species. In addition, implementation of the proposed project's noxious weed control program would help minimize the establishment and spread of invasive and non-native species in the proposed disturbance areas and, therefore, minimize the project's contribution to cumulative effects associated with these species. Disturbance areas in the cumulative effects study area that would not be reclaimed would be prone to the establishment of invasive and non-native species.

Woodland Products. It is assumed that a portion of the total disturbance associated with the past and present actions and RFFAs in the cumulative effects study area have resulted in the loss of piñon-juniper woodlands and woodland products provided by these woodlands, with wildland fires affecting 22,918 acres of piñon-juniper. The loss of 1,612 acres of piñon-juniper woodlands associated with the Proposed Action would result in an incremental additional loss of woodland products within the cumulative effects study area.

Water Management Activities

General Vegetation. No cumulative impacts to upland vegetation would occur since the water management activities associated with the Proposed Action would not affect upland vegetation. Cumulative groundwater drawdown associated with water management activities potentially would affect riparian/wetland vegetation associated with 30 seeps and springs (approximately 5.3 acres [see **Table 3.2-12**]) and 3 perennial stream segments.

Special Status Species. No cumulative impacts to special status species would occur since these species would not be affected by groundwater drawdown associated with the Proposed Action.

Ethnobotanical Plant Species. No cumulative impacts to *Lomatium dissectum* would occur since this species would not be affected by groundwater drawdown associated with the Proposed Action.

Invasive and Non-native Species. Cumulative impacts associated with establishment of invasive and non-native species may occur in riparian/wetland areas potentially affected by cumulative groundwater drawdown. This potential impact would be minimized by implementation of reclamation programs and

noxious weed controls in association with the Proposed Action and other authorized actions in the cumulative effects study area.

Woodland Products. No cumulative impacts to woodland products would occur since piñon-juniper woodlands would not be affected by groundwater drawdown associated with the Proposed Action.

Other Action Alternatives

Cumulative impacts to vegetation resources (including special status species) under the Grass Valley Heap Leach and Crescent Valley Waste Rock alternatives would be the same as discussed above for the Proposed Action, except they incrementally would increase short-term and long-term vegetation loss by 787 and 38 acres, respectively. ***Cumulative impacts to vegetation resources under the Revised Cortez Hills Pit Design Alternative would be the same as the Proposed Action, with the exception of an incremental decrease in short-term and long-term vegetation loss of 159 acres.*** Under the Cortez Hills complex Underground Mine Alternative, the project's contribution to short-term and long-term cumulative vegetation loss would be 5,002 acres less than under the Proposed Action. In addition, cumulative impacts to vegetation species due to groundwater drawdown effects on perennial water sources and associated wetland/riparian habitat would be similar to the Proposed Action, with the exception that the impacts would be longer in duration as the proposed project's incremental contribution would extend for a longer period and result in an increased total dewatering rate under this alternative.

3.4.4 Monitoring and Mitigation Measures

Issue: The long-term loss of riparian/wetland vegetation as a result of mine-related surface disturbance (approximately 0.7 acre) and groundwater drawdown impacts to seeps and springs (approximately 3.5 acres) and perennial streams would be considered a significant impact.

Mitigation Measure V1: CGM would coordinate with the BLM to develop new riparian/wetland areas and/or enhance existing riparian/wetland areas at off-site locations to compensate for the loss of riparian/wetland vegetation. The loss of riparian/wetland vegetation would be compensated at a 2:1 ratio (i.e., for every acre of riparian/wetland vegetation removed or disturbed by mine development or groundwater drawdown, 2 acres of riparian/wetland vegetation would be created and/or enhanced). Where appropriate, replacement of wetland/riparian vegetation would be developed in conjunction with Mitigation Measure WR-1b. This measure identifies potential methods for development of new water sources or improvement to existing local water sources to off-set mine-related groundwater drawdown effects on perennial waters (see Section 3.2, Water Resources and Geochemistry). CGM in coordination with a BLM botanist would identify appropriate wetland/riparian species to be seeded or transplanted in these locations. Alternately, local existing areas of wetland/riparian vegetation unaffected by mine-related groundwater drawdown would be identified in coordination with the BLM for enhancement. Enhancement methods could include, but would not be limited to, the use of BLM-approved fencing to minimize livestock impacts, implementation of weed controls, and/or supplemental planting or seeding, as appropriate.

CGM would be responsible for monitoring these sites on an annual basis for approximately 3 years after creation or enhancement to ensure that these mitigation measures were effective and that the riparian/wetland sites were self-sustaining and provided similar functions as existing riparian/wetland areas. CGM would be responsible for developing an annual riparian/wetland vegetation monitoring report, which would be provided to the BLM for review and approval.

Effectiveness: The creation of new riparian/wetland areas and/or enhancement of existing riparian/wetland areas would ensure that the loss of riparian/wetland vegetation would be offset. The submittal of annual monitoring reports to the BLM during the 3-year monitoring period would provide a basis for evaluating the effectiveness of the program.

Issue: Known occurrences of special status plant species, as recorded by the NNHP, may occur in proposed disturbance areas previously surveyed in 2007.

Mitigation Measure V2: Prior to the initiation of ground-disturbing activities in the proposed disturbance areas recently surveyed in 2007, CGM would obtain information from the NNHP regarding any known occurrences of special status plant species that occur within this area. If known populations occur within this proposed disturbance area, an additional field survey would be conducted for the appropriate species prior to mine development in order to determine the extent of these populations. A survey report, which would include survey methods, results, summary, a map illustrating the areas surveyed, and any populations observed during the survey, would be submitted to the BLM. After BLM's review of the report, CGM would coordinate with the BLM to develop appropriate mitigation measures.

Effectiveness: This measure would provide a means for evaluating the need for potential mitigation prior to surface-disturbing activities, thereby reducing the potential for direct impacts to special status species.

3.4.5 Residual Adverse Effects

Residual adverse effects to vegetation would include the permanent loss of vegetative productivity from approximately 999 acres of land associated with the Cortez Hills Pit and county road reroutes that would not be reclaimed, and a long-term change in vegetation composition (i.e., tree and shrub-dominated communities to grass- and forb-dominated communities) as a result of project development and operation.

Residual adverse effects to special status species would not occur as a result of mine development and operation, assuming additional field surveys would be conducted in suitable habitat areas and appropriate mitigation measures implemented prior to ground-disturbing activities.

Residual impacts to woodland products would result from the long-term loss of approximately 1,612 acres of piñon-juniper woodland on BLM-administered land. Woodland products from these areas would not be available until mature trees had become re-established, which would take approximately 75 to 100 years. Of the 1,612 acres of total disturbance in piñon-juniper woodland areas, approximately 817 acres piñon-juniper woodland would be permanently lost with the development of the Cortez Hills Pit and county road reroutes.

Groundwater drawdown that would affect seeps, springs, and perennial streams would result in the long-term loss of riparian/wetland vegetation. This impact would be mitigated by Mitigation Measure V1.

3.5 Wildlife and Fisheries Resources

The study area for direct and indirect impacts for wildlife and fisheries (including special status species) includes the ***area within the*** project boundary and wetland and riparian habitat within the projected project-related 10-foot groundwater drawdown area. The cumulative effects study area for these resources generally includes the project boundary, surface disturbance associated with past and present actions and RFFAs within a 30-mile radius of the project, and wetland and riparian habitat within the projected cumulative 10-foot groundwater drawdown area.

3.5.1 Affected Environment

Information regarding wildlife and fish species and current habitat conditions within the study area and the larger cumulative effects study area (Section 3.5.3, Cumulative Effects) was obtained from existing published sources (BLM 1986a, 1983; NDOW 2005a,b, 2002) and site-specific field surveys (JBR 2005c, 2004, 2000b). These surveys examined the existing use of the study area by terrestrial vertebrates and special status species. Representative wildlife species that may occur in the vicinity of the project are listed in Appendix C.

3.5.1.1 Terrestrial Wildlife

Habitat

Wildlife species and habitats occurring in the study area are typical of the northern Great Basin desert region. The study area occurs within the transitional zone between the foothills of the Toiyabe Range and the Cortez Mountains, and the lower elevation sagebrush and desert scrub communities in Crescent and Grass valleys located immediately north and south of the project boundary, respectively. Within the project boundary, wildlife habitat primarily is composed of black sagebrush/piñon-juniper woodland, Wyoming big sagebrush/piñon-juniper woodland, Wyoming big sagebrush/grassland, basin big sagebrush, and low sagebrush/grassland. Wildlife species identified in the project vicinity during baseline surveys (JBR 2005c, 2000c) are presented in **Table C-1** in Appendix C.

Wetland/riparian communities within the project boundary are limited to small seeps and springs (see Section 3.2, Water Resources and Geochemistry). Seeps and springs within the Toiyabe Range and the Cortez Mountains provide valuable water resources for area wildlife.

Big Game Species

Mule deer, pronghorn, and mountain lion are the only big game species that are present within the study area (NDOW 2005b; BLM 1983). The study area is located within the NDOW's Mule Deer Management Areas 14 and 15, Units 141, 152, and 154, respectively. Overall, the limiting factor for mule deer within the region is the quantity and quality of available summer range. However, water is the primary limiting factor within the study area (Podborny 2002). Mule deer populations within Management Areas 14 and 15 have been in a downward trend since 1985. Downward trends are thought to be the result of heavy winter fawn losses and low fawn production due to extended drought conditions (BLM 1996a). Although mule deer are

known to occur throughout the study area, seasonal use is expected to be low due to current population trends, the lack of major seasonal migratory routes through the permit area, and the limited amount of open or free water within the project boundary (Podborny 2002).

Summer range for mule deer generally occurs above 7,500 feet amsl in most ranges, while ***intermediate*** and winter ranges occur at lower elevations (BLM 1983). The BLM Elko Field Office identifies most of the Cortez Range as year-long mule deer range (BLM 1986a). ***Intermediate mule deer range occurs immediately south and west of the project boundary in the Toiyabe Range*** (BLM 1983; NDOW 2005a). Summer range for mule deer occurs approximately 3 miles northwest of the project boundary in the higher elevations of the Shoshone Range ***and from the southeastern portion of the project boundary, east into the Cortez Mountains*** (NDOW 2005a). Winter range for mule deer occurs in the northwestern portion of the project boundary and extends northwest into the Shoshone Range. Winter range also occurs ***in the southeastern portion of the project boundary and extends*** immediately southwest of the project boundary in Carico Lake Valley, along the Red Mountains, and approximately 4 miles southeast of the project boundary east of Grass Valley (NDOW 2005a***; 2008***). Although some mule deer may migrate southward between the Cortez Mountains and the northern Toiyabe Range, migration studies have not been conducted within the study area (Lamp 2005). **Figure 3.5-1** presents the designated mule deer ranges located in the study area and cumulative effects study area.

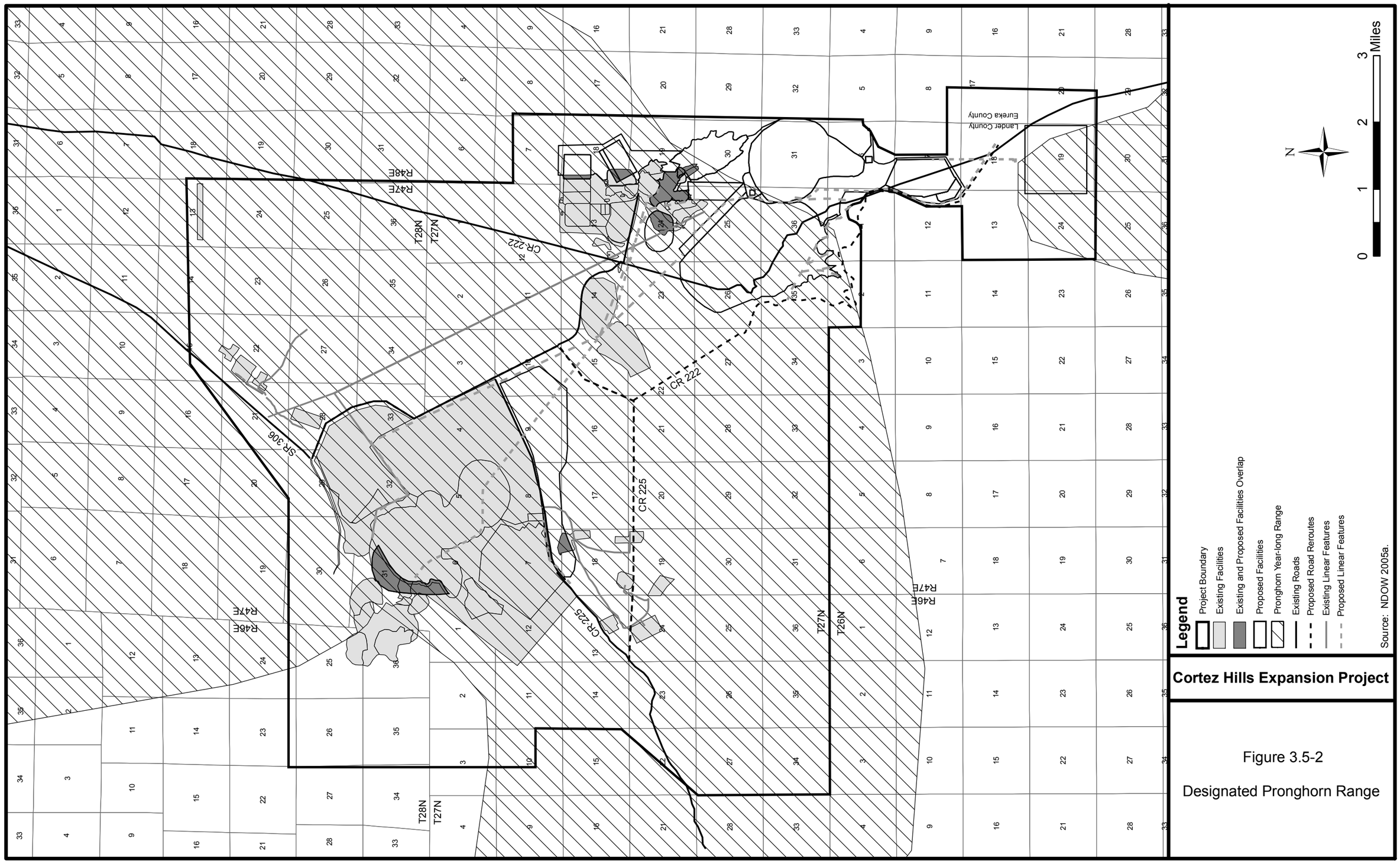
Pronghorn generally utilize valley and foothill habitats that provide adequate food and water. Currently, an increasing population of approximately 80 pronghorn utilize Crescent Valley near the study area, and another 30 to 40 animals winter in the northern end of the valley (Teske 2007). Pronghorn also occur in Grass Valley east of Bald Mountain (Teske 2003). Crucial pronghorn summer range occurs along the eastern slopes of the Cortez Range from south of Horse Canyon northeast to north of Agate Pass (BLM 1992; Teske 2003) (see **Figure 3.5-2**).

Mountain lions typically occupy the higher elevations in the surrounding mountain ranges and are closely associated with populations of resident mule deer herds. Estimates of lion populations within the region, prior to mule deer declines in the 1980s, included approximately six adults in the Cortez Mountains, eight lions in the Simpson Park Range, and slightly higher lion numbers in the Shoshone and Toiyabe ranges (BLM 1992). Although lion populations within the region may have suffered due to recent deer declines, it is suggested that lions may be able to supplement their diet with weakened wild horses (BLM 1996a, 1992).

Small Game Species

Upland game birds that occur within the study area and cumulative effects study area include greater sage-grouse, mountain quail, chukar, mourning dove, and gray (Hungarian) partridge. Greater sage-grouse and mountain quail are designated as special status species and are discussed further in Section 3.5.1.3, Special Status Species. Chukar occur throughout the lower elevations and typically are associated with more rugged slopes, canyons, and drainages in proximity to open water. Concentrations of chukar are known to occur in the northern Toiyabe Range south of Cortez Canyon (BLM 1996a, 1992). Mourning dove is one of the more commonly observed upland game species within the study area, particularly during spring, summer, and early fall. Mourning doves typically prefer habitat in close proximity to sources of open

Legend
Project Boundary
Existing Facilities
Existing and Proposed Facilities Overlap
Proposed Facilities
Mule Deer Winter Range
Mule Deer Summer Range
Designated Mule Deer Intermediate Range
Existing Roads
Proposed Road Reroutes
Existing Linear Features
Proposed Linear Features
Source: NDOW 2008.
Cortez Hills Expansion Project
Figure 3.5-1
Designated Mule Deer Range
03/14/2008
0 1 2 3 Miles
N
Lander County
Eureka County
CR 222
CR 225
SR 306
T28N
T27N
T26N
R47E
R46E
R48E


Legend
Project Boundary
Existing Facilities
Existing and Proposed Facilities Overlap
Proposed Facilities
Pronghorn Year-long Range
Existing Roads
Proposed Road Reroutes
Existing Linear Features
Proposed Linear Features
Source: NDOW 2005a.
Cortez Hills Expansion Project
Figure 3.5-2
Designated Pronghorn Range
06/15/2007
N
0
1
2
3
Miles
Lander County
Eureka County
SR 306
CR 222
CR 225
T28N
T27N
T26N
R47E
R46E
R48E

water. The gray (Hungarian) partridge is considered widespread but not common and is associated with grasslands, shrublands, and agricultural areas. Other game species that are found in the study area and cumulative effects study area include pigmy and cottontail rabbits and white-tailed jackrabbits.

Furbearers occurring in the study area and cumulative effects study area include kit and gray fox, coyote, bobcat, badger, and other small mustelids (e.g., weasel and skunks) (BLM 1996a, 1992).

Nongame Species

A diversity of nongame species (e.g., small mammals, passerines, raptors, amphibians, and reptiles) occupy a variety of habitat types within the study area and cumulative effects study area. Habitats found within the study area (e.g., sagebrush, shrubland, grassland, riparian, and wooded uplands) support a variety of resident and seasonal nongame species; however, certain habitats (e.g., riparian) support a greater density and diversity of species than others. Nongame mammals would include the least chipmunk, golden-mantled ground squirrel, Townsend's ground squirrel, and woodrat (JBR 2005c; Lamp 2005). Rodent populations within the study area provide a substantial prey base for local predators including mammal (e.g., bobcat, gray fox, coyote, badger, skunk), raptor (e.g., eagles, buteos, accipiters, owls), and reptile species (snakes). Nongame species that have been identified within the study area are presented in **Table C-1**, Appendix C.

Nongame bird species encompass a variety of passerine and raptor species, including migratory bird species that are protected under the Migratory Bird Treaty Act (16 U.S. Code [USC] 703-711) and EO 13186 (66 FR 3853). Regional birds observed during baseline surveys (JBR 2005c, 2000b) are presented in **Table C-1** in Appendix C. These birds are considered integral to natural communities and act as environmental indicators based on their sensitivity to environmental changes caused by human activities.

Passerine or songbird species occupy the entire range of habitats that occur within the study area and cumulative effects study area. However, due to the higher level of plant diversity and structure, more abundant potential nest sites, and greater food base, the transitional zones between the piñon-juniper woodlands along the foothills and the sagebrush and desert scrub communities support a greater number and diversity of birds than the lower elevation grassland communities located to the north and south of the project boundary.

A number of raptor species have been observed using the study area including sharp shinned hawk, golden eagle, red-tailed hawk, Swainson’s hawk, ferruginous hawk, prairie falcon, American kestrel, northern harrier, burrowing owl, short-eared owl, and long-eared owl (JBR 2005c, 2000b; Lamp 2005, 2002). Additional regional species that could occur within the study area include turkey vulture, Cooper’s hawk, rough-legged hawk, bald eagle, and great-horned owl (BLM 1996a; Herron et al. 1985). According to NDOW (2005b), a number of historic raptor nests occur in the project vicinity, including golden eagle, ferruginous hawk, red-tailed hawk, American kestrel, and great horned owl.

One golden eagle nest was documented on a rock outcrop on the steep slopes of Mount Tenabo outside of the project boundary in spring 2000. Based on the limited amount of whitewash around the nest, this nest was determined to be inactive in 2000. An inactive stick nest also was located on a rock outcrop above Cortez Canyon during the baseline surveys (JBR 2000b). Other golden eagle nest sites within the project

vicinity include one nest located approximately 1.5 miles north of the project boundary near the Robertson Mine in the Shoshone Range, one located approximately 6 miles southwest of the project boundary at an old ranch site in the Red Mountains, and another located approximately 4.5 miles west of the project boundary at Horse Ranch in the Carico Lake Valley.

Five ferruginous hawk nests were identified 3 miles south and east of the project boundary (NDOW 2005b). In order to protect the sites and their inhabitants, the locations of these nest sites are not delineated in this document. These nesting records are important, since they document presence, historical distribution, and suitable breeding habitat. However, since raptors often maintain alternative nest sites within their respective breeding territories or establish new nests in previously unoccupied habitats, these historical records are used only as references, and breeding pairs may occupy any potentially suitable nesting sites within the study area.

Additional raptor species have been observed nesting in the project vicinity. Observations have included an American kestrel nest identified in a gravel pit high wall located within Grass Valley approximately 3.5 miles south of the project boundary, a red-tailed hawk nest located in Indian Creek in the Shoshone Range approximately 4 miles north of the project boundary, and a great horned owl nest located approximately 7 miles northwest of the project boundary (NDOW 2005b). In addition, an occupied western burrowing owl nest was documented along a dirt road in northwestern Grass Valley, just east of the northern Toiyabe Range in spring 2005 (JBR 2005c).

Other important nongame species in the project vicinity include several bat species. Existing shafts, adits, and other underground openings support both breeding and hibernating bat species. Bats that potentially occur in the vicinity of the project are listed in **Table 3.5-1**. An AnaBat II Bat Detector and an AnaBat 6 Zero Crossing Analysis Interface Module were used to record bat calls at several locations in the study area (JBR 2004). Since the bat species identified for this project currently are listed as BLM sensitive species, the survey methods, area examined, and results are discussed in detail in Section 3.5.1.3, Special Status Species.

Other nongame species in the study area include common reptiles such as the western fence lizard, sagebrush lizard, collard lizard, Great Basin skink, desert horned lizard, gopher snake, and Great Basin rattlesnake. Amphibian presence would be low in the study area, due to the limited amount of water sources. However, amphibians occur throughout the project region, according to habitat associations.

Migratory Birds

Pursuant to EO 13186, a draft Memorandum of Understanding among the BLM, USFS, and USFWS was drafted in order to promote conservation and protection of migrating birds. Specific measures to protect migratory bird species and their habitats have not been identified within EO 13186, but instead, the EO provides guidance to agencies to promote best management practices for the conservation of migratory birds. As a result, the BLM Nevada State Office prepared Migratory Bird Best Management Practices for the Sagebrush Biome in order to assist BLM field offices in the consideration of migratory birds in land management activities (BLM [no date]).

Table 3.5-1
Bat Species Potentially Occurring in the Project Vicinity

Common Name	Scientific Name	Status[1]
Pallid bat	*Antrozous pallidus*	BLM
Big brown bat	*Eptesicus fuscus*	BLM
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM
Silver-haired bat	*Lasionycteris noctivagans*	BLM
Small-footed myotis	*Myotis ciliolabrum*	BLM
Long-eared myotis	*Myotis evotis*	BLM
Fringed myotis	*Myotis thysanodes*	BLM
Long-legged myotis	*Myotis volans*	BLM
Spotted bat	*Euderma maculatum*	BLM
Western pipistrelle	*Pipistrellus hesperus*	BLM
Little brown bat	*Myotis lucifugus*	BLM
California myotis	*Myotis californicus*	BLM
Yuma myotis	*Myotis yumanensis*	BLM

[1]BLM = BLM sensitive species.

Breeding bird surveys were conducted in May and June 2005, within the study area (JBR 2005c). Avian species that were observed within and adjacent to the study area are presented in **Table C-1** in Appendix C. Details on sensitive bird species such as greater sage-grouse, pinyon jay, and juniper titmouse are discussed further in Section 3.5.1.3, Special Status Species.

3.5.1.2 Fisheries

Due to the predominantly intermittent drainages within the study area and cumulative effects study area, fish habitat in the vicinity of the proposed project is limited. Based on a reconnaissance of the study area by JBR (2005c), perennial flow is limited to the upper reaches of Copper Canyon and the south-central drainage on the east side of the northern Toiyabe Range. Habitat consists of several large ponds in Copper Canyon and springs in the northern Toiyabe drainage. Flowing water also was observed in May 2005 in Copper Canyon and nine unnamed tributaries in the northern Toiyabe Range. In general, the stream reaches did not contain sufficient depths to provide persistent habitat for fish. Fish were not observed in the ponds or springs during amphibian surveys; however, based on the observed depth and inflow, the habitat could support fish species. Fish were observed in the stock pond in Copper Canyon; however, species were not identified (JBR 2007a).

The cumulative effects study area consists of drainages within the Crescent Valley, Grass Valley, and Pine Valley hydrographic basins. Stream flow is known to occur in segments of the Crescent Valley basin in areas near seeps or springs. Examples include Fourmile Canyon and Thomas and Frenchie creeks in the Cortez Mountains and the upper reaches of Fire, Feris, and Indian creeks in the Shoshone Range. Potential fish habitat could exist in stream segments and springs or ponds near the seepage source. Feris and Indian creeks contain brook trout and dace species. In addition, Mill Canyon, a potential perennial stream, is located in the Cortez Mountains approximately 1 to 2 miles northeast of the project boundary. All of these

streams could provide sufficient depths to support fish at scattered locations. However, fish were not present at three sampling locations surveyed in May 2007 (JBR 2007c).

3.5.1.3 Special Status Species

Special status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed species that are protected under the ESA, species of concern as identified by the USFWS, and species designated as state sensitive by the BLM. In addition, there is a Nevada State protected animal list (NAC 501.100-503.104) that the BLM has incorporated, in part, into the BLM's sensitive species list.

A total of 52 special status species (42 terrestrial species and 10 aquatic species) were identified as potentially occurring within the study area (BLM 2004a; NNHP 2005; USFWS 2006, 2002). These species, their associated habitats, and their potential for occurrence within the study area are summarized in **Table C-2** in Appendix C. Occurrence potential in the study area and cumulative effects study area was evaluated for each species based on their habitat requirements and/or known distribution. Although a number of sensitive terrestrial and aquatic animal species occur in northern Nevada, few species have been documented for the study area. In support of this document, baseline information and surveys have been collected in or near the study area (BLM 2004a,b, 2001c, 2000a, 1996a, 1992; JBR 2005c, 2000b). Based on these evaluations, 22 special status species (13 terrestrial species and 9 aquatic species) have been eliminated from detailed analysis based on their habitat requirements and/or known distributions as discussed in **Table C-1** in Appendix C. These species include western least bittern, snowy plover, long-billed curlew, yellow-billed cuckoo, flammulated owl, Lewis's woodpecker, red-naped sapsucker, crissal thrasher, LeConte's thrasher, gray vireo, Lucy's warbler, black rosy finch, yellow-breasted chat, Lahontan cutthroat trout, Fish Creek Springs tui chub, Big Smoky Valley tui chub, Big Smoky Valley speckled dace, spotted frog, elongated Cain Spring pyrg, large-gland carico pyrg, ovate Cain Spring pyrg, and Big Smoky wood nymph. The 30 special status species identified as potentially occurring within the study area are described below.

Mammals

Special Status Bat Species. Several federal and state sensitive bat species have been identified as potentially occupying appropriate habitat types in or near the study area (**Table 3.5-1**). Bat species that could occur within the study area or cumulative effects study area include pallid bat, big brown bat, Townsend's big-eared bat, silver-haired bat, small-footed myotis, long-eared myotis, fringed myotis, long-legged myotis, spotted bat, and western pipestrelle, little brown bat, California myotis, and Yuma myotis (BLM 2004a, 2000a; JBR 2005c, 2004, 2000b). Rock outcrops, caves, mine shafts and adits, cliffs, trees, and abandoned buildings could provide day roost sites; caves and mines may be used for hibernacula, maternity roosts, or bachelor roosts. Wildlife surveys conducted within the study area in 2000 identified one adit. This adit was located near the Cortez Canyon spring ***(also known as Shoshone Wells spring)*** in the southwestern portion of the project boundary. However, this adit was flooded and was not available for bats. An additional adit was identified in central Copper Canyon in 2005 (JBR 2005c). An AnaBat bat detector was placed near the mouth of the adit and at a pond approximately 750 feet below the

adit. Species recorded by the AnaBat detector included Townsend's big-eared bats, little brown myotis, big brown bats, long-eared myotis, and multiple unidentified myotis vocalizations (JBR 2005c). Other manmade structures that could provide potential roost sites for area bats include three standing cabins located in the area of the Cortez townsite/mill (JBR 2000b). Other potential roosting habitat within the vicinity of the project boundary includes forested habitat and rock outcrops. Piñon-juniper woodlands within and adjacent to the project boundary may provide roosting habitat for some bat species. Limited cliff habitat for roosting bats occurs within the project boundary. However, cliffs and older mine workings are available higher on Mount Tenabo, east of the project boundary and may provide potential roosting habitat for area bats (JBR 2004, 2000b).

Pallid Bat. The pallid bat is a year-round resident in Nevada, occupying a variety of habitats including piñon-juniper, blackbrush, creosote, sagebrush, and salt desert scrub. The pallid bat is a colonial species with roost site habitats that include rock outcrops, mines, hollow trees, caves, buildings, and bridges. Recent research suggests a large reliance on tree roosts, and pallid bats will not tolerate a roost with temperatures greater than 40 °C. Food items primarily are large ground-dwelling arthropods but also include large moths (Arizona Game and Fish Department [AGFD] 1993; Altenbach et al. 2002). Although this species was not documented during baseline surveys, a single open adit found in central Copper Canyon could provide suitable habitat for the pallid bat (JBR 2005c). Additionally, mist netting surveys conducted at mine workings east of the project boundary in September 2004 (JBR 2004), documented the presence of pallid bats. The potential for this species to occur within the study area and cumulative effects study area is considered low to moderate, depending on the availability of suitable roosting habitat.

Big Brown Bat. The big brown bat is a year-round resident in Nevada, occupying a variety of habitats including piñon-juniper, blackbrush, creosote, sagebrush, and salt desert scrub at an elevational range of approximately 985 to 9,850 feet amsl. This species gleans insects over water and open landscapes, as well as in both forested and edge settings (Altenbach et al. 2002). The big brown bat is a colonial species, roosting in groups of up to several hundred. Roost sites include caves, mines, buildings, bridges, and trees. Small numbers of big brown bat calls were recorded using an AnaBat detector placed at the mouth of an open adit found in Copper Canyon (JBR 2005c). The potential for the species to occur in the study area and cumulative effects study area is considered high.

Townsend's Big-eared Bat. The Townsend's big-eared bat is found throughout Nevada from low desert to high mountain habitats. Throughout much of its range, this bat is common in mesic habitats, characterized by coniferous and deciduous forests (AGFD 1993; Harvey et al. 1999). In Nevada, the Townsend's big-eared bat primarily occurs in piñon-juniper, mountain mahogany, white fir, blackbrush, sagebrush, salt desert scrub, agricultural lands, and urban habitats (Altenbach et al. 2002). This species prefers caves, mines, and buildings that maintain stable temperatures and airflow for nursery colonies, bachelor roosts, and hibernacula (Harvey et al. 1999). It does not make major migrations and appears to be relatively sedentary, not traveling far from summer foraging grounds to winter hibernation sites (Harvey et al. 1999). Its distribution seems to be determined by suitable roost and hibernation sites, primarily caves and mines. This bat is believed to feed entirely on moths (Harvey et al. 1999) and gleans insects from foliage and other surfaces (Altenbach et al. 2002). This species has been documented in the Battle Mountain area (BLM 2002f). The Townsend's big-eared bat also was recorded within the study area at an open adit in Copper Canyon using an AnaBat mounted at the mouth of the adit on the night of May 25, 2005

(JBR 2005c). Mist netting surveys conducted at mine workings east of the project boundary in September 2004 (JBR 2004), documented the presence of Townsend's big-eared bats. The potential for this species to occur in the study area and cumulative effects study area is considered high.

Silver-haired Bat. The silver-haired bat's resident status is poorly understood, but it is probably a transient spring and fall migrant that occupies woodland and riparian habitats in the north and central portions of Nevada. This species of bat is closely associated with mature forested areas at higher elevations ranging from approximately 1,574 to 8,267 feet amsl. It is found in coniferous and deciduous mixed forests, piñon-juniper woodlands, subalpine fir, white fir, limber pine, aspen, cottonwood, and willow habitats. This species forages on insects and moths in or near wooded areas and along edges of roads, streams, or waterbodies. This species roosts both singly or in small groups. Summer roosts are almost exclusively in trees. Winter roosts include hollow trees, rock crevices, mines, caves, and houses (Altenbach et al. 2002). Although previous surveys have not observed this species in the study area, the area contains older mines and numerous cliffs and outcrops suitable for silver-haired bats. The potential for this species to occur within the study area and cumulative effects study area is considered low, depending on the availability of suitable roosting habitat.

Small-footed Myotis. The small-footed myotis is found throughout Nevada from approximately 3,500 to 5,900 feet amsl in elevation. This species inhabits a variety of habitats including desert scrub, grassland, sagebrush steppe, blackbrush, greasewood, piñon-juniper woodlands, pine-fir forests, agricultural lands, and urban areas (Altenbach et al. 2002). Day and maternity roosts of western small-footed myotis have been found in crevices in cliffs, boulders, and on talus slopes. Summer roosts are highly variable and include buildings, mines, under the bark on trees, and crevices in cliffs and boulders (AGFD 1993; Harvey et al. 1999). This species prefers small protected dry crevices. Night and hibernation roosts are located in small caves and abandoned mine adits. Buildings also are used as temporary night roosts between flights. Western small-footed myotis forage for insects over the edge of rocky bluffs, in clearings, near rocks, and over forests (AGFD 1993; Altenbach et al. 2002; Harvey et al. 1999). This species has been documented in the Battle Mountain area (BLM 2002f) but not within the study area. However, multiple unidentified myotis vocalizations were recorded at an adit in Copper Canyon during the 2005 bat surveys (JBR 2005c). The potential for this species to occur within the study area and cumulative effects study area is considered moderate.

Long-eared Myotis. The long-eared myotis is found throughout Nevada from approximately 2,260 to 6,790 feet amsl in elevation but primarily is found at higher elevations. The long-eared myotis primarily is associated with coniferous forests, including piñon-juniper woodlands, but the species also utilizes sagebrush and desert scrub habitats. Day roosts include hollow trees; under loose tree bark; crevices in rock cliffs and fissures in the ground; and occasionally in caves, abandoned mines, and buildings. Night roosts primarily occur in caves, mines, and abandoned buildings (AGFD 1993; Altenbach et al. 2002; Harvey et al. 1999). This species is known to roost singly or in small groups. This species gleans insects (primarily small moths) over vegetation and open water (e.g., rivers, streams, and ponds) (Altenbach et al. 2002). Areas of rock outcrops as well as abandoned mines and buildings in the area could provide suitable roost sites for this species. Long-eared myotis were recorded by an AnaBat bat detector placed at a pond 750 feet below an adit in Copper Canyon on the night of June 7, 2005 (JBR 2005c). AnaBat detections

also were documented immediately east of the project boundary in 2004 (JBR 2004). The potential for this species to occur within the study area and cumulative effects study area is considered high.

Fringed Myotis. The fringed myotis is found in the central and southern portions of Nevada and probably in portions of northern Nevada. This species occupies a wide range of habitats ranging from desert scrub communities to higher elevation coniferous forests. However, oak and piñon woodlands appear to be the most commonly used habitat (Harvey et al. 1999). This small myotis typically is found from approximately 1,380 to 7,090 feet amsl in elevation (Altenbach et al. 2002). Fringed myotis use mines, caves, rock crevices, and buildings for day roosts. Temporary night roosts have been found in mines, and large maternity colonies have been located in caves and buildings (AGFD 1993; Altenbach et al. 2002; Harvey et al. 1999). Little is known about the migration habits of the fringed myotis, but individuals have been documented hibernating in caves. This species gleans small insects (mainly moths) from foliage during foraging. As discussed above for the long-eared myotis, rock outcrops as well as abandoned mines and buildings in the area could provide suitable roost sites for this species. The likelihood that this species would occur within the study area and cumulative effects study area is considered low, based on its known occurrence in the Great Basin of Nevada (BLM 2000a).

Long-legged Myotis. The long-legged myotis occupies piñon-juniper and montane coniferous forest habitats from approximately 3,050 to 11,220 feet amsl in Nevada. Individuals typically day roost singly or in small groups in buildings, rock crevices, caves, abandoned mines, or in hollow trees, particularly large diameter snags or live trees within lightning scars (AGFD 1993; Altenbach et al. 2002; Harvey et al. 1999). Night roosts and hibernacula are often in caves and mines. Foraging typically occurs in open areas, often at canopy height (Altenbach et al. 2002). This species has been documented in the Battle Mountain area (BLM 2002f) but not within the study area. However, multiple unidentified myotis vocalizations were recorded at an adit in Copper Canyon during the 2005 bat surveys (JBR 2005c). The potential for this species to occur within the study area and cumulative effects study area is considered high.

Spotted Bat. The spotted bat is rare throughout the western U.S., including Nevada. Although limited data currently are available on this species, it is thought that its distribution is linked to the availability of suitable cliff roosting habitat. This species is found within a wide variety of habitats from low elevation desert scrub to high elevation coniferous forest habitats, including piñon-juniper, sagebrush, riparian, and urban habitats (Altenbach et al. 2002). This species has been reported roosting in horizontal rock crevices in cliffs, along washes, or in rock outcrops (AGFD 1993; Altenbach et al. 2002; Harvey et al. 1999). It is believed that this bat forages nocturnally for insects over open water, marshes, and open woodlands (e.g., piñon-juniper). The upper elevations along the eastern portion of the study area may provide suitable habitat for the spotted bat. Based on the known distribution of this species in the project region, the potential for this species to occur within the study area and cumulative effects study area is considered low.

Western Pipistrelle. The western pipistrelle is a year-round resident found throughout Nevada at low to middle elevations averaging approximately 5,905 feet amsl. The species occupies desert habitats of blackbrush, creosote, salt desert scrub, and sagebrush, with occasional occurrence in ponderosa pine and piñon-juniper, usually in association with rock features such as granite boulders and canyons. This species gleans insects over open habitats. The western pipistrelle usually roosts singly or in small groups. Roost sites include rock crevices, mines, caves, and occasionally buildings and vegetation (Altenbach et al. 2002).

AnaBat bat detector surveys conducted in 2004 (JBR 2004) at mine workings just east of the project boundary recorded western pipistrelle vocalizations. The potential for this species to occur within the study area and cumulative effects study area is considered moderate, depending on the availability of suitable roosting habitat.

Little Brown Bat. The little brown bat is a likely year-round resident found primarily in northern Nevada at higher elevations. This species often is associated with coniferous forests. Foraging occurs in open areas among vegetation, along water margins, and above open water. Roost sites include hollow trees, rock outcrops, buildings, and occasionally mines and caves (Altenbach et al. 2002). AnaBat bat detector surveys conducted in 2004 (JBR 2004) at mine workings just east of the project boundary recorded little brown bat vocalizations. The potential for this species to occur within the study area and cumulative effects study area is considered moderate, depending on the availability of suitable roosting habitat.

California Myotis. The California myotis is a year-round resident found throughout Nevada at low and middle elevations (690 to 8,960 feet amsl). This species occurs in a variety of habitats from lower Sonoran desert scrub to forests. The California myotis gleans insects above open habitat. This species typically roosts singly or in small groups, although some mines are known to shelter colonies of over 100 individuals. Roost sites include mines, caves, buildings, rock crevices, hollow trees, and under exfoliating bark (Altenbach et al. 2002). AnaBat bat detector surveys conducted in 2004 (JBR 2004) at mine workings just east of the project boundary recorded California myotis vocalizations. The potential for this species to occur within the study area and cumulative effects study area is considered moderate, depending on the availability of suitable roosting habitat.

Yuma Myotis. The Yuma myotis is a year-round resident found primarily in the southern and western half of Nevada at low to middle elevations (1,480 to 7,680 feet amsl). This species occurs in a wide variety of habitats, including sagebrush, salt desert scrub, agricultural, playa, and riparian habitats. This species geans aquatic insects over open water and above vegetation. Roost sites include buildings, trees, mines, caves, bridges, and rock crevices. Night roosts usually are associated with buildings, bridges, or other man-made structures (Altenbach et al. 2002). Based on the species' known distribution, the potential for this species to occur within the study area and cumulative effects study area is considered low.

Pygmy Rabbit. The pygmy rabbit is distributed throughout the northern Great Basin, primarily in rocky habitats dominated by dense stands of big sagebrush and rabbitbrush, particularly in floodplain habitats. Pygmy rabbits usually remain near dense cover, where rabbits excavate burrows and create trail systems in the understory (JBR 2000b). Sagebrush is important forage for this rabbit and is consumed year-round (BLM 1997). Pockets of dense sagebrush habitat occur in the southern portion of the project boundary, and near the Cortez Canyon spring ***(also known as Shoshone Wells spring)***. Surveys for pygmy rabbits were conducted in potentially suitable habitat within the project boundary in 2000. No pygmy rabbits were observed, but several potential burrows and trails were found at the foot of the northeastern portion of the Toiyabe Range. The potential for this species to occur within the study area and cumulative effects study area is considered moderate.

Birds

Northern Goshawk. The northern goshawk is an uncommon forest species that is a year-long resident of Nevada, breeding in the mountains and wintering in the lower foothills and valleys (Herron et al. 1985). In Nevada, this species generally is associated with aspen stands and perennial water sources (Herron et al. 1985). No potentially suitable nesting habitat occurs within the project boundary. However, a small grove of aspen occurs at the head of Fourmile Canyon located approximately 4 miles northeast of the project boundary (BLM 2001c). The potential for this species to occur within the study area and cumulative effects study area is considered low.

Bald Eagle. ***On July 9, 2007, the USFWS delisted the bald eagle in the lower 48 states (72 FR 37346).*** No bald eagle nesting habitat occurs in or near the project boundary; however, migrating eagles do move through the state, and wintering birds would occur within the appropriate winter habitats (e.g., Humboldt River corridor). Winter habitat generally includes open water and upland habitats for foraging.

In addition to open water, other important habitat components for wintering eagles include suitable trees for diurnal perching and night roosting (Terres 1991; USFWS 1986). Bald eagle wintering habitat exists along the Humboldt River, approximately 30 miles north of the project boundary (JBR 2005c, 2000b). Eagle presence in the immediate project vicinity would be infrequent and limited to occasional foraging in the upland habitats.

Golden Eagle. The golden eagle is a year-long resident and is considered to be a common breeder throughout Nevada; however, eagle densities and nesting activity are greatest in the northern third of Nevada (Herron et al. 1985). Nesting golden eagles prefer suitable cliffs that overlook sagebrush flats, piñon-juniper forests, salt desert shrub, or other habitat capable of supporting a suitable prey base. Highest densities of nesting eagles typically are found along river systems where cliffs border the entire length of the river, and lower densities are found in piñon-juniper habitat and salt desert shrub communities (Herron et al. 1985). Wintering golden eagles tend to congregate in broad valleys interspersed with agricultural croplands or sagebrush and desert shrub communities. Nesting activity has been documented within the project vicinity, as discussed in the Nongame Species subsection of Section 3.5.1.1, Terrestrial Wildlife. The potential for this species to occur within the study area and cumulative effects study area is considered high.

Ferruginous Hawk. The ferruginous hawk is a common breeder in many areas of Nevada. This species often nests in trees, on promontory points, rocky outcrops, cut banks, or on the ground. Preferred breeding habitat in most of the state is scattered juniper forests at the interface between piñon-juniper and desert shrub communities that overlook broad valleys used for foraging (Herron et al. 1985). As discussed above for general raptor species, three ferruginous hawk nests occur within the vicinity of the study area. No ferruginous hawk nests have been identified within 3 miles of the project boundary (NDOW 2005b). However, suitable nesting habitat potentially could occur within the project boundary. The potential for this species to occur within the study area and cumulative effects study area is considered moderate.

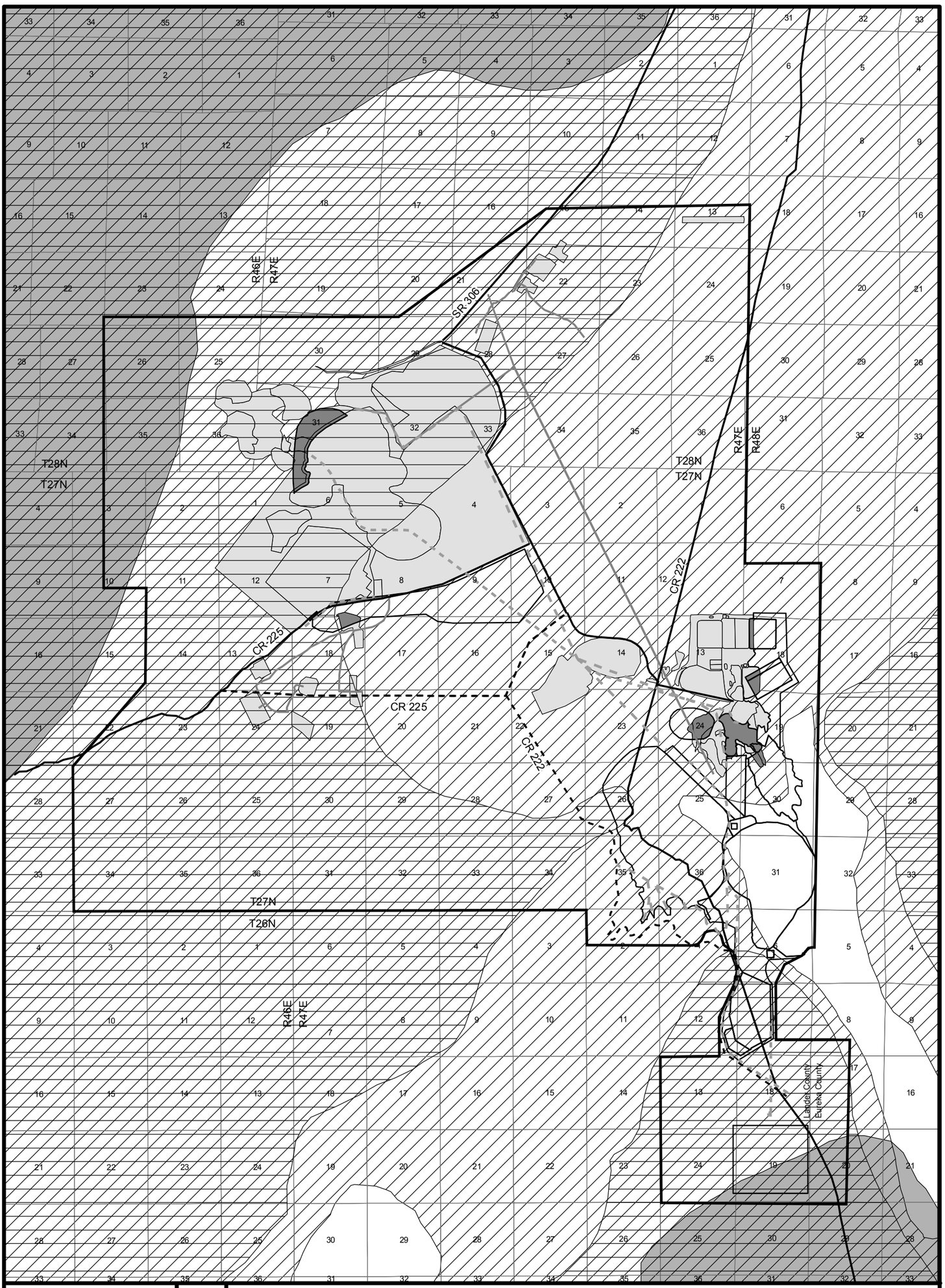
Swainson's Hawk. Swainson's hawk breeds in open country throughout most of the West. Swainson's hawk is known to nest in trees, shrubs, and occasionally on low cliffs, cutbanks, and on the ground (Herron et al. 1985). In Great Basin desert areas of Nevada, this hawk appears to prefer to nest in deciduous trees

in agricultural valleys (Herron et al. 1985). Known nesting areas within the region primarily occur along the Humboldt River drainage. No Swainson's hawk nests or potentially suitable nesting habitat occurs within the project boundary. The potential for this species to occur within the study area and cumulative effects study area is considered low.

Prairie Falcon. Prairie falcons range throughout the Great Basin and are permanent residents of Nevada. Habitat requirements include steep cliff ledges and outcrops for nesting that border semi-arid valleys. The highest nesting densities in Nevada occur in northern counties, particularly located in or near the mouth of narrow canyons, overlooking riparian vegetation and agricultural lands (Herron et al. 1985). There have been no observations of this species within the study area during previous surveys. However, prairie falcons are commonly observed in the Dry Hills, immediately north of the project boundary, and are known to occur within the project boundary (JBR 2000b, 2005c). As a result of known distribution and habitat association, the potential for this species to occur within the study area and cumulative effects study area is considered high.

Greater Sage-grouse. Greater sage-grouse are known to occur in the project vicinity, primarily in the southern and eastern portions of the study area. Sagebrush is a key component of greater sage-grouse habitat on a year-long basis. Sagebrush provides forage and nesting, security, and thermal cover for greater sage-grouse. Moist areas that provide succulent herbaceous vegetation during the summer months are used extensively as brood rearing habitat. Open, often elevated areas within sagebrush habitats usually serve as breeding areas (strutting grounds or lek sites). During winter, greater sage-grouse often occupy wind exposed areas where sagebrush is available (e.g., drainages, southern or western slopes, or exposed ridges). Greater sage-grouse winter habitat encompasses the western half of the project boundary in Crescent Valley and extends into the Shoshone Range. Additional winter range occurs in the southern portion of the project boundary and extends south into Grass Valley and the lower elevations of the Toiyabe Range and Cortez Mountains (NDOW 2005a). Winter greater sage-grouse habitat is presented in **Figure 3.5-3**. Greater sage-grouse nesting habitat clips the northwest and southeast corners of the project boundary and extends farther to the northwest and southeast. To the northwest, breeding habitat includes western portions of Carico Lake Valley and extends into the Shoshone Range. Nesting habitat in the southeast includes a large area in Grass Valley and the Cortez Mountains (see **Figure 3.5-3**). No existing lek sites have been identified within the project boundary. However, 7 active leks, 3 historic leks, and 1 lek of unknown status are located within approximately 6 miles of the project boundary. The locations of these lek sites are provided in **Table 3.5-2**. The nearest lek site to the proposed project occurs less than 1 mile from the northwestern edge of the project boundary (NDOW 2005b). The potential for this species to occur within the study area and cumulative effects study area is considered high.

Mountain Quail. Mountain quail are permanent residents of Nevada found at high elevations during the spring and summer seasons but move to lower elevations for wintering grounds. This species inhabits meadows with forested edges, arid sagebrush shrublands, piñon-juniper forests, and steep mountainsides with dense cover for nesting (American Ornithologists' Union [AOU] 1983). Mountain quail favor habitat with tall dense shrubs close to water (Brennan et al. 1987). Potential habitat use within the study area would be limited to foraging and migrating individuals. The potential for this species to occur within the study area and cumulative effects study area is considered low.



Legend

- Project Boundary
- Existing Facilities
- Existing and Proposed Facilities Overlap
- Proposed Facilities
- Greater Sage-grouse Winter Habitat
- Greater Sage-grouse Nesting Habitat
- Greater Sage-grouse Late Summer Habitat
- Existing Roads
- Proposed Road Reroutes
- Existing Linear Features
- Proposed Linear Features

Source: NDOW 2005a.

N

0 1 2 3 Miles

Cortez Hills Expansion Project

Figure 3.5-3
Greater Sage-grouse Habitat

06/19/2007

Table 3.5-2
Greater Sage-grouse Lek Sites Within the Study Area

Lek Name	Approximate Distance from Project Boundary (miles)	Location	Last Active	Last Checked	Status
Cook's Creek 2	6.0	Shoshone Range	2003	2004	Active
Horse Ranch	5.0	Carico Lake Valley	2003	2004	Active
Utah Mine Camp 1	2.5	Shoshone Range	2003	2004	Active
Elder Creek	1.5	Carico Lake Valley	1974	--	Historic
Clipper Mine	0.75	Shoshone Range	2003	2004	Active
Tenabo	1.0	Shoshone Range	1947	--	Historic
Indian Creek	3.75	Crescent Valley	2000	2002	Unknown
Mud Springs Gulch	5.5	Crescent Valley	--	--	Historic
Utah Mine Camp 2	2.0	Shoshone Range	2004	2004	Active
Horse Creek 2	4.0	Cortez Mountains	--	1999	Active
Cortez-Grass Valley	1.5	Grass Valley	--	1980	Active

Source: NDOW 2005.

Short-eared Owl. Short-eared owls are year-round residents of Nevada, although few nest sites have been identified. The species tend to nest in meadow and wetland habitats (Herron et al. 1985). During the 2000 baseline surveys, a single individual was flushed from piñon-juniper habitat on the eastern edge of the study area, but there has been no other evidence of occurrence (JBR 2000b). The potential for this species to occur within the study area and cumulative effects study area is considered high.

Long-eared Owl. Long-eared owls occur within juniper woodlands, coniferous forests, and riparian areas at higher elevations (Herron et al. 1985). The majority of Nevada's population of long-eared owls is considered non-migratory, although individuals occurring outside of Nevada have been known to winter in Nevada (Herron et al. 1985). An individual long-eared owl was observed during baseline surveys conducted in 2000 but no other evidence of occurrence was observed within the study area (JBR 2000b). The potential for this species to occur within the study area and cumulative effects study area is considered high.

Burrowing Owl. The burrowing owl is known to breed throughout Nevada. The majority of the breeding population is known to migrate from northern Nevada during the winter months. However, observations of this owl have been recorded throughout Nevada during all months of the year (Herron et al. 1985). Breeding by burrowing owls is strongly dependent on the presence of burrows constructed by prairie dogs, ground squirrels, or badgers. Prime burrowing owl habitat must be open, have short vegetation, and contain an abundance of burrows. Potentially suitable breeding habitat for this species would be limited to the extreme southwestern portion of the project boundary. However, habitat within the southern portion of the project boundary would be considered marginal habitat for this species. An active burrowing owl nest was found in a roadside berm just east of the north Toiyabe Range during the 2005 surveys (JBR 2005c). The potential for this species to occur within the study area and cumulative effects study area is considered high.

Pinyon Jay. The pinyon jay ranges throughout the western U.S. and is a permanent resident of Nevada. The species is strongly associated with piñon-juniper forest habitat and can be found following the piñon-juniper belt extending from the Humboldt River south to the Mojave Desert. Pinyon jays are

semi-colonial nesters (Nevada Partners in Flight [NPIF] 1999) and were observed in flocks during the 2000 wildlife baseline surveys. Pinyon jays were observed on multiple occasions during the 2000 and 2005 baseline studies (JBR 2005c, 2000b) resulting in a high potential of occurrence for the study area and cumulative effects study area.

Loggerhead Shrike. The loggerhead shrike is a common resident throughout Nevada. The species is found in open grasslands along valley floors and foothills of the Great Basin. In Nevada, it is commonly found in scrub habitat types such as sagebrush and greasewood. Loggerhead shrikes prefer shrubs or small trees for nesting, but nesting also can occur in piñon-juniper woodlands. This species can be found perching on wire, fences, or poles (NPIF 1999). Although this species has not been documented in previous wildlife surveys within the study area, the known distribution and habitat association of the species resulted in a moderate potential of occurrence for the study area and cumulative effects study area.

Vesper Sparrow. The vesper sparrow is an uncommon summer resident of Nevada. The species is found in various open shrub habitats from high elevation valleys to higher mountain slopes and basins. Nesting only has been recorded in the northern half of Nevada. The preferred nesting habitat includes open areas with a scattered sagebrush canopy and a minimum ground cover of 20 percent grasses, forbs, and small shrubs (NPIF 1999). This species was not observed within the study area during previous wildlife surveys. The potential for this species to occur within the study area and cumulative effects study area is considered moderate.

Juniper Titmouse. The Nevada range for the juniper titmouse extends north from I-80 and south to the Colorado River. The species is a year-round resident of Nevada and is closely associated with piñon-juniper woodlands. The juniper titmouse utilizes riparian areas as well and an area that includes a transition between piñon-juniper and riparian habitats would be beneficial to the species. Snags, heart rot, and riparian vegetation all provide nesting habitat (NPIF 1999). The species was observed within the study area in March during the 2000 baseline surveys (JBR 2000b) resulting in a high potential of occurrence for the study area and cumulative effects study area.

Invertebrates

Springsnails. A variety of small snails usually referred to as springsnails (*Pyrgulopsis* spp.) occur in some isolated springs in the Great Basin. These small snails, once occurring over a wider range during the Pleistocene Epoch when pluvial lakes covered much of the Great Basin, became restricted to isolated spring locations as the lakes dried. These isolated populations evolved independently, and many of these populations now constitute distinct species (JBR 2000b). Endemic populations of springsnails associated with these freshwater seeps and springs can be threatened by changes in water quantity and quality. Consequently, in 1996, the preservation of springsnails on federal lands in the Great Basin was addressed in a MOU between the USFWS, National Biological Survey, BLM, National Park Service (NPS), USFS, and the Smithsonian Institution. Surveys for springsnails were conducted by JBR within the study area in 2000, 2005, and 2007. Springsnails were documented at one site in Fourmile Canyon, located approximately 4 miles northeast of the project boundary (JBR 2000b). No springsnails were observed during surveys in springs in central Copper Canyon and the eastern side of the Toiyabe Range (JBR 2005c). In addition, JBR conducted springsnail surveys in 19 springs in the Horse Canyon area located in the Cortez Mountains

(JBR 2007a). No springsnails were observed; however, potential habitat was identified in three springs (27-48-10-344, 27-48-34-322B, and 27-48-34-412).

Fish Species

No special status fish species were identified as potentially occurring within the study area or cumulative effects study area (NNHP 2005; USFWS 2006). As a result, they have been eliminated from further analysis.

3.5.2 Environmental Consequences

Wildlife species and related issues addressed by this analysis were determined through consultation with the BLM, NDOW, and USFWS. The primary issues related to wildlife and fisheries resources include: 1) potential impacts to special status species, especially pygmy rabbit, resident bats, and springsnail species that would contribute to their being listed as federally threatened or endangered; 2) disruption of big game movements and cumulative loss of habitat; 3) potential loss of raptor nest sites; 4) potential impacts to important greater sage-grouse habitat; 5) loss or changes in existing wildlife water sources; 6) potential effects of contaminated water sources; 7) changes in water quality and available water management activities; and 8) loss of springs and associated springsnail habitat.

Environmental impacts to wildlife and fisheries resources would be significant if the Proposed Action or other alternatives result in any of the following:

- Impacts to special status species, including direct or indirect disturbance of federally threatened or endangered terrestrial or aquatic wildlife species or their critical habitat, or disturbance of USFWS species of concern or BLM sensitive species in a manner and a degree that would contribute to their being listed as either federally threatened or endangered.

- Impacts to nesting raptor or passerine species protected under the Migratory Bird Treaty Act, or loss of an active nest site, as a result of mine construction or operation during the breeding season (March through July).

- Impacts to naturally occurring seeps, springs, or creeks or their associated habitats in the study area from either direct disturbance or indirect effects from mine dewatering activities that reduce the availability or quality of water or availability of wetland/riparian habitat for aquatic and terrestrial wildlife species.

- Acute or chronic toxicity resulting from exposure to toxic materials in the tailings or heap leach facilities.

- Destruction of active bat roosts or maternity sites.

The potential impacts of the proposed project on terrestrial wildlife can be classified as short-term and long-term. Short-term impacts arise from habitat removal and disturbance as well as from activities

associated with mine operation; these impacts would cease upon mine closure and completion of successful reclamation. Long-term impacts consist of permanent changes to habitats and the wildlife populations that depend on those habitats, irrespective of reclamation success. Direct impacts to wildlife populations could include limited direct mortalities from mine development, habitat loss or alteration, incremental habitat fragmentation, and animal displacement. Indirect impacts could include increased noise, additional human presence, and the potential for increased vehicle-related mortalities.

The habitat mosaic and increased edge effect present along the foothill region in the study area support a greater number of species than either of the individual habitat types. As a result, project-related effects may be prominent for species closely associated with the piñon-juniper and sagebrush transitional zone. The degree of the effects on terrestrial wildlife species and their upland habitats would depend on factors such as the sensitivity of the species, seasonal use patterns, type and timing of project activity, and physical parameters (e.g., topography, cover, forage, climate).

Limited riparian/wetland habitat and perennial water sources also provide important habitat and available surface water for wildlife species in the study area (see Section 3.2, Water Resources and Geochemistry).

3.5.2.1 Proposed Action

Terrestrial Wildlife

Surface Disturbance. Impacts to wildlife from mine-related surface disturbance would include the temporary (short-term and long-term) and permanent reduction or loss of habitat. This impact would result from construction and operation of the proposed project. Habitat loss or alteration would result in direct losses of smaller, less mobile species of wildlife, such as small mammals and reptiles, and the displacement of more mobile species into adjacent habitats. Displacement also could result in some local reductions in wildlife populations if adjacent habitats are at carrying capacity. Mine-related surface disturbance also would result in an incremental increase in habitat fragmentation at the mine site until vegetation has been re-established. It is anticipated that the potential mine-related displacement and habitat fragmentation effects would be highest for wildlife species that typically are dependent on the transitional zone between the higher elevational piñon-juniper and lower elevation sagebrush habitats.

The Proposed Action would result in the reduction of approximately 6,792 acres of native vegetation, including the long-term reduction of approximately 1,612 acres of piñon-juniper habitat, 3,226 acres of low elevation sagebrush habitat, 380 acres of greasewood habitat, 1,274 acres of shadscale-budsage habitat, and 0.3 acre of wetland/riparian habitat (**Table 3.4-1**). Up to 300 acres of exploration-related disturbance would occur in desert shrub and piñon-juniper habitats. Woody species such as sagebrush would require up to 25 years to reach maturity. Piñon pine would require 75 to 100 years to reach maturity. The disturbance associated with the proposed Cortez Hills Pit and county road reroutes would not be reclaimed following the completion of mining, resulting in the direct permanent loss of approximately 817 acres of piñon-juniper habitat and approximately 182 acres of shrubland habitat. The expansion of the North Gap Pit and deepening of the Cortez Pit would have negligible effects on wildlife since the pit expansions would occur in previously disturbed habitat that would have little to no value for wildlife.

Limited wetland/riparian vegetation would be affected by the Proposed Action. As discussed in Section 3.4.2, Vegetation, 0.7 acre of wetland/riparian habitat would be disturbed by project development. Due to the limited amount of wetland/riparian habitat within the project vicinity, this habitat loss would represent a significant impact to wildlife species.

Game Species. Potential direct impacts to mule deer would include the incremental long-term reduction of potential forage and the incremental increase of habitat fragmentation from vegetation removal associated with mine construction and development activities. The project would disturb approximately ***3,868*** acres of mule deer range, consisting primarily of piñon-juniper ***and shrubland*** habitat**s**. Of this disturbance, approximately ***946*** acres ***of mule deer range*** associated with the Cortez Hills Pit and county road reroutes would not be reclaimed (see **Figure 3.5-1**). This anticipated loss of habitat would result in a***n*** incremental reduction in the amount of available habitat. Although winter range occurs in the northwest***ern and southeastern*** portion***s*** of the project boundary, no important mule deer movement corridors or seasonal habitats would be directly impacted from project activities. ***Based on the existing low deer population densities that occur in the project boundary,*** impacts to deer populations are expected to be low.

Impacts to pronghorn would be similar to those discussed above for mule deer. Potential direct impacts would include the incremental long-term reduction of approximately 4,110 acres of pronghorn range, and the permanent loss of approximately 21 acres of habitat (see **Figure 3.5-2**). However, no important pronghorn seasonal ranges would be directly impacted from project activities.

Impacts to mountain lions would be expected to be minimal, based on the infrequent occurrence of the species in the study area.

Direct impacts to small game species (e.g., chukar, mourning dove, gray partridge, cottontail rabbit, and black-tailed rabbit) would include the temporary reduction of approximately 5,793 acres of potentially suitable habitat, and the permanent loss of approximately 999 acres of potential habitat. Impacts also would include displacement from the proposed disturbance areas and increased habitat fragmentation, until vegetation is re-established. In most instances, suitable habitat adjacent to disturbance areas would be available for use by these species. However, as discussed above, displacement would increase competition and could result in some local reductions in wildlife populations if adjacent habitats are at carrying capacity. Potential impacts also could include nest and burrow abandonment or loss of eggs or young. However, potential effects to small game from mine development are expected to be low. These temporary losses would reduce productivity for that breeding season. Potential impacts to the pygmy rabbit are discussed in the Special Status Species subsection below.

Potential effects to upland game birds from mine development are expected to be low. The lack of known breeding sites (e.g., sage-grouse leks) and water sources that would support brooding birds limit the overall habitat quality for greater sage-grouse, mourning dove, and mountain quail. Potential impacts to the greater sage-grouse and mountain quail are discussed in the Special Status Species subsection below.

Nongame Species. A variety of resident and migratory bird species (e.g., raptors and songbirds) have been identified as potentially occurring in the study area. Potential direct adverse impacts to bird species would include the temporary loss of approximately 5,493 acres and permanent loss of approximately 999 acres of potentially suitable breeding, roosting, and foraging habitat; however, this temporary loss is expected to have little effect on local bird populations based on the amount of suitable breeding and foraging habitat in the surrounding area. If construction or development of the proposed facilities was to occur during the breeding season (approximately March 1 through July 31, depending on species), direct impacts to breeding birds could include the possible direct loss of nests or indirect effects (e.g., abandonment) from increased human noise and human presence within close proximity of an active nest site. Loss of an active nest site, incubating adults, eggs, or young would be in violation of the Migratory Bird Treaty Act. In order to minimize impacts to breeding raptors, CGM has committed to conducting breeding raptor surveys and implementing appropriate mitigation measures, as needed, in the event that project construction should occur during the raptor breeding season. In addition, for the protection of breeding songbirds, CGM has committed to avoiding habitat removal, to the extent possible, between March 1 and July 31 or, alternately, conducting breeding bird surveys and implementing appropriate mitigation in coordination with the BLM and USFWS. With implementation of these measures, residual impacts to nesting bird species within and near the proposed disturbance area would be limited primarily to temporary habitat loss. This loss is anticipated to have little effect given the extent of native habitats in the surrounding region.

New and rerouted power line segments (i.e., transmission lines and distribution lines) and the new substation potentially could pose an electrocution hazard for raptor species attempting to perch on the structures. To minimize this potential impact, CGM has committed to using a raptor-deterring design as discussed in Section 2.4.12, Applicant-committed Environmental Protection Measures. New and rerouted power line segments also would incrementally increase collision potential for migrating and foraging bird species. However, collision potential typically is dependent on variables such as the location in relation to high-use habitat areas (e.g., nesting, foraging, and roosting), line orientation to flight patterns and movement corridors, species composition, visibility, and line design (APLIC 1994). The majority of the transmission line reroutes and distribution lines, as well as the new substation, would be located internal to the proposed project disturbance area. In addition, to minimize potential collision impacts to migrating and foraging bird species, CMG has committed to using standard raptor-proofing designs as discussed in Section 2.4.12, Applicant-committed Environmental Protection Measures.

Human Presence and Noise. Indirect impacts to wildlife species would result from human presence and noise. The most common wildlife responses to noise and human presence are avoidance or accommodation. Avoidance would result in displacement of animals from an area larger than the actual disturbance area. It is not possible to predict the total extent of habitat lost as a result of wildlife avoidance response, since the degree of this response varies from species to species and can even vary between different individuals of the same species. Also, after initial avoidance of human activity and noise, certain wildlife species may acclimate to the activity and begin to reoccupy areas formerly avoided. For example, during the initial development phases, it is likely that big game (i.e., pronghorn and deer) would be displaced from a larger area than the actual disturbance sites due to the avoidance response. However, these big game species have demonstrated the ability to acclimate to a variety of mining activities as long as human harassment levels do not increase substantially. It is possible, therefore, that the extent of displacement

would approximate the actual disturbance area after the first few years of mine operation. One factor that would add to the reduction of potential effects related to increased human presence and noise in the study area is the proximity of the proposed project to the currently operating Pipeline/South Pipeline Project. As a result, impacts to wildlife species associated with human presence and noise are anticipated to be negligible to low.

Under the Proposed Action, a cross-valley conveyor would be constructed to transport mill-grade ore from the Cortez Hills Pit to the existing Pipeline Mill. To prevent wildlife access to the conveyor corridor, CGM has committed to install BLM-approved fencing along both sides of the conveyor corridor, with the following exceptions. To facilitate the passage of wildlife across the cross-valley conveyor corridor, five wildlife overpasses or ramps would be installed. One wildlife ramp would be constructed over the conveyor corridor on the ***western*** slope of the Cortez range to provide for mule deer migration. The other four wildlife ramps would be constructed over the conveyor corridor to facilitate antelope movement in Crescent Valley. All wildlife ramps would be sized and field located in coordination with the BLM and NDOW. The ramps would include appropriately sized safety berms and barriers, and ends would be fenced to prevent wildlife access as discussed in Section 2.4.11, Applicant-committed Environmental Protection Measures. ***In addition, CGM has committed to coordinate with the BLM and NDOW to develop a protocol to evaluate big game use of the conveyor overpasses or ramp structures. If it is determined by these agencies that the overpass/ramp structures are not used by big game, CGM would coordinate with BLM and NDOW to develop off site habitat enhancement projects as discussed in Section 2.4.11, Applicant-committed Environmental Protection Measures, or develop additional measures to encourage migration movement.***

As an option to the cross-valley conveyor, CGM may use haul trucks to transport mill-grade ore across the valley floor via the existing Gold Acres haul road. Approximately 15 to 30 round trips per day (12 miles each way) would be required during production (see Section 2.4.4.4, Access and Haul Roads). Potential impacts associated with cross-valley truck transport of ore would include an increase in the potential for wildlife/vehicle collisions, resulting in an unquantifiable, but probably minor, reduction in wildlife populations.

Under the Proposed Action, heap leach ore from the Cortez Pit may be processed at the proposed Cortez Heap Leach Facility or at one of the existing Pipeline heap leach facilities. If processed at Pipeline, the ore would be transported in haul trucks across the valley via the existing Gold Acres haul road. Under the alternative, if ore is trucked across the valley, approximately 93 fewer acres of shrub (shadscale, black greasewood, and budsage) habitat would be impacted. However, approximately 50 truck trips per day (12 miles each way) would be required during production for cross-valley ore transport (see Section 2.4.4.4, Access and Haul Roads). As discussed above, cross-valley truck transport of ore would result in some unquantifiable, but probably minor, reduction in wildlife populations due to the increased potential for wildlife/vehicle collisions.

Water Quality and Quantity. Wildlife populations in the project boundary could be affected by exposure to mine-related process solutions, which could contain potentially toxic levels of cyanide. Potential sources for wildlife exposure to these solutions would include the proposed Grass Valley Heap Leach Facility, Cortez

Heap Leach Facility expansion, associated process solution ponds, and the Cortez tailings facility expansion.

To minimize potential wildlife mortalities from exposure to adverse cyanide concentrations in the heap leach processing solution, CGM would implement the following committed environmental protection measures as discussed in Section 2.4.11, Applicant-committed Environmental Protection Measures. An 8-foot-tall chain link fence would be installed around each of the heap leach facilities, and solution ditches and ponds would be covered with netting, pond covers, or floating "bird balls," as appropriate, to prevent wildlife access to process solutions. In addition, new heap leach and tailings facilities would be designed and constructed as zero discharge facilities to minimize the potential for release of process solutions outside of the appropriately protected containment areas. To minimize impacts to wildlife from exposure to adverse cyanide concentrations at the tailings impoundments, CGM has committed to maintaining WAD cyanide concentrations at non-lethal levels. Based on CGM's committed environmental protection measures, potential impacts to wildlife from cyanide ingestion would be low.

Naturally occurring seeps, springs, and perennial and intermittent streams provide important wildlife habitat in the study area. Riparian habitat and its associated plant communities contribute to greater wildlife species diversity, compared to the adjacent upland areas. Since surface water and the associated riparian habitat are limiting factors for wildlife in study area, the loss of these habitat features would alter the available habitat for species that depend on these riparian areas, resulting in: 1) a reduction of available water for consumption; 2) a reduction in riparian vegetation for breeding, foraging, and cover; 3) reduction in the regional carrying capacity; 4) displacement and loss of animals; 5) a reduction in the overall biological diversity; 6) a potential long-term impact to the population numbers of some species; and 7) reduction in prey availability. The degree of impacts to wildlife resources would depend on a number of variables, such as the existing habitat values and level of use, species' sensitivity (i.e., level of dependency on riparian areas), and the extent of the anticipated water and riparian habitat reductions. Mine-related groundwater drawdown potentially would affect 22 seeps and springs and 3.5 acres of associated wetland/riparian habitat (see **Table 3.2-12**), which would be a significant impact.

Due to the limited amount of riparian communities within the study area, it is assumed that species dependent upon these areas are currently at carrying capacity. As a result, some species that are displaced due to the reduction of surface water or riparian vegetation may be able to move into adjacent areas; however, it is assumed that these adjacent riparian habitats are already at their full carrying capacity and would not support additional animals. Therefore, some individuals would be lost from the population, concentrating the remaining animals within smaller habitat areas.

Species likely affected by reductions in perennial water sources and associated habitats would include big game, upland game birds and mammals, nongame birds (e.g., raptors and passerines), mammals (e.g., bats), reptiles, amphibians, and fish. The related long-term impacts to wildlife would continue until mine dewatering is completed, groundwater elevations have recovered to approximate pre-mining levels, and riparian vegetation has become re-established. The extent of these indirect effects from the mine's dewatering activities would depend on the species' use and relative sensitivity, as discussed for each group below.

As discussed in Section 3.2, Water Resources and Geochemistry, dewatering activities would result in groundwater drawdown potentially affecting 22 seeps or springs and 1 potential perennial stream within the modeled 10-foot groundwater drawdown contour (**Figure 3.2-*24***). It is anticipated that associated riparian/wetland habitat also could be affected by water level change. Due to the limited amount of wetland/riparian habitat in the project vicinity, this habitat loss would result in a significant impact to wildlife species.

Game Species. Big game (i.e., mule deer and pronghorn) require water during the summer and fall periods, as well as during the winter period, as needed, to satisfy physiological requirements. The reduction or loss of existing water sources could impact big game use and movements. As discussed above, relatively low big game populations currently occupy the study area. However, based on the year-long mule deer habitat available within the projected 10-foot groundwater drawdown area, some individuals could be displaced due to the reduction of surface water and riparian vegetation and may move into adjacent areas that are already at their carrying capacity. These displaced individuals could be lost from the population; however, this loss cannot be quantified. Impacts to regional deer populations from the reduction of surface water and riparian vegetation would be expected to be low.

Although no water sources within designated crucial pronghorn range (i.e., summer range) would be affected by mine-related groundwater drawdown, pronghorn herds are known to occupy portions of Crescent Valley and Grass Valley that occur within the predicted 10-foot drawdown area. As a result, a reduction in available surface water for pronghorn within the mine-related drawdown area would result in a significant long-term impact to pronghorn until the water table recovers to approximate pre-mining water elevation levels and surface water availability approximates pre-mining conditions.

A reduction in riparian habitat would affect the amount of nesting, brooding, and foraging habitat for upland game birds (e.g., greater sage-grouse, mountain quail, mourning dove), and denning and foraging habitat for small game mammals (e.g., cottontail rabbits and white-tailed jackrabbits), and furbearers (e.g., kit and gray fox, coyote, bobcat, and other small mustelids). A decline in surface water availability would impact the extent of available surface water and riparian vegetation along portions of the seep, springs, and streams. Since riparian communities are limited within the study area, it cannot be assumed that displaced individuals would successfully relocate into adequate breeding or foraging habitat in adjacent areas, as it is assumed that these habitats already would be at carrying capacity. As a result, some animals could be lost from the population. Therefore, the reduced availability of potential riparian habitat and surface water within the mine's drawdown area would result in a long-term direct adverse impact to some small game species until the water table recovers to approximate pre-mining water elevation levels, and riparian vegetation has become re-established.

Nongame Species. As discussed above for general wildlife, a variety of nongame species (e.g., birds and mammals) may breed, forage, or roost in or near the study area. Potential long-term impacts to these species could include loss of nesting, brooding, roosting, foraging, and cover habitats along perennial and intermittent drainages, and at the seep and springs identified in Section 3.2, Water Resources and Geochemistry, that occur within the mine-related 10-foot drawdown area (see **Figure 3.2-*24***). These losses would result from an incremental reduction in available habitat for both resident and migratory bird

and mammal species. In addition, the regional carrying capacity would be reduced by the incremental loss of available riparian breeding and foraging habitat. Therefore, the reduced availability of potential breeding and foraging riparian habitats within the mine's drawdown area would result in a significant long-term impact to some species until the water table recovers to approximate pre-mining water elevation levels, and riparian vegetation has become re-established.

Potential impacts to amphibian and reptile species that are associated with the perennial water sources that may be affected by mine-related groundwater drawdown activities would parallel those discussed for other terrestrial wildlife species. The loss or reduction in surface water availability and associated riparian vegetation would result in a significant long-term impact to breeding, foraging, and cover habitats for these species until the water table recovers to approximate pre-mining water elevation levels, and riparian vegetation has become re-established.

As discussed in Section 3.2, Water Resources and Geochemistry, disposal of excess dewatering water through the existing infiltration basins is not anticipated to affect groundwater quality or the water quality of associated seeps, springs, or gaining reaches of streams. As a result, there would be no associated impacts to wildlife species.

Pit Lake. The BLM is directed to consider the applicable water quality standards in determining the need for an ERA for a pit lake. Based on guidance in BLM Instruction Memorandum NV-2004-031, Ecological Risk Assessment Guidelines for Open Pit Mine Lakes in Nevada (BLM 2004g), "ERAs should normally be used for additional analysis when the predicted pit water chemistry identifies a potential problem with the future pit lake." In the case of the Cortez Hills Pit lake, the pit lake water quality is not anticipated to exceed most Nevada surface water quality standards, including those for aquatic life, irrigation, and livestock watering (NDEP 2005).

Based on BLM Instruction Memorandum NV-2004-031, an ERA was not required as part of the NEPA analysis for the proposed project. However, during development of baseline studies for the project, CGM conservatively chose to have a screening-level ERA conducted for the project to evaluate the potential for adverse effects to wildlife and fish species that could be exposed to the post-mining Cortez Hills Pit lake. A standardized ERA procedure was followed by Geomega (2007h) using both USEPA and Nevada BLM guidance documents (USEPA 1998 and BLM 2004g, respectively). Where appropriate, supplemental information also was used from additional risk assessment documents from the USEPA (USEPA 2002, 2001b, 1993, 1992).

The ERA included evaluation of potential risk to terrestrial organisms (mammal and bird species) and aquatic vertebrates, specifically fish. However, no fish stocking of the pit lake is proposed. The screening-level ERA analysis is summarized below.

Methodology and Assumptions. The environmental setting of the study area and the types of species that are likely to occur are typical of the arid and semi-arid environments of central Nevada. The post-mining pit lake could provide a water source that may attract mammal and bird species. Pit lake habitats typically include open-water areas and near-shore littoral zones. Pit lake morphology, at least in the initial stages, generally is conducive to narrow littoral zones with little available benthic habitat. However, for

this ERA, it was conservatively assumed that a substantial littoral zone would develop with substantial shallow zones where sunlight could penetrate, thereby providing habitat for rooted plants to establish and grow. Other habitats that were assumed to exist were riparian (after lake stabilization) and upland (pit walls). These areas could be attractive to terrestrial wildlife species looking for foraging, nesting, or roosting locations. The pit lake is anticipated to be oligotrophic. Oligotrophic lakes generally are deep and unproductive with low levels of macronutrients such as nitrogen, phosphorus, and carbon. Animal and plant population densities tend to be low. Higher productivity may be restricted to the shallow littoral zones around the perimeter of the lake.

Constituents of potential concern in the pit lake environment were determined in a two-step process. Predicted concentrations of constituents of potential concern (Geomega 2007b) first were compared to State of Nevada Public Water Quality Criteria (NAC 445A.144). Any constituents that exceeded these standards then were compared to available screening-level benchmarks. Benchmarks used in this screening step included BLM ambient water quality criteria and (if BLM criteria are not available for a particular constituent of potential concern) USEPA ambient water quality criteria, regional USEPA ecological screening levels, secondary chronic values from Suter and Tsao (1996), alternative benchmarks (EC20s) (Suter and Tsao 1996), or Oak Ridge National Laboratory benchmarks (Sample et al. 1996). Nutrients (e.g., potassium and calcium) were screened against wildlife nutritional requirements; no concentrations were higher than the daily nutritional levels for birds or mammals.

While predicted pit lake silver and lead concentrations were slightly greater than the ambient water quality criteria values listed in Ford (2004), both of these elements are hardness-dependent, and the Ford (2004) values for hardness-dependent metals were based on 100 mg/L as calcium carbonate. When the ambient water quality criteria were adjusted for a predicted pit lake hardness of 175 mg/L, they were greater than the predicted pit lake concentrations, and thus, were excluded from the ERA analysis as constituents of potential concern. The predicted concentration of mercury in the pit lake is less than 0.001 mg/L (less than the analytical detection limit). To determine whether mercury should be retained as a constituent of potential concern, one half the detection limit, or 0.0005 mg/L, was selected as a reasonable estimate of the potential mercury concentration in the pit lake. This value is less than the chronic ambient water quality criterion for mercury (0.00077 mg/L). Mercury, therefore, was excluded as a constituent of potential concern.

The predicted pit lake selenium concentration of 0.008 mg/L is greater than the USEPA chronic ambient water quality criterion (and State of Nevada water quality standard for aquatic life) of 0.005 mg/L. Selenium, therefore, was retained as a constituent of potential concern for the ERAs of both terrestrial wildlife and fish species.

As part of the evaluation, a conceptual site model was developed, providing a visual representation of the pathways through which species likely would be exposed to constituents of potential concern. Receptor species were selected for the analysis based on their representativeness of functional groups, potential for exposure via direct and indirect pathways, and regulatory and/or stakeholder concerns. Selected receptor species included golden eagle, mallard duck, cliff swallow, killdeer, bald eagle, little brown bat, and mule deer.

Although stocking of the pit lake is not proposed, sunfish and bass are two groups of fish that might become established in the future pit lake. Both types have been observed in other pit lakes in the State of Nevada (EVS 1998). Sunfish (e.g., bluegill) most likely would be found around the edge of the lake in shallow regions where primary productivity would be highest. Bass also would occupy the lake edges but also might venture into deeper, cooler waters.

Analysis of Risk to Wildlife. The potential exposure to selenium was based on individual species exposure pathways. Possible routes of exposure used in the analysis included pit lake water, sediment, and food sources. Critical input variables, such as body weight, water and food ingestion rate, and sediment ingestion rate, were taken directly from the literature or calculated using standard equations available from risk guidance documents. Site-specific Biota-Sediment Accumulation Factors were calculated for this ERA through laboratory investigations in which metals-spiked water was added over Cortez Hills alluvium. Organisms were added to the microcosm, which was monitored for several weeks. The resulting Biota-Sediment Accumulation Factors were included in the calculation of Wildlife Dietary Exposure.

Toxicity Reference Values (TRVs) represent concentrations below which adverse effects are not expected to occur. The TRVs used in this ERA were selected from studies chosen as best representing the receptors being evaluated. For the selection process, a database was established that included all known available chronic and subchronic bird and mammal studies. Acute studies were excluded since they do not assess long-term exposures that may occur for animals occupying the pit lake for extended periods of time. Short-term acute tests usually evaluate only survival and do not consider growth, reproduction, development, or other important, sublethal endpoints. Once the database was prepared, appropriate studies were selected for each receptor and selenium, the constituent of potential concern. No Observed Adverse Effects Levels (NOAELs) and Lowest Observed Adverse Effects Levels (LOAELs) also were derived for selenium. Uncertainty factors were applied, as appropriate, to the NOAELs and LOAELs to derive NOAEL and LOAEL TRVs for the pit lake ERA, thereby representing a range of potential risks. Uncertainty categories included intertaxon extrapolation, exposure duration, and toxicological endpoints.

Once appropriate uncertainty factors were applied to NOAELs and LOAELs, and TRVs derived, risk characterization was completed. Risk characterization was quantified by calculating the ratio of the constituent of potential concern dose received by a receptor species and the TRV for the constituent of potential concern. Hazard quotients $(HQ)_{NOAELs}$ and HQ_{LOAELs} were calculated by dividing the dose calculated for each receptor species by the TRV_{NOAEL} and TRV_{LOAEL}, respectively.

Analysis of Risk to Fish. The USEPA chronic ambient water quality criterion for selenium is based on a threshold, whole-body fish tissue concentration of 3 micrograms per gram (µg/g). If the concentration of selenium in fish tissue falls below this value, fish populations should not be at risk from selenium. Previous pit lake studies of the Cortez Pit lake reported that a sediment selenium concentration of 1.6 milligrams per kilogram (mg/kg) resulted in fish tissue selenium concentrations of 2 µg/g or less (EVS 1998). To predict the possible tissue concentration of fish in the proposed Cortez Hills Pit lake, the expected average selenium sediment concentration (0.7 mg/kg) was compared to data from the Cortez Pit lake.

Results. The calculated HQs for each of the wildlife receptor species are presented in **Table 3.5-3**. Both HQ_{NOAELs} and HQ_{LOAELs} were less than 1.0 for selenium, indicating that selenium likely would pose no risk to receptor species.

Table 3.5-3
Calculated HQs for Receptor Species
for the Proposed Action

Receptor Species	Selenium	
	HQ_{NOAEL}	HQ_{LOAEL}
Bald Eagle	0.30	0.15
Cliff Swallow	0.16	0.08
Golden Eagle	0.27	0.13
Killdeer	0.06	0.03
Little Brown Bat	0.03	0.02
Mallard Duck	0.06	0.03
Mule Deer	0.01	0.01

Source: Geomega 2007b.

The projected sediment selenium concentration in the future pit lake (0.7 mg/kg) is less than one half of what was measured in the Cortez Pit lake (EVS 1998), where an average whole body fish tissue concentration of 2 µg/g was reported. Since the projected Cortez Hills Pit lake sediment concentration is lower than the sediment concentration measured in the Cortez Pit lake, it is expected that the selenium tissue concentration of fish, if present, in the Cortez Hills Pit lake would be 2 µg/g or less, which would be less than the threshold value of 3 µg/g. Fish, therefore, should not be at risk from selenium in the Cortez Hills Pit lake.

Hazardous Materials Spill. The probability of a transportation-related spill of process chemicals along the proposed transportation route (SR 306) is discussed in Section 3.16, Hazardous Materials and Solid Waste. The sensitive resources identified along SR 306 that could be affected by a potential spill include the Humboldt River and associated riparian zone, as well as the wildlife species dependent upon them.

The potential for wildlife exposure to toxic chemicals as a result of a transportation-related spill would be greatest if an accident were to occur near aquatic habitats. Spills in dryland habitat would pose only minimal risk to most wildlife species since these spills would be adjacent to highways and could be rapidly contained and cleaned up.

In general, the materials of greatest concern that would be transported under the Proposed Action would be sodium cyanide and diesel fuel. The effects of a sodium cyanide release would be highly variable and would depend on the quantity released, the location of the release (e.g., dry upland area, wet meadow area, or flowing stream area), the species exposed, and the chemical conditions at the release location. The most likely effect of a potential release of sodium cyanide would be the poisoning of terrestrial or aquatic species. Animal species that drink contaminated water could suffer severe effects or death depending on the

concentration of cyanide and the volume of the water consumed. Sodium cyanide solution can decompose rapidly when in contact with the atmosphere into poisonous and flammable hydrogen cyanide gas. Animal species that breathe this gas could suffer severe effects or death depending on the concentration of cyanide gas and the duration of exposure. However, sodium cyanide solution pH during transport is maintained at levels greater than 10, making evolution of hydrogen cyanide gas unlikely. Environmental effects of a cyanide spill or leak would be limited in extent and time of contamination, due to the rapid degradation of cyanide into benign elements when exposed to direct sunlight or oxygen.

A diesel spill has the potential to contaminate soil, surface water, and groundwater in addition to harming aquatic life and vegetation. Although unlikely, such a spill also could ignite from the accident and cause a range fire. Since cleanup actions would take place immediately, diesel contamination has a low potential to result in long-term impacts to soil, surface water, and possibly groundwater.

The risk of wildlife exposure associated with accidental spills into aquatic habitats would be highly unlikely for several reasons. The probability of an accident and the resulting release of process chemicals would be low as discussed in Section 3.17, Hazardous Materials and Solid Waste, and areas of aquatic habitat adjacent to the proposed transportation route are very limited. Hazardous chemicals would be transported via USDOT certified containers and transporters, and transportation of sodium cyanide and other chemical reagents would be in accordance with all applicable rules and regulations. In the event of a spill, a carrier would be required to implement appropriate emergency response measures as stipulated by state and federal regulations. In addition, as discussed in Section 2.4.10.2, Spill Prevention and Emergency Response, CGM would implement the existing Hazardous Materials Spill and Emergency Response Plan that establishes procedures for responding to accidental spills or releases of hazardous materials to minimize environmental risks.

Fisheries

Perennial stream and spring/pond habitat in the project boundary is limited to the upper portion of Copper Canyon and the northern portion of the Toiyabe Range. Since no project-related surface disturbance would occur within these drainages, impacts to aquatic habitat or fish species (if present) in these drainages are not anticipated. Project-related surface disturbance would occur in approximately 10 intermittent channel segments; however, these areas do not support aquatic habitat on a consistent basis.

As discussed in Section 3.2, Water Resources and Geochemistry, mine-related groundwater drawdown potentially could reduce surface flows in Mill Canyon, which is located in the Cortez Mountains approximately 1 to 2 miles east of the project boundary. This potential perennial stream contains sufficient depths to support fish species; however, no fish were collected in recent surveys (JBR 2007b).

Special Status Species

The primary issues related to special status wildlife species would parallel those identified above for general wildlife species, including the loss or alteration of native habitats, increased habitat fragmentation, animal displacement, direct loss of wildlife, and impacts associated with water management. Potential impacts for the 30 BLM sensitive species identified as potentially occurring in the study area are discussed below. No

impacts to federally listed or proposed or federal candidate species would occur as a result of the proposed project based on the lack of presence in the study area.

Mammals.

***Bats*.** Of the 13 bat species that could occur in the study area, 8 species (pallid bat, big brown bat, Townsend's big-eared bat, small-footed myotis, long-eared myotis, western pipistrelle, little brown bat, California myotis) were documented by JBR (2005c, 2004, 2000b) during surveys in the project boundary and mine workings immediately east of the project boundary. Potentially suitable habitat for the remaining five species (silver-haired bat, fringed myotis, long-legged myotis, spotted bat, and Yuma myotis) exists in the study area. Implementation of the Proposed Action could result in direct and indirect impacts to local bat species and their habitat. Direct impacts would include the long-term disturbance of foraging habitat, including approximately 1,612 acres of piñon-juniper habitat, 3,226 acres of low elevation sagebrush habitat, and 380 acres of greasewood habitat. Impacts also would result in the permanent loss of approximately 817 acres of piñon-juniper habitat and 122 acres of low sagebrush habitat from the development of the Cortez Hills Pit and construction of the county road reroutes. The proposed reroute of CR 222 would pass within approximately 500 feet of an adit where a number of bat species (i.e., Townsends Big-eared bats, little brown bats, big brown bat) were recorded during surveys. If project development were to affect the adit, potential effects to local bat populations from the potential loss of maternity roosts, nursery colonies, or hibernacula (whether from disturbance, habitat loss, or mortalities) would be considered a significant impact. Also, with the proposed reroute of CR 222 in close proximity of this adit, there would be an increased potential for human entry into the adit, potentially resulting in the abandonment of the roost site by those bat species with a higher sensitivity to disturbance.

Bats species in Nevada, require open water and riparian systems for roosting, drinking, and foraging (Hall 2000). Water resources, especially in arid and semi arid areas of the West, are often vital to wildlife survival (Studier et al. 1970). The presence of riparian habitat at water sources provides a rich forage base for insectivorous bats. Grindal et al. (1999) found that bat activity was 40 times greater at water sources with healthy, diverse, riparian-wetland habitats, which provide a richer insect fauna than surrounding upland areas. In addition, because bats are especially vulnerable to dehydration, sometimes losing 30 percent of their body weight in evaporative water loss in a single afternoon, a reliable source of water is essential for their survival (Studier et al. 1970). Hall (2000) found that almost all bat activity in the Great Basin occurs at water sources including livestock troughs, ponds, springs, seeps, and streams. Even the most desert-adapted species, such as pallid bat, may rely heavily on drinking sites when rearing young in hot weather (Schmidt 1999). Evidence suggests a strong relationship between bat species abundance and availability of open water for drinking (Adams 2003). Loss of just one water site can eliminate multiple bat species from a wide area and mortality among bats is more serious because most species produce only one young per year (Altenbach et al. 2002). As a result, it has been suggested that water deprivation and associated mortality may be the single most important cause of bat decline (Altenbach et al. 2002). Therefore, the reduced availability of water sources and riparian habitats within the predicted mine-related drawdown area would result in a significant long-term impact to bat populations, until the completion of dewatering operations, recovery of the water table to approximate pre-mining water elevation levels, and re-establishment of riparian vegetation.

***Pygmy Rabbit*.** Development of project facilities would result in the long-term reduction of approximately 7 acres, and permanent loss of approximately 5 acres, of potentially suitable sagebrush habitat (basin big sagebrush-dominated habitats) for this species. This impact would be considered low to moderate, depending on the relative habitat quality, which has not been determined within the proposed disturbance areas that currently support sagebrush habitat. In addition, project construction likely would result in the direct mortalities of individual rabbits, if present. The loss of individual pygmy rabbits (a game species in Nevada) would not result in population-level effects.

Birds. As discussed above for general raptor species, based on implementation of applicant-committed environmental protection measures, no adverse effects to sensitive raptor species have been identified in association with construction of the proposed power line, and the potential for impacts to sensitive bird species related to exposure to process solutions would be considered low. Other potential species-specific impacts are discussed below.

***Northern Goshawk*.** No direct or indirect impacts to the northern goshawk would be anticipated as a result of project construction or operation due to the lack of breeding and foraging habitat within the project boundary.

***Bald Eagle*.** No impacts to wintering or migrating bald eagles would be expected from the proposed project. Although suitable roosting and foraging habitat occurs along the Humboldt River and surrounding foothills, the potential for roosting and foraging activities in upland habitats located within the proposed disturbance area likely would be sporadic. Direct impacts would include the long-term reduction of approximately 4,698 acres of potential foraging habitat, until reclamation has been completed and prey species have been re-established, and the permanent loss of approximately 182 acres of shrubland habitat. However, overall impacts to this species from the development of the pit lake would be dependent on the use of the pit lake by prey species (e.g., waterfowl and fish). It is anticipated that the development of the pit lake would attract prey species that otherwise would not occur in the study area.

Golden Eagle. No golden eagle nest sites occur within the project boundary. However, potential nesting habitat (exposed rocky outcrops or knolls) occurs within the project boundary. Potential direct impacts to breeding eagles as a result of mine-related activities could include abandonment of a breeding territory or nest site or the potential loss of eggs or young, which would reduce productivity for that breeding season, if present. However, based on CGM's committed environmental protection measures, including conduct of nesting raptor surveys and implementation of mitigation measures, as applicable, impacts to breeding birds would be minimized. Direct impacts would include the long-term reduction of approximately 4,698 acres of potential foraging habitat, until reclamation has been completed and prey species have been re-established, and the permanent loss of approximately 182 acres of potential foraging habitat associated with development of the Cortez Hills Pit and construction of the county road reroutes. However, overall impacts to this species from development of the pit lake would be dependent on the use of the pit lake by prey species. It is anticipated that the development of the pit lake may support a greater number and diversity of prey species for golden eagle that otherwise would not occur in the pit lake area. Indirect impacts associated with mine-related noise and human presence currently occurs at the site and would continue under the Proposed Action. Based on implementation of CGM's committed environmental protection

measures, the lack of existing nest sites within the project boundary, and the existing level of activity at the mine site, potential impacts to this species as a result of the proposed project would be considered low.

Ferruginous Hawk. As discussed above, no ferruginous hawk nests have been identified within 3 miles of the project boundary. However, potential nesting habitat occurs within the project boundary. Potential impacts to breeding ferruginous hawks would be similar to those discussed above for the golden eagle. However, based on CGM's committed environmental protection measures, including conduct of nesting raptor surveys and implementation of mitigation measures, as applicable, impacts to breeding birds would be minimized. Direct impacts would include the long-term reduction of approximately 4,698 acres of potential foraging habitat, until reclamation has been completed and prey species have been re-established, and the permanent loss of approximately 182 acres of potential foraging habitat associated with development of the Cortez Hills Pit and construction of the county road reroutes. However, this impact would be considered negligible based on the overall availability of suitable foraging habitat in the vicinity. Indirect impacts would result from mine-related noise and human presence. Based on implementation of CGM's committed environmental protection measures, the lack of existing nest sites within the project vicinity, and the existing level of activity at the mine site, potential impacts to this species as a result of the proposed project would be considered low.

Swainson's Hawk. No direct impacts to nesting Swainson's hawks would be anticipated from project construction due to the lack of breeding habitat within the project boundary. As a result, it is anticipated that potential impacts to this species would be limited to migrating and foraging individuals. Direct impacts would include the long-term reduction of approximately 4,698 acres of potential foraging habitat (e.g., shrubland habitats), until reclamation has been completed and prey species have been re-established, and the permanent loss of approximately 182 acres of shrubland habitat associated with development of the Cortez Hills Pit and construction of the county road reroutes. These impacts would be considered negligible based on the overall availability of suitable foraging habitat in the vicinity. Indirect impacts would result from mine-related noise and human presence.

Prairie Falcon. As discussed above for this species, no prairie falcon nest sites have been documented within the project vicinity. However, potential nesting habitat (exposed rocky outcrops) occurs within the project boundary. Potential direct impacts to breeding falcons as a result of mine-related activities could include abandonment of a breeding territory or nest site or the potential loss of eggs or young, which would reduce productivity for that breeding season, if present. However, based on CGM's committed environmental protection measures, including conduct of nesting raptor surveys and implementation of mitigation measures, as applicable, impacts to breeding birds would be minimized. Direct impacts to migrating and foraging falcons would include the long-term reduction of approximately 4,698 acres of potential foraging habitat, until reclamation has been completed and prey species have been re-established, and the permanent loss of approximately 182 acres of habitat associated with development of the Cortez Hills Pit and county road reroutes. However, overall impacts to this species from the development of the pit lake would be dependent on the use of the pit lake by prey species. It is anticipated that the development of the pit lake would attract prey species (e.g., waterfowl) that otherwise would not occur in the study area. Indirect impacts would result from mine-related noise and human presence. Based on the implementation of the committed environmental protection measures, the lack of existing nest sites within the project

boundary, and the existing level of activity at the mine site, potential impacts to this species as a result of the proposed project would be considered low.

Greater Sage-grouse. No greater sage-grouse lek sites have been identified within the project boundary. As discussed above, the nearest lek site occurs less than 1 mile from the northwestern edge of the project boundary. As a result, no impacts to breeding greater sage-grouse would be anticipated from project activities. Although the greater sage-grouse could nest in upland habitats within the project boundary, it is anticipated that brooding activity would be low, due to the limited availability of surface water and riparian vegetation in the study area.

Direct impacts to this species would include the long-term reduction of approximately 3,087 acres of habitat until reclamation has been completed and vegetation has been re-established. Permanent impacts would result from the loss of approximately 139 acres of habitat in association with the development of the Cortez Hills Pit and construction of the county road reroutes. This impact would be considered negligible based on the overall availability of suitable wintering habitat in the vicinity of the project.

Mountain Quail. As discussed above, occurrence of mountain quail in the study area would be limited to foraging and migrating individuals. Direct impacts from project-related activities would include the long-term reduction of approximately 5,793 acres of habitat and the permanent loss of approximately 999 acres of habitat in association with the development of the Cortez Hills Pit and construction of the county road reroutes. This impact would be considered negligible based on the overall availability of suitable wintering habitat in the vicinity of the project.

Short-eared Owl. Although this species was documented in the area during the 2000 biological surveys, no impacts to breeding birds as a result of proposed mine-related activities would be anticipated based on the lack of potentially suitable breeding habitat (e.g., meadows and wetland habitats) in the proposed disturbance areas. Direct impacts to this species would result from the long-term reduction of approximately 4,698 acres of potential foraging habitat and the permanent loss of approximately 182 acres of potential foraging habitat in association with the development of the Cortez Hills Pit and county road reroutes. These impacts would be considered negligible based on the overall availability of suitable wintering habitat in the vicinity of the project. Indirect impacts would result from mine-related noise and human presence.

Long-eared Owl. Based on the documented occurrence of this species in the study area in 2000 and the presence of potentially suitable breeding habitat (piñon-juniper woodlands), direct impacts to breeding pairs, if present, as a result of proposed mine-related activities could include abandonment of a breeding territory or nest site or the potential loss of eggs or young, which would reduce productivity for that breeding season. However, based on CGM's committed environmental protection measures, including nesting raptor surveys and implementation of mitigation measures, as applicable, impacts to breeding birds would be minimized. Direct impacts to this species would result from the long-term reduction of approximately 795 acres of potential nesting and foraging habitat, until mature habitat is re-established (approximately 75 to 100 years), and the permanent loss of approximately 817 acres of piñon-juniper habitat in association with the development of the Cortez Hills Pit and county road reroutes. Indirect impacts would result from construction-related noise and human presence. Based on implementation of CGM's committed

environmental protection measures and the existing level of activity at the mine site, potential impacts to this species as a result of the proposed mine expansion would be considered low.

Burrowing Owl. Although limited burrowing owl nest sites have been documented within the project boundary, grassland and shrubland vegetation that would be disturbed as a result of the proposed project would be suitable for supporting breeding and foraging birds, primarily in the southern portion of the project boundary. Potential impacts to breeding pairs as a result of proposed mine-related activities could include abandonment of a breeding territory or nest site or the potential loss of eggs or young, which would reduce productivity for that breeding season, if present. However, based on CGM's committed environmental protection measures, including nesting raptor surveys and implementation of mitigation measures, as applicable, impacts to breeding birds would be minimized. Direct impacts to this species would include the short-term reduction of approximately 4,698 acres of potential grassland and shrubland breeding and foraging habitat, until reclamation has been completed and vegetation has been re-established and the permanent loss of approximately 182 acres of suitable habitat. Indirect impacts would result from mine-related noise and human presence. Based on implementation of CGM's committed environmental protection measures and the existing level of activity at the mine site, potential impacts to this species as a result of the proposed project would be considered low.

Pinyon Jay. Based on the documented occurrence of this species in the study area during the 2000 and 2005 biological surveys and the presence of potentially suitable breeding habitat (piñon-juniper woodlands), direct impacts to breeding pairs as a result of proposed mine-related activities could include abandonment of a breeding territory or nest site or the potential loss of eggs or young, which would reduce productivity for that breeding season. To minimize these impacts, CGM has committed to avoiding habitat removal, to the extent possible, between April 15 and July 15 or, alternately, conducting breeding bird surveys and implementing appropriate mitigation in coordination with the BLM and NDOW as discussed in Section 2.4.12, Applicant-committed Environmental Protection Measures. Direct impacts to this species would result from the long-term reduction of approximately 795 acres of piñon-juniper habitat, until mature juniper trees have re-established in project disturbance areas (approximately 75 to 100 years), and the permanent loss of approximately 817 acres of piñon-juniper habitat in association with the development of the Cortez Hills Pit and county road reroutes. Indirect impacts would result from mine-related noise and human presence. Based on the implementation of CGM's committed environmental protection measures, the overall availability of piñon-juniper habitat in the vicinity of the project, and the existing level of activity at the mine site, potential impacts to this species as a result of the proposed project would be considered low.

Loggerhead Shrike. Based on the presence of potentially suitable breeding habitat, direct impacts to breeding pairs as a result of proposed mine-related activities and the applicable environmental protection measures to minimize these impacts would parallel those described above for the pinyon jay. Direct impacts to this species would include the long-term reduction of approximately 5,793 acres of potential breeding and foraging habitat, until reclamation has been completed and vegetation has re-established, and the permanent loss of approximately 999 acres of breeding and foraging habitat in association with the development of the Cortez Hills Pit and county road reroutes. Indirect impacts would result from mine-related noise and human presence. These impacts would be considered negligible based on

implementation of CGM's committed environmental protection measures, the overall availability of suitable habitat in the vicinity of the project, and the existing level of activity at the mine site.

Vesper Sparrow. Based on the presence of potentially suitable breeding habitat, direct impacts to breeding pairs as a result of proposed mine-related activities and the applicable environmental protection measures to minimize these impacts would parallel those described above for the pinyon jay. Direct impacts to this species would include the long-term reduction of approximately 3,087 acres of potential sagebrush breeding and foraging habitat, until reclamation has been completed and vegetation has been re-established, and the permanent loss of approximately 139 acres of potential foraging habitat (shrubland) in association with the development of the Cortez Hills Pit and county road reroutes. Indirect impacts would result from mine-related noise and human presence. These impacts would be considered negligible based on implementation of CGM's committed environmental protection measures and the overall availability of suitable breeding and foraging habitat in the vicinity of the project.

Juniper Titmouse. Although this species was documented in the study area during the 2000 biological surveys, no impacts to breeding pairs as a result of proposed mine-related activities would be anticipated based on the lack of potentially suitable breeding habitat (cavities in riparian vegetation juxtaposed to piñon-juniper) in the proposed disturbance area. Direct impacts to this species would result from the long-term reduction of approximately 795 acres of potential piñon-juniper foraging habitat, until mature piñon-juniper trees have re-established in project disturbance areas (approximately 75 to 100 years), and the permanent loss of approximately 817 acres of potential foraging habitat in association with the development of the Cortez Hills Pit and county road reroutes. Indirect impacts would result from mine-related noise and human presence. These impacts would be considered negligible based on the overall availability of suitable wintering habitat in the vicinity of the project.

Invertebrates

Surface Disturbance. Although potential springsnail habitat was identified in three springs in the Horse Canyon area, mine dewatering is not expected to affect springs in this area. Habitat in springs or seeps in Fourmile Canyon, which is the only drainage in the study area with a documented occurrence of springsnails, would not be affected by proposed mine-related surface disturbance or mine-related groundwater drawdown. Mill Canyon, a potential perennial stream that could be affected by mine-related groundwater drawdown, is not known to contain springs and seeps.

Water Quality and Quantity. Potential impacts to special status species from water management activities would be the same as discussed for wildlife and fisheries (see Water Quality and Quantity section above).

3.5.2.2 Grass Valley Heap Leach Alternative

Under this alternative, the Grass Valley Heap Leach Facility would be moved approximately 1.5 miles southeast of the proposed location and the ancillary disturbance area would be expanded (see **Figure 2-11**).

Terrestrial Wildlife

Overall, impacts associated with the Grass Valley Heap Leach Alternative would parallel those described for the Proposed Action, with the following exception. This alternative would result in the direct disturbance of approximately 7,579 acres of habitat, approximately 787 acres more than under the Proposed Action.

Fisheries

Under the Grass Valley Heap Leach Alternative, the potential effects to fish habitat and fisheries as a result of the proposed surface disturbance and mine-related groundwater drawdown would be similar to those described under the Proposed Action.

Special Status Species

Potential impacts to special status wildlife species under this alternative would parallel those described above for terrestrial wildlife. The increased surface disturbance associated with this alternative would result in the long-term reduction of approximately 787 additional acres of greater sage-grouse nesting habitat than under the Proposed Action.

Under the Grass Valley Heap Leach Alternative, the potential impacts to springsnails or potentially suitable habitat as a result of the proposed surface disturbance and mine-related groundwater drawdown would be the same as described under the Proposed Action.

3.5.2.3 Crescent Valley Waste Rock Alternative

Under this alternative, the Crescent Valley Waste Rock Facility would be constructed on the valley floor; the Canyon Waste Rock Facility would not be constructed (see **Figure 2-13**).

Terrestrial Wildlife

Overall impacts associated with the Crescent Valley Waste Rock Alternative would parallel those described for the Proposed Action, with the following exceptions. This alternative would result in the direct disturbance of approximately 6,830 acres of habitat, approximately 38 acres more than under the Proposed Action.

Fisheries

Under the Crescent Valley Waste Facility Alternative, the potential effects to fish habitat and fisheries as a result of the proposed surface disturbance and mine-related groundwater drawdown would be similar to those as described under the Proposed Action.

Special Status Species

Potential impacts to special status wildlife species under this alternative would parallel those described above for terrestrial wildlife.

Under the Crescent Valley Waste Facility Alternative, the potential impacts to springsnails or potentially suitable habitat as a result of the proposed surface disturbance and mine-related groundwater drawdown would be the same as described under the Proposed Action.

3.5.2.4 Cortez Hills Complex Underground Mine Alternative

Under this alternative, surface facilities would not be constructed at the Cortez Hills Complex. Surface facilities associated with the underground operation would be developed in areas of existing disturbance at the Cortez Complex (see **Figure 2-15**).

Terrestrial Wildlife

Development of the Underground Mine Alternative would result in the direct disturbance of approximately 1,790 acres of habitat, approximately 5,002 fewer acres than under the Proposed Action. As a result, this alternative would result in substantially less impact to native habitats (i.e., sagebrush, grassland, and piñon-juniper), as compared to the Proposed Action, that would be available for wildlife. In addition, there would be no permanent loss of terrestrial habitat, as the Cortez Hills Pit would not be developed.

Under the Underground Mine Alternative, the potential effects to wildlife as a result of the mine-related groundwater drawdown would be similar to those as described under the Proposed Action, with the exception that impacts would be longer in duration based on the extended dewatering period and increase in total dewatering rate.

Fisheries

Under the Cortez Hills Complex Underground Mine Alternative, potential effects to fish habitat and fisheries as a result of proposed surface disturbance would be similar to those described for the Proposed Action.

The potential effects to fish as a result of the mine-induced groundwater drawdown would be similar to the Proposed Action.

Special Status Species

Development of the Underground Mine Alternative would result in the direct disturbance of approximately 5,002 fewer acres of terrestrial habitat resulting in substantially less disturbance to habitat for special status terrestrial species.

Under this alternative, potential impacts to special status aquatic species (i.e., springsnails) and their habitat would be the similar to those described for the Proposed Action, with the following exception. Under this

alternative, 48 inventoried seeps/springs would occur in the mine-related 10-foot groundwater drawdown contour, of which 21 are located in areas that could experience long-term drawdown-related impacts.

3.5.2.5 *Revised Cortez Hills Pit Design Alternative*

Under this alternative, the Cortez Hills Pit would have a shallower pit configuration, and the extent of underground mining operations would increase relative to the Proposed Action. Revision to the Cortez Hills Pit design would result in changes to the depth of the pit and, subsequently, changes to the configuration of the post-mining pit lake that would form following cessation of mining activities and associated dewatering. The reduction in the pit lake depth under the Revised Cortez Hills Pit Design Alternative is predicted to alter the evapoconcentration factor, resulting in higher concentrations of some constituents, and lower concentrations of others. Because of the possible changes in pit lake chemistry, Geomega conducted a screening-level ecological risk assessment using the Revised Cortez Hills Pit Design Alternative pit lake chemistry concentrations (Geomega 2008b).

Terrestrial Wildlife

Surface Disturbance. Overall impacts associated with the Revised Cortez Hills Pit Design Alternative would parallel those described for the Proposed Action, with the following exception. This alternative would result in the direct disturbance of approximately 159 fewer acres of wildlife habitat than under the Proposed Action. As a result, this alternative would result in less impact to native habitats (i.e., sagebrush and grassland) that would be available for wildlife, compared to the Proposed Action.

Water Quality and Quantity. The potential effects to wildlife as a result of the mine-related groundwater drawdown would be similar to those described under the Proposed Action.

Fisheries

Under the Revised Cortez Hills Pit Design Alternative, potential impacts to fish habitat and fisheries would be the same as described for the Proposed Action.

Pit Lake

The Revised Cortez Hills Pit Design Alternative would result in a reduction in pit depth and, as a result, changes in the configuration of the pit lake that would form following cessation of mining activities and associated dewatering. The reduction in the pit lake depth under this alternative is predicted to alter the evapoconcentration factor, resulting in higher concentrations of some constituents and lower concentrations of others. Due to the predicted changes in pit lake chemistry, Geomega conducted a screening-level ecological risk assessment using the Revised Cortez Hills Pit Design Alternative pit lake chemistry concentrations (Geomega 2008b). Geomega followed a

standardized ecological risk assessment approach, using both USEPA (USEPA 1998b) and Nevada BLM (BLM 2004g) guidance documents.

Methodology and Assumptions.

Wildlife. The methods and assumptions were the same as for the Proposed Action, with the following exceptions. As part of the screening process to select the constituents of potential concern to be further analyzed through the ecological risk assessment, concentrations of pit lake constituents predicted to be present at 100 years after the end of dewatering were compared to BLM Ambient Water Quality Criteria; Nevada water quality standards (NAC 445A.144) for aquatic life, irrigation, and watering of livestock; and additional screening benchmarks for metals without ambient water quality criteria as derived from various sources. In the ecological risk assessment for the Proposed Action, only selenium was selected as a constituent of potential concern since the predicted value (0.008 mg/L) exceeded one or more of the screening standards or benchmarks. For the Revised Cortez Hills Pit Design Alternative, both selenium and mercury exceeded the screening standards and benchmarks. The predicted 100-year concentrations for selenium and mercury are 0.022 mg/L and 0.0016 mg/L, respectively.

The Revised Cortez Hills Pit Design Alternative ecological risk assessment used different bioaccumulation factors than were used in the Proposed Action ecological risk assessment. To determine site-specific bioaccumulation factors for the Proposed Action ecological risk assessment, a biotic analog pit lake test was conducted, wherein test organisms were exposed to sediment, and sediment plus water, where the chemistry of the media was prepared to mimic the predicted future chemistry of the pit lake. Organisms then were analyzed to determine tissue concentrations and calculate bioaccumulation factors, which were used in the ecological risk assessment. It was determined, however, that due to predicted changes in pit lake chemistry under the Revised Cortez Hills Pit Design Alternative, the bioaccumulation patterns would be sufficiently altered so as to make the original biotic analog pit lake test data no longer applicable. In addition, in the original biotic analog pit lake study, some of the analytical results were below the detection limit, and therefore, bioaccumulation factors in some cases were based on those non-detection results. Although these bioaccumulation factors were applicable for the risk assessment on the Proposed Action pit lake (because the chemistry of the analog pit lake matched the projected pit lake chemistry), it was determined that their use would introduce too much uncertainty when applied to the Revised Cortez Hills Pit Design Alternative pit lake. Therefore, literature-based bioaccumulation factors were used.

Fish. The methods and assumptions were the same as for the Proposed Action, with the following exceptions. In the ecological risk assessment for the Proposed Action, only selenium was selected as a constituent of potential concern since the predicted value exceeded the BLM ambient water quality criterion for selenium (0.005 mg/L) (which also is the Nevada water quality standard for aquatic life [NAC 445A.144]). For the Revised Cortez Hills Pit Design Alternative, in addition to selenium (0.022 mg/L), the predicted mercury concentration (0.0016 mg/L) also exceeded the BLM ambient water quality criterion (0.00077 mg/L) (which also is the Nevada water quality standard for aquatic life [NAC 445A.144]). In addition, although no fish stocking of the pit lake is proposed, the

possible effects of pH to fish also were evaluated since the predicted pH of the pit lake water at 100 years under the Revised Cortez Hills Pit Design Alternative (8.9 pH units) is higher than the pH predicted under the Proposed Action (8.5 pit units).

Analysis.

Wildlife. The analysis methods were the same as for the Proposed Action, with the following exception. Due to changes in the final predicted pit lake concentrations under the Revised Cortez Hills Pit Design Alternative, mercury and selenium were retained as constituents of potential concern. Doses of both metals to selected receptor species were calculated using the same methods as for the Proposed Action.

Fish. The analysis methods were the same as for the Proposed Action, with the following exception. Due to changes in the final predicted pit lake concentrations in the Revised Cortez Hills Pit Design Alternative, selenium and mercury were retained as constituents of potential concern. Modeled mercury concentrations were compared to Nevada water quality standards and USEPA water quality criteria for aquatic life. A fish tissue concentration of mercury also was estimated based on literature-based bioconcentration factors and modeled surface water concentrations. Estimated mercury tissue concentrations were compared to the U.S. Food and Drug Administration action level.

Results.

Wildlife. The calculated HQs for each of the receptor species are presented in Table 3.5-4. For the Revised Cortez Hills Pit Design Alternative, the selenium HQ for the cliff swallow is 1.51. A HQ greater than 1.0 may indicate that possibility of adverse effects to the receptor, or similar species. However, in a screening-level risk assessment, certain conservative assumptions are made regarding the likely exposure and potential effects to the receptor species. In the screening-level ecological risk assessment for the Revised Cortez Hills Pit Design Alternative, it was assumed that 100 percent of the insects consumed by the insectivorous cliff swallow would come from the Cortez Hills Pit lake (as emergent insects). This is highly unlikely; a large portion of the diet of insectivorous birds (and bats) is likely to come from aquatic or terrestrial sources not associated with the pit lake. As a result, risks to wildlife from selenium exposure should be low. The organic mercury HQ for the cliff swallow is 1.15. As with selenium, due to the same conservative exposure and effects assumptions that were used, risks to wildlife from organic mercury should be low.

Fish. As in the screening-level ecological risk assessment for the Proposed Action, the screening-level ecological risk assessment for the Revised Cortez Hills Pit Design Alternative concluded that fish tissue selenium concentrations likely would be less than 3 µg/g, which is the tissue level used to set the current USEPA ambient water quality criterion and Nevada aquatic life standard of 0.005 mg/L. Risk to fish, or animals that eat fish, from selenium should be low. For total and organic (methyl) mercury, predicted 100-year pit lake concentrations were compared to USEPA

Table 3.5-4
Calculated HQs for Receptor Species for the Revised Cortez Hills Pit Design Alternative

Receptor Species	Mercury (Inorganic)		Mercury (Organic)		Selenium	
	HQNOAEL	HQLOAEL	HQNOAEL	HQLOAEL	HQNOAEL	HQLOAEL
Cliff Swallow	0.006	0.003	1.15	0.19	1.51	0.76
Golden Eagle	0.002	0.001	0.006	0.0009	0.005	0.002
Bald Eagle	0.002	0.001	0.02	0.021	0.046	0.02
Killdeer	0.018	0.009	0.091	0.015	0.14	0.068
Little Brown Bat	<0.0001	<0.0001	0.27	0.055	0.066	0.041
Mallard Duck	0.011	0.005	0.036	0.006	0.09	0.047
Mule Deer	<0.0001	<0.0001	0.009	0.002	0.019	0.012

Source: Geomega 2008b.

ambient water quality criteria and Nevada water quality standards for aquatic life. The Nevada chronic mercury standard for aquatic life (12 nanograms/L) is the USEPA 1986 chronic criterion, and was calculated based on a specific bioconcentration factor for methylmercury. However, the actual proportion of mercury in the Cortez Hills Pit lake water that would be in the methylmercury form is likely to be 1 percent or less based on analytical data from existing pit lakes in Nevada (EVS 1998; PTI 1996), making the predicted methylmercury concentration no more than 1 nanogram/L (0.000001 mg/L), which is less than the existing USEPA aquatic life standard (0.00077 mg/L).

The potential concentration of mercury in fish that could be present in the Cortez Hills Pit lake under this alternative was estimated by applying recent mercury bioconcentration data for fish to the estimated methylmercury concentration of the pit lake water. A bioconcentration factor of 1.2×10^6 was applied to the estimated methylmercury concentration (1 nanogram/L), resulting in an estimated fish tissue concentration of 1.2 mg/kg (wet weight). While this value is slightly greater than the U.S. Food and Drug Administration action level of 1 mg/kg used to develop the 1986 ambient water quality criterion of 12 nanograms/L (USEPA 1986), it is within the background tissue concentrations of fish in Nevada (0.3 to 8.8 mg/kg wet weight) (NDOW 2005c). There is considerable uncertainty associated with potential tissue concentrations of fish that could be present in the Cortez Hills Pit lake under this alternative. Both the bioconcentration factor and surface water concentrations are modeled values; therefore, actual fish tissue concentrations could be slightly higher or lower than the predicted values.

A pH of 8.9 means the water of the Cortez Hills Pit lake could be somewhat alkaline. The Nevada water quality pH standard for Class A, B, and C waters (NAC 445A.124, 445A.125, and 445A.126, respectively), is between 6.5 and 9.0. The pH of the Cortez Hills Pit lake water under this alternative should not adversely affect fish and other aquatic life.

<u>Special Status Species</u>

Potential impacts to special status wildlife species under this alternative would parallel those described above for terrestrial wildlife.

Under the Revised Cortez Hills Pit Design Alternative, potential impacts to special status aquatic species (i.e., springsnails) and their habitat would be the same as described for the Proposed Action.

3.5.2.6 No Action Alternative

Under the No Action Alternative, the proposed Cortez Hills Expansion Project would not be developed, and the associated potential impacts to wildlife and fish species would not occur. Under this alternative, both the existing Pipeline/South Pipeline Project and Cortez Mine Underground Exploration Project would continue to operate under existing authorizations.

Terrestrial Wildlife

Under this alternative, no additional disturbance-related activities or water management activities resulting in habitat impacts would occur beyond those currently authorized. No additional direct impacts to wildlife species would occur. Ongoing reclamation would continue to reduce habitat impacts in currently authorized disturbance areas. Noise levels and human presence would remain the same as current levels until ongoing mining, processing, underground exploration, and reclamation activities have been completed. Groundwater drawdown from currently authorized activities would continue to result in the potential reduction of available perennial surface waters and wetland/riparian vegetation within the mine-related 10-foot groundwater drawdown contour until the groundwater table recovers to approximate pre-mining water elevation levels, and riparian vegetation has become re-established.

Fisheries

No additional surface disturbance to fish habitat in the study area would occur as a result of the currently authorized activities that would continue under the No Action Alternative. Based on groundwater model predictions, groundwater drawdown associated with the existing mine- and underground exploration-related dewatering operations could reduce flows or water levels in Indian and Feris creeks and their associated springs and seeps and Mill Creek, a potential perennial stream. No additional mine-related groundwater drawdown effects would occur under this alternative.

Special Status Species

Potential impacts to special status wildlife species under this alternative would parallel those described above for terrestrial wildlife.

Continuation of currently authorized mining activities under the No Action Alternative would not result in surface disturbance to springsnail habitat in the study area. Based on groundwater model predictions, mine- and underground exploration-related groundwater drawdown could reduce flows or water levels in Indian Creek and its associated springs and seeps, which could be inhabited by springsnails.

3.5.3 Cumulative Impacts

The cumulative effects study area for wildlife and special status species is shown in **Figure 3.1-*10***. Past and present actions and RFFAs are identified in **Table 2-*18*** and shown in **Figure 2-*26***. For wildlife resources, the cumulative effects analysis focused on the past, present, and reasonably foreseeable mining activities, mining exploration programs, utility/community infrastructure, livestock grazing, and habitat conversion associated with agriculture development and water supply.

Terrestrial Wildlife

Cumulative impacts to wildlife resources primarily would be directly related to habitat loss, habitat fragmentation, and animal displacement and mortality. Nesting raptor species would be the most susceptible to these cumulative impacts since encroaching human activities along the foothills of the Shoshone Range and the Cortez Mountains have resulted in bird displacement and habitat fragmentation in areas that may be at their relative carrying capacity for these resident species. Many of the local wildlife populations (e.g., mule deer) that occur in the cumulative effects study area would continue to occupy their respective ranges and breed successfully, although population numbers may decrease relative to the amount of cumulative habitat loss and disturbance from incremental development.

Past and present actions and RFFAs in the cumulative effects study area have resulted, or would result, in the direct disturbance of approximately 132,912 acres of wildlife habitat, of which approximately 90,099 acres has been related to wildland fires and approximately 5,641 acres has been related to BLM fuel reduction programs. Future underground mining, if it should occur, likely would not result in additional habitat disturbance. The Proposed Action incrementally would increase habitat disturbance by an additional 6,792 acres, resulting in an incremental increase in habitat-related wildlife impacts. A portion of the cumulative disturbance area has been, or would be, reclaimed or has recovered materially (i.e., wildfire areas). The reclaimed areas, and areas associated with habitat conversion, would be capable of supporting wildlife use; however, species composition and densities would change.

Indirect impacts associated with human presence and noise incrementally would increase in the cumulative effects study area during the life of the proposed project. The contribution of the Proposed Action to these impacts would be short-term and temporary and would cease following completion of operations and final reclamation.

Groundwater drawdown associated with existing and proposed dewatering operations could result in a long-term reduction in the amount and extent of available surface water (e.g., perennial seeps, springs, streams) and associated riparian habitats for area wildlife within the cumulative 10-foot groundwater drawdown area. Reasonably foreseeable mine-related dewatering activities could extend the duration or areal extent of habitat effects. Potential loss or reduction of available water or possible long-term effects to riparian communities could result in the loss of breeding, foraging, and cover habitats; reduction in available water for consumption; increased animal displacement and loss; reduction in the overall biological diversity; and a reduction in the area's carrying capacity for terrestrial wildlife (i.e., the region located within the cumulative drawdown area would support a lower diversity and reduced number of riparian-dependent wildlife species). Animals that use perennial water sources would be displaced as the available water and

riparian vegetation declines. Assuming that these limited communities currently are at their respective carrying capacities, individuals that are displaced into adjacent communities may be lost from the population, concentrating the remaining animals within smaller habitat areas.

Species likely impacted by the potential cumulative reductions of seeps, springs, streams, and riparian habitats would include big game, upland game birds, raptors, songbirds, nongame mammals, and area amphibians and reptiles. The extent of these indirect effects from water level change would depend on the species' use and relative species' sensitivity.

Fisheries

Cumulative effects to fish habitat and fisheries would be limited to potential reductions in habitat (perennial waters) located within the predicted cumulative mine-related 10-foot groundwater drawdown contour. Groundwater drawdown from existing and proposed mine operations potentially could result in long-term impacts to fish habitat in Indian Creek and its tributary Feris Creek, which are located in the Shoshone Range. Reasonably foreseeable mine-related dewatering activities could extend the duration or areal extent of habitat effects.

Special Status Species

Potential cumulative impacts to special status wildlife species would parallel those described above for terrestrial wildlife.

Cumulative effects to spring or seep habitats and springsnails would be limited to potential reductions in suitable habitat located within the predicted cumulative mine-related 10-foot groundwater drawdown contour. Groundwater drawdown from existing and proposed mine operations potentially could result in long-term impacts to 52 perennial seep/spring habitat. Reasonably foreseeable mine-related dewatering activities could extend the duration or areal extent of habitat effects. Associated impacts to springsnails would occur, if present, in the affected seeps/springs.

Other Action Alternatives

Cumulative impacts to wildlife resources (including special status species) under the Grass Valley Heap Leach and Crescent Valley Waste Rock alternatives would be the same as discussed above for the Proposed Action, except these alternatives incrementally would increase short-term and long-term habitat loss by 787 and 38 acres, respectively. ***Cumulative impacts under the Revised Cortez Hills Pit Design Alternative would be the same as for the Proposed Action, with the exception of an incremental decrease in short-term and long-term habitat loss of 159 acres.*** Under the Cortez Hills Complex Underground Mine Alternative, the project's contribution to short-term and long-term cumulative habitat loss would be 5,002 acres less than under the Proposed Action. Cumulative impacts to wildlife species due to groundwater drawdown effects on perennial water sources and associated wetland/riparian habitat would be similar to the Proposed Action, with the exception that the impacts would be longer in duration as the

proposed project's incremental contribution would extend for a longer period and result in an increased total dewatering rate under this alternative.

3.5.4 Monitoring and Mitigation Measures

Implementation of mitigation recommended to minimize mine-related impacts to wetland/riparian vegetation as described in Section 3.4, Vegetation, would help minimize related impacts to wetland/riparian habitats. Implementation of mitigation recommended to minimize mine-related impacts to livestock watering sources as described in Section 3.6, Range Resources, would help minimize potential water quantity-related impacts to wildlife species identified as a result of mine-related groundwater drawdown.

Issue: The long-term loss of available surface water and riparian/wetland habitat for wildlife species as a result of mine-related surface disturbance (approximately 0.7 acre) and groundwater drawdown impacts to seeps and springs (approximately 3.5 acres) and perennial streams would be considered a significant impact.

Mitigation Measure WL1: CGM would coordinate with the BLM to develop new surface water sources (e.g., seeps and springs) and riparian/wetland habitat to offset the loss of available surface water and riparian/wetland habitat for wildlife, including special status species. The loss of available surface water and riparian/wetland habitat would be mitigated at a 2:1 ratio or greater. ***This measure would be developed in conjunction with Mitigation Measure V1, where appropriate.*** The location and design of new surface water sources (e.g., wells, pipelines, or ponds) and riparian/wetland habitat would be developed in coordination with the BLM and NDOW. CGM would be responsible for monitoring these sites on an annual basis for the life of the project to ensure that this mitigation measure is effective. CGM would be responsible for developing an annual surface water and riparian/wetland vegetation monitoring report, which would be provided to the BLM and NDOW for review and approval. Surface water and riparian/wetland mitigation would continue until natural water sources return to pre-dewatering conditions.

Effectiveness: The creation of new surface water sources and riparian/wetland habitat would offset the loss of available surface water sources and riparian/wetland habitat for wildlife species as a result of mine-related activities. The submittal of annual monitoring reports to the BLM and NDOW during the life of the project would provide a basis for evaluating the effectiveness of this mitigation measure.

Issue: Potential wildlife/vehicle collision impacts resulting from increased cross-valley truck transport of ore.

Mitigation Measure WL2: CGM would ***continue its*** mandatory employee education program for all personnel to minimize wildlife/vehicle-related impacts during project operation.

Effectiveness: This measure would reduce direct impacts to wildlife by reducing the potential for wildlife/vehicle collisions.

Issue (relative to Mitigation Measure WL3 and WL4): Direct and indirect disturbance of potential bat roosting habitat (identified adit) located in the immediate vicinity of the proposed relocation of CR 222.

Mitigation Measure WL3: Prior to construction of the proposed reroute of CR 222, a qualified biologist would determine if the adit that was identified in the vicinity of the reroute during baseline biological surveys would be directly impacted by the proposed road construction. If the adit would be directly impacted, CGM would coordinate with the BLM on applicable mitigation measures, as needed.

Mitigation Measure WL4: CGM would install a NDOW-approved bat gate at the existing mine working that is located in the immediate vicinity of the proposed reroute of CR 222.

Effectiveness: Mitigation Measure WL3 would allow for the evaluation of potential mitigation prior to surface-disturbing activities to reduce direct impacts to roosting habitat for bat species, if the need is identified. Implementation of Mitigation Measure WL4 would secure roosting habitat for bats in the study area.

Issue: Direct loss of potentially suitable habitat for pygmy rabbits would be considered a moderate impact, depending on the relative habitat quality. Also, direct mortalities of individual rabbits likely would occur, if present in proposed disturbance areas.

Mitigation Measure WL5: Prior to construction of proposed mine facilities, a qualified biologist would conduct surveys in the areas containing Wyoming big sagebrush and basin big sagebrush habitats for the presence or sign (e.g., burrows, fecal pellets) of pygmy rabbits. If pygmy rabbits are identified, CGM would coordinate with the BLM to determine whether additional mitigation would be required, based on the quality of habitat conditions.

Effectiveness: This measure would allow for the evaluation of potential mitigation prior to surface-disturbing activities to reduce direct impacts to the pygmy rabbit, if the need is identified.

Issue: Potential flow or water level reductions in seep/spring habitats as a result of cumulative mine-related groundwater drawdown and associated impacts to springsnails, if present.

Mitigation Measure WL6: Prior to initiation of pit dewatering, a springsnail survey would be conducted in previously unsurveyed perennial seeps and springs located within the projected cumulative mine-related 10-foot groundwater drawdown contour to determine if springsnails are present. If springsnails are present, a monitoring program would be developed in coordination with the BLM to determine if the species is affected by cumulative mine-related groundwater drawdown. For those springs with known springsnail populations, water levels would be monitored in a selected number of springs. If water levels are reduced in any of these springs, mitigation would be implemented. Mitigation options would include flow augmentation, habitat enhancement, or relocation of springsnails. The relocation option would be feasible if the population size is relatively small and a spring with suitable habitat is identified.

Effectiveness: Implementation of this measure would not avoid impacts to springsnails; however, it would provide information needed to determine the need for subsequent monitoring based on the presence of springsnails in potentially affected habitat.

3.5.5 Residual Adverse Effects

Residual adverse effects to wildlife resources from the Proposed Action would include the long-term loss of approximately 817 acres of piñon-juniper habitat and 182 acres of shrubland habitat associated with development of the proposed Cortez Hills Pit and construction of county road reroutes. Residual adverse effects also would result from the long-term or permanent (25-, 50-, or 100-year) loss of surface water and riparian habitat due to mine dewatering.

3.6 Range Resources

3.6.1 Affected Environment

The study area for direct and indirect impacts for range resources encompasses the ***area within the*** project boundary (**Figure 2-2**). The cumulative effects study area encompasses the eastern portion of the Carico Lake Allotment, western portion of the South Buckhorn Allotment, northern portion of the Grass Valley Allotment, southwestern portion of the Thomas Creek Fenced Federal Ranges, southern portion of the Scotts Gulch Allotment, southern portion of the Geyser Allotment, and the southeastern portion of Argenta Allotment.

Livestock grazing is one of the predominant land uses within the study area. Of the three grazing allotments within the study area, the Carico Lake and Grass Valley allotments are administered by the BLM Battle Mountain Field Office, and the South Buckhorn allotment is administered by the BLM Elko Field Office (**Figure 3.6-1**). The portions of these allotments that occur within the study area predominantly are used for cattle grazing. The current authorized AUMs present within the study area include 11,620 AUMs for the Carico Lake Allotment, 4,149 AUMs for the South Buckhorn Allotment, and 120 AUMs for the Grass Valley Allotment. An AUM is the amount of forage required for a cow/calf pair for 1 month.

The study area primarily lies within the eastern portion of the Carico Lake allotment. In addition, small portions of the South Buckhorn and Grass Valley allotments also occur within the study area. The Carico Lake Allotment encompasses approximately 53,098 acres of public land ***within the study area***. Stocking rates for rangeland within these three allotments range from 22 to 55 acres per AUM. The Carico Lake, South Buckhorn, and Grass Valley allotments have been categorized as “I” (improve the current unsatisfactory condition) allotments. “I” category allotments may have the following characteristics:

C1 Ecological conditions are poor to fair.

C2 Vegetation types have the capability of increased production.

C3 The range trend is declining or static.

C4 A high potential exists for positive economic return of public investments.

C5 The degree to which social/political controversy or interest conflict with present management is moderate to high.

C6 Resource management objectives are not being met; the allotment is in need of an allotment management plan or grazing system, or major revisions are needed to an existing allotment management plan.

C7 Additional range improvements are required to meet management objectives.

C8 Land status, exchange-of-use agreements, and size are not prohibitive factors for future management practices if there is a history of prior trespass.

C9 It is feasible to implement more intensive grazing management and to further develop range improvements (as compared to other allotments considering constraints of 10-year projections of funding and manpower availability).

C10 One or more major resource conflicts are present with critical wildlife habitat, wild horse and burro/livestock use areas, recreation, water rights, mining, lands action, Areas of Critical Environmental Concern, reintroduction of plants and animals, soil, water, and air quality.

"I" category allotments receive the highest priority for development because grazing management is most needed to improve the basic resources and/or resolve serious resource use conflicts.

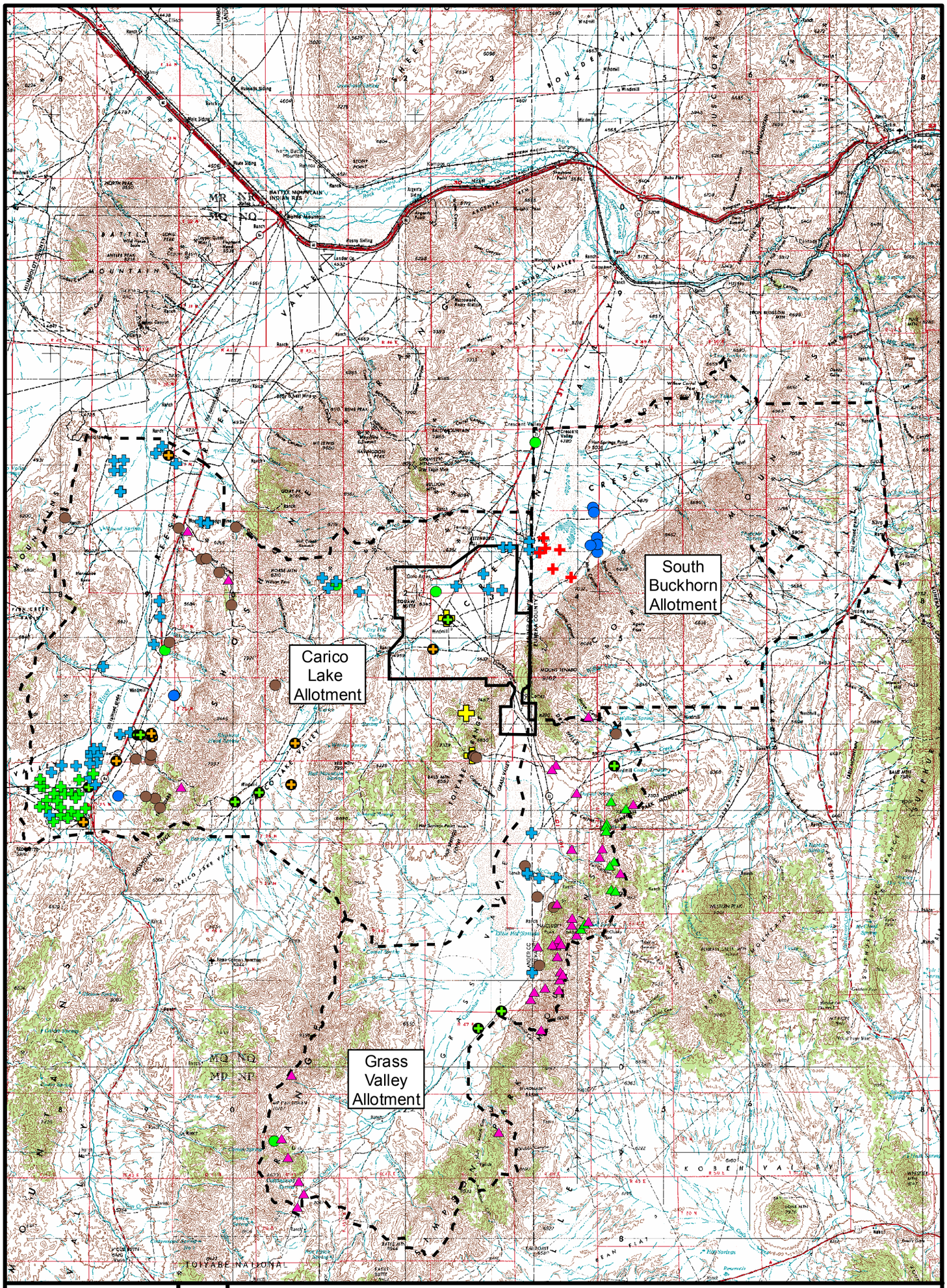
Information regarding the number of use areas and operators, number and kind of livestock, use dates, and AUMs associated with the ***portion of the*** allotments ***that occur within the study area*** is provided in **Table 3.6-1**. **Table 3.6-2** lists the ecological sites that occur within the***se areas***. An ecological site consists of a specific combination of soils and vegetation that have occurred over the long term as a result of factors including landscape position, elevation, aspect, precipitation levels, and geologic substrate. Nine range improvements, including six wells, one water tank, one windmill, one well with a windmill, and one corral, occur within the Carico Lake allotment portion of the study area (**Figure 3.6-1** and **Table 3.6-3**). The portions of the Grass Valley and South Buckhorn allotments that occur within the study area do not include water-related range improvements. Livestock movement corridors are not known to occur within any of these grazing allotments. All of these allotments include in-holdings of private property, which commonly include fences that have been constructed along the boundaries of these properties.

Vegetation types within the study area, which provide forage for livestock grazing, are described in Section 3.4, Vegetation. In addition, information regarding soil types present within the study area is described in Section 3.3, Soils and Reclamation.

3.6.2 Environmental Consequences

Issues related to range resources include the following:

- Potential loss of active AUMs by allotment due to direct disturbance to range resources or the potential for reduced forage production following reclamation
- Potential impacts to existing water sources and range improvements
- Potential impacts to seasonal livestock movement within grazing allotments



Legend

- Project Boundary
- Range Allotment Boundaries

Water-related Range Improvements

- Spring
- Spring (Developed)
- Stock Tank
- Trough
- Water Tank
- Well
- Well (Flowing)
- Well (Private)
- Windmill
- Windmill (Well)
- Spring Developments

Note: The Lander/Eureka County line was adjusted subsequent to the date of this USGS map base.
Source: McDaniel 2006a.

N

0 3 6 9 Miles

Cortez Hills Expansion Project

Figure 3.6-1

Grazing Allotments and Water-related Range Improvements

06/15/2007

Table 3.6-1
Livestock Grazing Permits for Portions of the Carico Lake, South Buckhorn, and Grass Valley Allotments Within the Study Area

Allotment	Operator/Operator Number	Use Area	Number	Kind	Use Dates	AUMs
Carico Lake	C Ranches/2702908 (leased from Cortez)	Cortez Joint Venture	898	Cattle	2/1 – 3/31	1,741
	C Ranches/2706032	Toiyabe Mountain	600	Cattle	4/1 – 6/30	1,795
		Shoshone Mountain	600	Cattle	4/1 – 6/30	1,795
		Toiyabe Flat	600	Cattle	7/1 – 11/15	2,722
		Carico Lake Valley	600	Cattle	7/1 – 11/15	2,722
		Carico Lake Valley	189	Cattle	11/16 – 3/31	845
Total			**3,487**	**N/A**	**N/A**	**11,620**
South Buckhorn	C Ranches/2702962	Gravel	50	Cattle	04/16 – 6/16	74
		Native	1,038	Cattle	04/16 – 10/31	4,075
Total			**1,088**	**N/A**	**N/A**	**4,149**
Grass Valley	Tom and Volina Connoly/2706002	N/A	N/A	N/A	N/A	120[1]
		N/A	N/A	N/A	N/A	N/A
Total			**N/A**	**N/A**	**N/A**	**120[1]**

[1] The study area occurs within the Cortez Joint Venture/Dean Ranch use area. The Cortez Joint Venture relinquished the 120 AUMs associated with this use area to wildlife in 2002.

Source: McDaniel 2006b.

Table 3.6-2
Ecological Sites that Occur in the Carico Lake, South Buckhorn, and Grass Valley Allotments

Allotment	Ecological Site Number	Ecological Site Name	Public Land Acres
Carico Lake	R024XY002NV	Loamy 5-8 inches precipitation zone	31,397
	R024XY030NV	Shallow calcareous loam 8-10 inches precipitation zone	9,196
	R024XY003NV	Sodic terrace 6-8 inches precipitation zone	4,946
	R024XY005NV	Loamy 8-10 inches precipitation zone	4,938
	--	Dumps/pits-mine (as per ecological site description map)	1,140
	F025XY059NV	*Juniperus osteosperma/Purshia tridentata-Artemisia tridentata* ssp.	885
	R024XY020NV	Droughty loam 8-10 inches precipitation zone	280
	R024XY018NV	Claypan 10-12 inches precipitation zone	164
	R025XY025NV	Chalky knoll	152
Total			**53,098**
South Buckhorn	F025XY019NV	Loamy 8-10 inches precipitation zone	3
	R025XY019NV	Loamy 8-10 inches precipitation zone	382
	R024XY005NV	Loamy 8-10 inches precipitation zone	2
Total			**387**
Grass Valley	R025XY019NV	Loamy 8-10 inches precipitation zone	171
	R02RXY005NV	Loamy 8-10 inches precipitation zone	174
Total			**345**

Source: McDaniel 2006b.

Table 3.6-3
Range Improvements in the Study Area

Improvement Type	Legal Description
Stock watering well	SW¼ of Sec. 13, T28N, R47E
Stock watering well	SW¼ of Sec. 13, T28N, R47E
Stock watering well	NE¼ of Sec. 27, T28N, R47E
Stock watering well	NE¼ of Sec. 32, T28N, R47E
Stock watering well	SW¼ of Sec. 35, T28N, R47E
Stock watering well	SW¼ of Sec. 36, T28N, R47E
Stock watering well with windmill	SW¼ of Sec. 8, T27N, R47E
Water tank	SE¼ of Sec. 31, T28N, R47E
Windmill	SW¼ of Sec. 19, T27N, R47E
Corral	SE¼ of Sec. 30, T27N, R47E

Source: McDaniel 2006a.

Environmental impacts to range resources would be significant if the Proposed Action or other alternatives result in any of the following:

- Loss of forage (or AUMs) or stock water sources that adversely affect livestock operations.
- Prevention of livestock movement within the allotment.
- Loss of key grazing areas that would necessitate major revisions in the grazing management approach for the remainder of an allotment.

3.6.2.1 Proposed Action

Surface Disturbance

The construction of perimeter fences around proposed mine and processing facilities would exclude rangeland from livestock grazing during the life of the project, resulting in the loss of a total of 142 AUMs within the Carico Lake Allotment and 36 AUMs within the South Buckhorn Allotment for a total reduction of 178 AUMs on BLM-administered lands. This is based on a stocking rate of approximately 54 acres per AUM for the ***CGM*** Area of the Carico Lake Allotment and 11 acres per AUM within the South Buckhorn Allotment. The Grass Valley Allotment would not be affected since proposed project facilities would not be located in this allotment. Privately owned rangeland also would be excluded from livestock grazing with the construction of the perimeter fences; however, AUMs associated with these areas would not affect the active grazing preference for the Carico Lake Allotment.

An allotment evaluation was completed for the Carico Lake Allotment in 2005. Through the evaluation and decision processes, appropriate stocking rates and grazing schedules for the allotment were implemented to improve rangeland health. Rangeland in the southern portion of the Carico Lake Allotment would be

temporarily degraded during mine development and operation. However, reclamation of surface disturbance areas, if successful, likely would result in enhanced rangeland condition relative to pre-mining rangeland condition.

Most (approximately 5,793 acres on BLM-administered land) of the proposed surface disturbance within the study area would be reclaimed (see Section 2.4.13, Reclamation). Successful reclamation of disturbed areas on BLM-administered lands would increase plant cover and provide an adequate amount of forage to recover 107 of the 178 AUMs lost during project development and operation. In addition, 52 AUMs would be recovered with the removal of perimeter fences after successful reclamation. Therefore, 159 of the 178 AUMs would be recovered after successful reclamation is achieved and perimeter fences have been removed. Livestock grazing may be resumed after re-established vegetation is capable of supporting grazing (i.e., approximately 3 to 5 growing seasons after final revegetation).

The permanent loss of rangeland (approximately 999 acres) and associated AUMs would occur in relation to the Cortez Hills Pit and the county road reroutes, which would not be reclaimed. As a result of the permanent exclusion of approximately 999 acres of BLM-administered land within the Carico Lake Allotment, a permanent loss of 19 AUMs would occur within the allotment and could limit future expansion of the current grazing operation. The permanent loss of 19 AUMs would represent less than 1 percent of the active grazing preference associated with the Cortez Use Area of the Carico Lake Allotment. The reduced number of AUMs would be considered during the formal allotment evaluation process.

Although the AUM reduction would be minimal in comparison to the size of the study area, the increased mine development and operation activity may affect the distribution and use of the Cortez Joint Venture Use Area within the Carico Lake Allotment. Livestock distribution may be affected as a result of the increased activity within areas where livestock typically utilized the allotment. The effects to livestock distribution also would affect the utilization of forage in upland and wetland/riparian areas in the long term.

No direct impacts to existing range improvements are anticipated since all current improvements lie outside of the area of proposed disturbance.

Water Management Activities

Impacts to three water-related range improvements (i.e., improved springs and wells) in the Carico Lake Allotment that are located within the predicted mine-related 10-foot groundwater drawdown area may occur as a result of proposed water management activities.

3.6.2.2 Grass Valley Heap Leach Alternative

Surface Disturbance

Impacts to range resources would be the same as described for the Proposed Action with the following exceptions.

In comparison to the Proposed Action, an additional 11 AUMs temporarily would be lost, all of which would occur in the Carico Lake Allotment. A small portion of the ***CGM***/Dean Ranch use area within the Grass Valley Allotment would be disturbed by mine development and operations. The preference of 120 AUMs once held by Cortez Joint Venture was relinquished to wildlife via an agreement dated March 27, 2002, and a decision dated June 21, 2002. Of the 189 total AUMs lost under this alternative, 170 AUMs would be recovered with the reclamation of disturbed lands (146 AUMs) and the removal of the perimeter fence (24 AUMs). Nineteen AUMs would be permanently lost within the Carico Lake Allotment.

Water Management Activities

Under this alternative, potential impacts to water-related range improvements as a result of mine-related groundwater drawdown would be the same as described for the Proposed Action.

3.6.2.3 Crescent Valley Waste Rock Alternative

Surface Disturbance

Impacts to range resources would be the same as described for the Proposed Action with the following exceptions.

An additional 11 AUMs temporarily would be lost within the perimeter fences around the mine and processing facilities under this alternative. In comparison to the Proposed Action, the Carico Lake Allotment would have an additional temporary loss of 27 AUMs under this alternative. The South Buckhorn Allotment would have 16 fewer AUMs temporarily lost compared to the Proposed Action. Of the 189 total AUMs lost under this alternative, 170 AUMs would be recovered with the reclamation of disturbed lands (159 AUMs) and the removal of perimeter fences (11 AUMs). Nineteen AUMs would be permanently lost within the Carico Lake Allotment.

Water Management Activities

Under this alternative, potential impacts to water-related range improvements as a result of mine-related groundwater drawdown would be the same as described for the Proposed Action.

3.6.2.4 Cortez Hills Complex Underground Mine Alternative

Surface Disturbance

In comparison to the Proposed Action, the Carico Lake Allotment would have 109 fewer AUMs temporarily lost within the perimeter fences. The South Buckhorn Allotment would not be affected under this alternative. Under this alternative, 33 AUMs temporarily would be lost and would be recovered following the successful reclamation of disturbed lands. There would be no permanent loss of AUMs under this alternative.

Water Management Activities

Under this alternative, potential impacts to water-related range improvements as a result of mine-related groundwater drawdown would be the same as described for the Proposed Action.

3.6.2.5 Revised Cortez Hills Pit Design Alternative

Surface Disturbance

Impacts to range resources would be the same as described for the Proposed Action with the following exceptions. Of the 119 AUMs lost under this alternative as a result of project-related surface disturbance, 102 AUMs would be recovered with the reclamation of disturbed lands. A total of 17 AUMs would be permanently lost within the Carico Lake Allotment.

Water Management Activities

Under this alternative, potential impacts to water-related range improvements as a result of mine-related groundwater drawdown would be similar to the Proposed Action.

3.6.2.6 No Action Alternative

Under the No Action Alternative, the proposed Cortez Hills Expansion Project would not be developed and the associated impacts to range resources would not occur. Under this alternative, the existing Pipeline/South Pipeline Project and Cortez Underground Exploration Project would continue to operate under existing authorizations.

Surface Disturbance

No additional surface disturbance beyond that currently authorized, or related impacts to range resources, would occur under the No Action Alternative. Ongoing reclamation would help to minimize existing impacts to vegetation in mine-related disturbance areas (with the exception of the portions of the existing pit that would not be backfilled), with resulting short-term impacts to grazing operations.

Water Management Activities

Under the No Action Alternative, impacts to water-related range improvements would be limited to those associated with ongoing permitted mine dewatering activities.

3.6.3 Cumulative Impacts

The cumulative effects study area for range resources is shown in **Figure 3.1-10**. Past and present actions and RFFAs are identified in **Table 2-*18*** and shown in **Figure 2-*26***.

Surface Disturbance

The Final Multiple Use Decision for the Carico Lake Allotment was issued in 2005. This decision implemented appropriate stocking rates for livestock, set Appropriate Management Levels for wild horses, established grazing systems, and appropriate seasons of use for upland and riparian zones. It is anticipated that upland vegetation would exhibit enhanced conditions that would improve rangeland health in its entirety with successful reclamation coupled with proper grazing management.

Cumulative impacts to range resources would occur in the Carico Lake and South Buckhorn allotments. The Grass Valley Allotment would not be affected by the construction of perimeter fences or surface disturbance related to the Proposed Action, and therefore, no cumulative impacts to range resources would occur in this allotment. Surface disturbance related to past and present actions and RFFAs within the Carico Lake and South Buckhorn allotments have affected, or would affect, a total of approximately 12,917 acres of rangeland. This disturbance has, or would, result in the loss of 340 AUMs, an unquantifiable portion of which has been, or would be, reclaimed. The Proposed Action incrementally would contribute to the loss of AUMs (178 AUMs), the majority of which would be reclaimed and available for grazing; the unreclaimed project components would result in the permanent loss of 19 AUMs in the Carico Lake Allotment.

Water Management Activities

Impacts to three water-related range improvements (i.e., improved springs and wells) may occur from groundwater drawdown associated with the Proposed Action, and impacts to six water-related range improvements may occur from groundwater drawdown associated with past and present actions and RFFAs. Therefore, a total of nine water-related range improvements may be affected by cumulative mine-related groundwater drawdown.

Other Action Alternatives

Cumulative impacts associated with the Grass Valley Heap Leach***,*** Crescent Valley Waste Rock***, and Revised Cortez Hills Pit Design*** alternatives would be similar to the Proposed Action, with the following exception***s***. Under the ***Grass Valley Heap Leach and Crescent Valley Waste Rock*** alternatives, there would be a slight incremental increase of 11 additional AUMs temporarily lost. ***Under the Revised Cortez Hills Pit Design Alternative, there would be a slight incremental decrease of 2 fewer AUMs permanently lost.***

Under the Cortez Hills Complex Underground Mine Alternative, there would be an incremental decrease of 126 AUMs temporarily lost in comparison to the Proposed Action. This alternative would not contribute to the cumulative permanent loss of AUMs.

3.6.4 Monitoring and Mitigation Measures

Issue: Long-term loss of three water-related range improvements for livestock use.

Mitigation Measure LS1: CGM would monitor three water-related range improvements that are projected to be affected by mine-related groundwater drawdown. If effects occur to these water sources, CGM would coordinate with the BLM to determine the appropriate placement and type of water-related range improvement to be developed. CGM routinely would inspect these water-related range improvements to ensure that they are operating in an appropriate manner.

Effectiveness: Implementation of this measure would minimize mine-related impacts to livestock water sources.

3.6.5 Residual Adverse Effects

Residual adverse impacts for range resources would include the permanent loss and exclusion of forage from approximately 999 acres of BLM-administered land, which would result in the permanent loss of 19 AUMs from the Carico Lake Allotment.

Residual adverse impacts to water-related range improvements as a result of the proposed project are not anticipated, assuming implementation of Mitigation Measure LS1.

3.7 Paleontological Resources

The study area for paleontological resources encompasses the ***area within the*** project boundary. The cumulative effects study area encompasses the project boundary and includes surface disturbance associated with past and present actions and RFFAs within a 30-mile radius of the proposed project.

3.7.1 Affected Environment

Paleontological resources identified on public lands are considered by the BLM as constituting a fragile and nonrenewable scientific record of the history of life on earth, and are thus considered to represent an important and critical component of America's natural heritage. Once damaged, destroyed, or improperly collected, their scientific and educational value may be reduced or lost forever. In addition to their scientific, educational, and recreational values, paleontological resources can be used to inform land managers about interrelationships between the biological and geological components of ecosystems over long periods of time.

3.7.1.1 Regulatory Framework

The BLM manages paleontological resources under a number of federal laws including FLPMA Sections 310 and 302(b), which direct the BLM to manage public lands to protect the quality of scientific and other values; 43 CFR 8365.1-5, which prohibits the willful disturbance, removal, and destruction of scientific resources or natural objects; and 43 CFR 3622, which regulates the amount of petrified wood that can be collected for personal, noncommercial purposes without a permit.

In addition, the BLM has a Paleontological Resource Management Program, which is intended to provide a consistent and comprehensive approach to the management of paleontological resources including identification, evaluation, protection, and use. This program is described in BLM Manual H-8270 (BLM 1998b).

Fossils occur in a wide variety of sedimentary rocks, including those found in caves, lake bottoms, and older alluvial surfaces. The purpose of paleontological resource location and evaluation is to identify areas that are likely to produce fossils. Classification is a method used to rank areas according to their potential to contain vertebrate fossils, or noteworthy occurrences of invertebrate or plant fossils. These rankings are used by the BLM in its land use planning process, as well as to identify areas that may warrant special management based on their potential to contain such fossils using the following criteria:

- Condition 1. Areas that are known to contain fossil localities. Consideration of paleontological resources will be necessary if available information indicates that such fossils are present in the area.

- Condition 2. Areas with exposures of geological units or settings that are likely to contain fossils. The presence of geologic units from which such fossils have been recovered elsewhere will require further assessment of these same units if they occur in the area of consideration.

- Condition 3. Areas that are very unlikely to produce fossils based on their surficial geology (e.g., igneous or metamorphic rocks, extremely young alluvium, colluvium, or aeolian deposits).

In keeping with the historical policies adopted by the Department of the Interior and the BLM, these classification guidelines apply primarily to vertebrate fossils. However, where noteworthy occurrences of invertebrate or plant fossils are known or expected, the same procedures are followed.

3.7.1.2 Paleontological Investigations in the Study Area

Paleontological resources are fossilized remains of multicellular invertebrate and vertebrate animals and multicellular plants, including imprints thereof (36 CFR 261.2). Fossilized remains are any non-manufactured evidence of prehistoric life, including skeletal remains, impressions of these remains, or their chemical signatures. The significance of paleontological resources is subjectively ranked based on the presumed scientific value of proven fossil content. For example, vertebrate fossils are typically both less common and less abundant than invertebrate fossils, and are usually rated as more significant. Exceptions are common, however, as in the case of well-preserved soft-bodied organisms such as worms, insects, and spiders, or in the case of rare invertebrate fossils, which have a unique occurrence (Firby 1999).

Exposures of Tertiary age (2 to 24 million years ago) alluvial gravel and sand deposits and Quaternary (present to 2 million years ago) deposits of valley alluvium, alluvial fans flanking the mountains, playa, talus, and landslide deposits are contained within the study area. These deposits are considered as Condition 3 for paleontological sensitivity (BLM 2001c).

A paleontological resources report that addresses vertebrate and invertebrate fossils in the study area was prepared in April 1991 (Firby 1991). According to the report, no fossil vertebrate localities were confirmed within the study area or cumulative effects study area through literature searches, BLM paleontological inventories, or queries to other paleontologists. Additionally, the report states that the potential for the occurrence of vertebrate fossils is considered low. The sensitivity ranking for invertebrate fossil localities would be at the least sensitive level (Firby 1991).

After the paleontological resources report had been issued, a mammoth tusk was discovered in the study area in late 1994 during a permitted gravel-quarrying operation. The site was evaluated as insignificant because there were no other fossils located with the mammoth tusk. The tusk was found in a paleo-channel, which indicates that it was transported; therefore, the location where the deposit originated could not be determined. Sporadic and unremarkable mammoth remains are known from many locations in Quaternary lake bed and spring-related sediments throughout Nevada (BLM 1996a).

3.7.2 Environmental Consequences

To be considered significant, a paleontological resource must retain integrity and satisfy at least one of the following criteria:

- Impacts to unique or site-specific invertebrate, vertebrate, or paleobotanical fossils.

- Impacts to scientifically significant or critical fossil resources requiring protection under FLPMA and BLM Manual H-8270.

3.7.2.1 Proposed Action

The Tertiary-age alluvial gravel and sand deposits and Quaternary deposits of valley alluvium, alluvial fans flanking the mountains, playa, talus, and landslide deposits within the study area are considered as Condition 3 for paleontological sensitivity and are unlikely to produce vertebrate or invertebrate fossils. In addition, an assessment of paleontological resources through the examination of inventories prepared by the BLM and review of the literature found no known vertebrate or invertebrate localities within the study area.

Since fossils usually are buried, their locations cannot be confirmed until excavation occurs. If paleontologically significant fossiliferous deposits, particularly vertebrate fossils, are encountered during construction, operation, or reclamation of the proposed project, measures would need to be taken to identify and preserve the fossils. Potential direct impacts to paleontological resources from the proposed project would be limited to areas of disturbance. Indirect impacts would be limited to areas peripheral to areas of disturbance.

3.7.2.2 Grass Valley Heap Leach Alternative

Under the Grass Valley Heap Leach Alternative, potential impacts to paleontological resources would be the same as those described for the Proposed Action.

3.7.2.3 Crescent Valley Waste Rock Alternative

Potential impacts to paleontological resources under the Crescent Valley Waste Rock Alternative would be the same as those described for the Proposed Action.

3.7.2.4 Cortez Hills Complex Underground Mine Alternative

As surface facilities would not be developed at the Cortez Hills Complex under this alternative, the potential for encountering paleontological deposits under this alternative would be lower than under the Proposed Action.

3.7.2.5 Revised Cortez Hills Pit Design Alternative

Potential impacts to paleontological resources under the Revised Cortez Hills Pit Design Alternative would be the same as those described for the Proposed Action.

3.7.2.6 No Action Alternative

Under the No Action Alternative, the proposed Cortez Hills Expansion Project would not be developed, and associated impacts would not occur. Ongoing open-pit mining and processing at the existing Pipeline/South Pipeline Project and activities associated with the Cortez Underground Exploration Project would continue under existing authorizations.

No new ground-disturbing activities beyond those previously authorized would occur under this alternative. As a result, there would be no potential direct impacts to paleontological resources beyond those analyzed in previous NEPA documents for the existing projects. Indirect impacts (e.g., erosional effects and potential collecting) would continue to occur at a rate similar to what is currently occurring in the area.

3.7.3 Cumulative Impacts

The cumulative effects study area for paleontological resources is shown in **Figure 3.1-10**. Past and present actions and RFFAs are identified in **Table 2-*18*** and shown in **Figure 2-*26***.

According to the paleontological resources report that addresses vertebrate and invertebrate fossils in the study area (Firby 1991), no vertebrate fossil localities were confirmed within the study area through literature searches, BLM paleontological inventories, or queries to other paleontologists. Additionally, the report states that the potential for the occurrence of vertebrate fossils in the study area is considered low. Therefore, no cumulative impacts to paleontological resources are anticipated.

Cumulative impacts under the Grass Valley Heap Leach, Crescent Valley Waste Rock, ***Revised Cortez Hills Pit Design,*** and Cortez Hills Complex Underground Mine alternatives would be the same as for the Proposed Action.

3.7.4 Monitoring and Mitigation Measures

The following mitigation measure would apply to the Proposed Action and other action alternatives.

Issue: Potential impacts to unique or site-specific invertebrate, vertebrate, or paleobotanical fossils, if present, requiring protection under FLPMA and BLM Manual H-8270.

Mitigation Measure P1: If vertebrate fossils are discovered during construction, operation, or reclamation of the proposed project, construction activities would be halted in the area of the discovery and CGM would contact the BLM Authorized Officer. The BLM Authorized Officer would evaluate the discovery within 5 working days of being notified. If the discovered paleontological resource is determined significant, appropriate measures would be developed to mitigate potential adverse effects. Construction activities would not resume until a notice to proceed was granted by the BLM Authorized Officer.

Effectiveness: This measure would allow for the evaluation of any vertebrate fossils that may be discovered and provide adequate time for their preservation or data recovery.

3.7.5 Residual Adverse Effects

Since no known scientifically significant paleontological resources have been identified in the study area, no adverse impacts to the resource are anticipated, and no residual adverse effects are expected to occur.

3.8 Cultural Resources

3.8.1 Affected Environment

The study area for cultural resources encompasses the ***area within the*** project boundary, which also includes the area of potential effect (APE) (**Figure 3.8-1**). Under Section 106 of the National Historic Preservation Act (NHPA), the APE is defined as "those areas in which impacts are planned or are likely to occur. Specifically, the APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. Additionally, the APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking (36 CFR 800.16[d])."

The APE should include:

- All alternative locations for all elements of the proposed project;
- All locations where the proposed project may result in ground disturbance;
- All locations from which elements of the proposed project (e.g., a facility or land disturbance) may be visible or audible;
- All locations where the proposed project may result in changes in traffic patterns, land use, public access, etc.; and
- All areas where there may be direct or indirect effects.

Only those cultural resources located in the APE were reviewed to determine if they would be subject to impacts that could affect their eligibility for the NRHP based on NRHP criteria for evaluation.

For the cultural resources viewshed analysis, the visual APE includes the ***area within the*** project boundary and an area extending approximately 15 miles to the south and west of the boundary (**Figure 3.8-1**). The approximately 15-mile limit beyond the project boundary was based on the assumption that the proposed facilities, as viewed from any NRHP-eligible properties greater than 15 miles away, would be barely visible, and any changes in the landscape as a result of the proposed expansion would not be distinguishable from the natural terrain. Mount Tenabo and the crest of the Cortez Mountains form a barrier to the east of the project ***boundary***, and Crescent Valley to the north contains modern mining facilities, including the facilities at the existing Pipeline and Gold Acres complexes (i.e., pits, heap leach pads, tailings facility, and waste rock facilities), which either hinder or obstruct visibility of proposed project facilities, or have already altered the landscape such that the proposed facilities would have no additional effect on any NRHP-eligible properties that may exist outside of the project boundary.

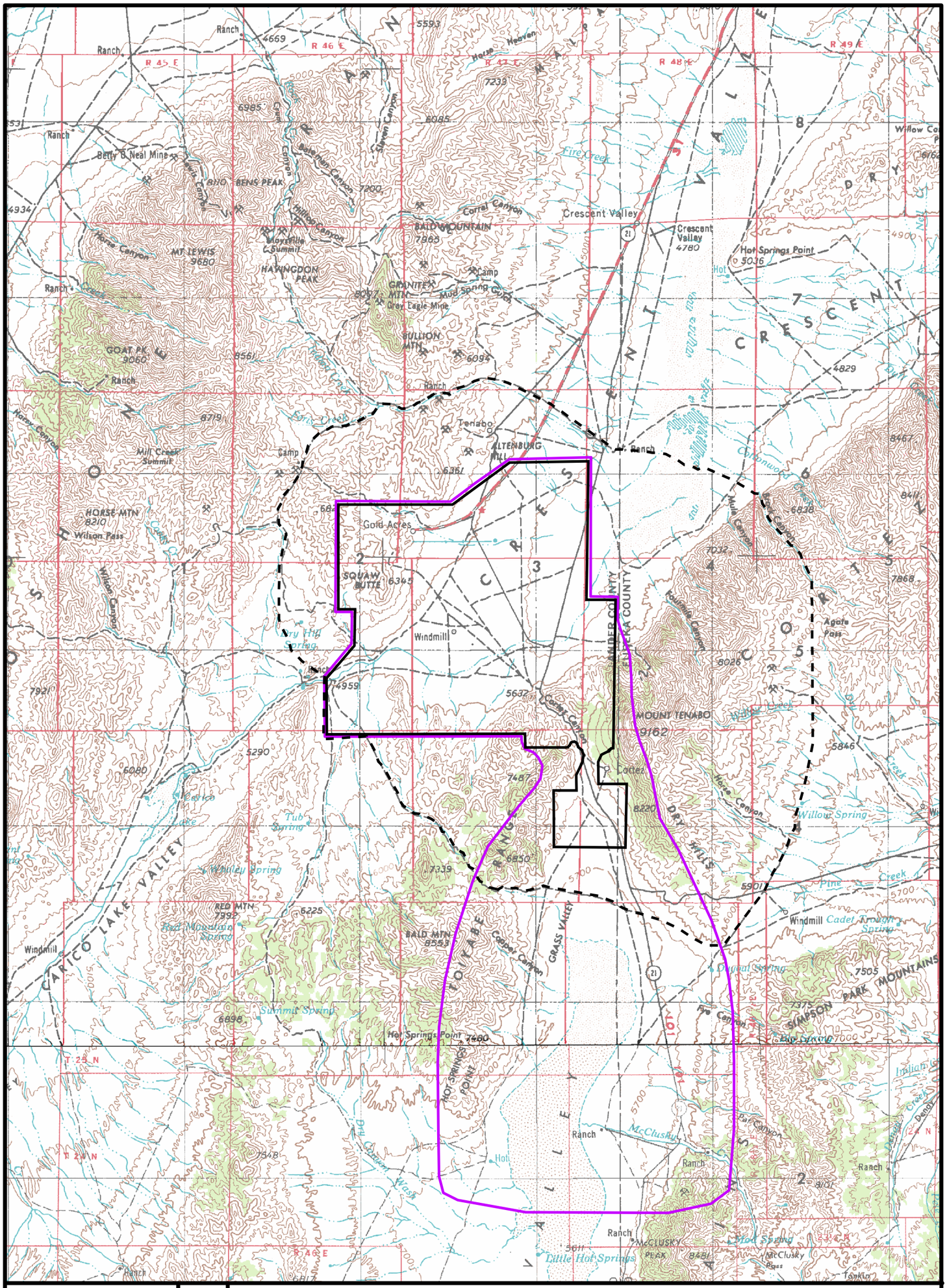
The APE for the cumulative effects study area generally includes the ***area within the*** project boundary and surrounding lands from approximately 1 to 6 miles from the boundary, including portions of the Cortez Mountains and portions of the Shoshone and Toiyabe ranges.

3.8.1.1 Regulatory Framework

Federal historic preservation laws provide a regulatory environment for documentation, evaluation, and protection of archaeological and historic sites that may be affected by federal undertakings, or by private undertakings operating under federal license or on federally-managed lands. NEPA states that federal undertakings shall take into consideration impacts to the natural environment with respect to an array of resources, and that alternatives must be considered. The courts have made clear that cultural resources are regarded as part of the natural environment. The NHPA established the Advisory Council on Historic Preservation (ACHP) and the NRHP. The NHPA mandates that federal agencies consider an undertaking's effects on cultural resources that are listed on or eligible for the NRHP, and Section 106 of the NHPA establishes a four-step review process by which cultural resources are given consideration during the evaluation of proposed undertakings. The four steps are: 1) initiate the Section 106 process by defining the undertaking and determining if the undertaking has the potential to affect properties included on, or eligible for inclusion on, the NRHP; 2) identify NRHP-eligible properties; 3) assess adverse effects applying criteria of adverse effects, and if so; 4) take appropriate steps to avoid or mitigate such adverse effects.

Regulations in 36 CFR 800 outline the process through which historic preservation legislation under the NHPA is administered. Regulations in 36 CFR 800.14 allow federal agencies to adopt program alternatives to 36 CFR 800 and to tailor the Section 106 process to better fit agency procedures. The most common program alternative is a PA (see Appendix D) negotiated between the agency and the ACHP. The National Programmatic Agreement (NPA) among the BLM, ACHP, and the National Conference of State Historic Preservation Officers was adopted as the program alternative for the BLM. The NPA is thus the national BLM authority for meeting requirements of the NHPA. Day-to-day Section 106 compliance is guided by statewide protocols developed by state BLM offices and SHPOs. In Nevada, the State Protocol Agreement (signed in 1999) between the BLM and the Nevada SHPO defines how the BLM and SHPO will interact and cooperate under the NPA, and provides direction for implementing Section 106 of the NHPA. Additionally, BLM Handbook H-8120 provides direction to BLM for conducting Section 106 reviews, and for mitigation of adverse effects of proposed undertakings on NRHP-eligible properties.

Under the NPA, the Nevada Protocol and 36 CFR 800, project-specific programmatic agreements are recommended for multiple undertakings or complex projects. A PA for a complex project lays out the steps that the agency and the consulting parties agree will be taken to consider the effects of the project on historic properties and to resolve any adverse effects. In October 2005, a PA among the BLM Battle Mountain and Elko field offices, Nevada SHPO, and CGM was finalized (McGonagle 2005). The PA defines general and specific measures that would be undertaken by the BLM, SHPO, and CGM to ensure that the BLM's objectives and responsibilities regarding the protection of historic properties under the NHPA would be fulfilled. The PA applies to all CGM undertakings within the "area of interest" defined in the PA. The Proposed Action is entirely within the PA's area of interest, and the PA governs compliance with the NHPA for the Proposed Action, consistent with and as supplemented by the NPA and the Nevada Protocol.



Legend

- Project Boundary, Study Area, and APE
- Cultural Resources and Recreation CESA
- Cultural Resources Visual APE (Summit Envirosolutions 2007b, 2008b.)

N

0 1 2 3 4 Miles

Note: The Lander/Eureka County line was adjusted subsequent to the date of this USGS map base.

Cortez Hills Expansion Project

Figure 3.8-1

Cultural Resources and Recreation CESA

05/01/2008

3.8.1.2 Eligibility Criteria for Listing Cultural Resources on the NRHP

The NRHP, maintained by the National Park Service (NPS) on behalf of the Secretary of the Interior, is the nation's inventory of NRHP-eligible properties. The NPS has established three main standards that a property must meet to qualify for listing on the NRHP: age, integrity, and significance. To meet the age criteria, a property generally must be at least 50 years old. To meet the integrity criteria, a property must "possess integrity of location, design, setting, materials, workmanship, feeling, and association" (36 CFR 60.4). Finally, a property must be significant according to one or more of the following criteria:

- Criterion a – Be associated with events that have made a significant contribution to the broad patterns of U.S. history; or

- Criterion b – Be associated with the lives of persons significant in U.S. history; or

- Criterion c – Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction; or

- Criterion d – Have yielded, or may likely yield, information important in prehistory or history.

NRHP-eligibility recommendations are developed using the prehistoric, ethnohistoric, and historic aspects of the cultural context appropriate to the sites identified during the inventories. Sites are examined to determine significance, based on property type, resources present, integrity, and association with time, place, and theme important to local, state, or national history. The cultural context consists of "those patterns, themes, or trends in history by which a specific occurrence, property, or site is understood and its meaning (and ultimately its significance) within prehistory or history is made clear" (NPS 1995). The cultural context is composed of three elements: time, place, and theme. Time is the chronological period in which events took place. Place is the encompassing geographic area or political subdivision. Theme is a broad categorization of the activities taking place. Significance for each site is assessed in light of the overall cultural context, by comparison with similar, known sites, by appraising the expected kinds of information that the site will yield, and by judging its research potential. National Register Criteria a through d, and consideration of the site integrity, are employed in determining potential eligibility for listing on the NRHP. The BLM will make a determination on significance of each NRHP-eligible property within the APE.

3.8.1.3 Investigations in the Proposed Project *Vicinity*

Over the last 30 years, more than 200 cultural resources investigations have been conducted in or near the project ***vicinity***. These have included numerous Class I, Class II, and Class III investigations, as well as research designs and prehistoric, historic, and ethnographic contexts. Class I investigations are a review of reports containing the results of previously conducted inventories in the project ***vicinity***, as well as library and archival sources for regional prehistory and history. Class II investigations are field surveys of sample portions of an area to provide estimates of site distribution, density, and significance. Class III investigations are intensive field surveys of areas in which potential impacts are anticipated or are likely to occur. Cultural

resources have been investigated at the Class I and Class III levels of intensity throughout the study area (Appendix D).

The results of the inventories have been documented in survey reports that have been submitted to the BLM and SHPO for review. The reports contain the cultural and historical overview of the area; the location, type, and significance of identified cultural resources; archaeological field methods; artifact analysis; eligibility recommendations for each identified site; and proposed mitigation for NRHP-eligible sites that would be affected by the proposed project. Contents of the survey reports, in particular the description and location of recorded prehistoric and historic resources, are confidential and are not accessible for public review.

3.8.1.4 Prehistoric Sites

Prehistoric archaeological resources comprise any material remains of human life or activities (i.e., sites, features, structures, or objects) that pre-date documented historic events, patterns of events, or individuals. Prehistoric sites within the ***study*** area could be determined eligible for the NRHP if they possess integrity and have a reasonable amount of research potential. While prehistoric sites can be eligible under any of the criteria, they typically are eligible under Criterion d. Examples of prehistoric resources identified in the study area include small and large artifact scatters and occupation sites.

Artifact scatters

Artifact scatters are predominantly scatters of stone tools and stone tool-making debris in the region, but they also could include ground stone, ceramics, and composite artifact scatters. These sites are important because they are often the only remnants indicating the presence of human activity. Artifact scatters may provide information on chronology, subsistence, technology, settlement patterns, and resource choices, and they help to understand past lifeways.

Occupation sites

Occupation sites contain a wide range of both flaked stone tools and debitage, milling equipment, and other processing tools, as well as some indication of domestic use as reflected in the presence of ceramics, fire-affected rock, domestic structures, and/or other feature elements (i.e., rock rings, storage caches). It is inferred that these sites were occupied seasonally for comparatively longer periods of time by larger social groups of men, women, and children. Although the frequency of intact subsurface cultural deposits at this class of sites is not well understood, complex occupation sites have the highest potential of all site classes to contain such deposits (McGuire et al. ***2007***). These sites are important because they can provide evidence of the range of habitation structural types and preferences and may provide information on settlement patterns, seasonal use of the area, social organization, and past lifeways.

Prehistoric site densities can vary from extremely high in some settings, such as certain ridge tops and areas near larger, more reliable drainages, to nonexistent in other settings. In and near the ***study*** area, most prehistoric settlement activity appears focused on the toe slopes and alluvial piedments that separate

the more mountainous upland areas from the valley bottoms (McGuire et al. ***2007***). Such areas are well positioned to take advantage of resources located at both higher and lower elevations. Additionally, these areas also contain the most consistent sources of water. Prehistoric settlement activity also appears to have favored upland arboreal contexts, however, only for certain types of occupations directed primarily at hunting and the coincident reduction of flaked stone. The valley bottoms appear to be the least sensitive areas for settlement activity and were not preferred as residential encampments. This may relate to the comparative lack of a consistent water supply or it may reflect natural geomorphological processes where high rates of alluvial deposition have buried or destroyed fragile archaeological components.

3.8.1.5 Historic Sites

Historic resources are districts, sites, buildings, structures, or other objects that are associated with or convey some aspect of history, architecture, engineering, and/or culture. Historic resources in the study area could be eligible for the NRHP if they relate directly to national, state, regional, or local themes such as exploration, transportation, communication, mining, ranching and farming, urban development, or government and political activity. Historic sites can be significant under Criteria a, b, c, or d. Examples of historic resources identified in the study area or within the APE viewshed of proposed project facilities include charcoal platforms, debris scatters, woodpiles, roads and trails, utility lines, residential sites, the Shoshone Wells Settlement, Garrison Mine Complex, and Cortez Townsite.

Charcoal platforms

As a result of the large amounts of charcoal needed to fuel local roasting ovens, a specialized charcoal industry developed to produce charcoal from local woodlands. At Cortez, stands of piñon-juniper and mountain mahogany were intensively harvested between 1884 and 1891 to provide cord wood that was converted into charcoal (Hattori and Thompson 1987). The archaeological evidence ranges from stumps of fallen trees to charcoal-burning platforms. Trees were felled with an ax or saw, cut into lengths of about 3 to 4 feet, and transported by mule to a centralized processing area. The charcoal-burning platform was situated in various locations ranging from drainage bottoms to ridge crests. The area generally was prepared by leveling, which could include construction of a retaining wall. The charcoal platforms near Cortez typically are about 20 feet in diameter and marked by charcoal staining.

Debris scatter

The debris scatter is one of the most commonly encountered historical site types in the study area (Resource Concepts, Inc. 1993). They can range from a small site of as few as two artifacts to the large and complex dumps containing thousands of artifacts, in particular, when they are found on the edges of towns or settlements. The scatters may be from a single dumping episode or cover long periods of time and exhibit characteristics indicating use over time. Debris scatters may have only one basic artifact type, such as cans, or be a mix of materials from clothing parts to building materials to broken/worn out machinery and parts. In general, scatters are found mainly on the surface with occasional examples of buried dumps or partially buried can scatters.

Woodpiles

Several sites contain ax-cut wood in 2- to 4-foot lengths stacked into piles. Wood was used in running the steam engines and furnaces in the mills from the 1860s to the early 1920s when the area converted to electricity (Hardesty and Hattori 1982). If these woodpiles were meant to be used either as charcoal or cord wood for running the steam engines or furnaces, then the wood was most likely cut prior to the 1920s, just prior to the period when it was no longer needed for operation of the mills.

Roads and Trails

Transportation sites contain historic roads or trails that have contributed to the movement of people, goods, and resources within the Cortez Mining District and between the district and core settlements like Austin and Beowawe. The category includes the main thoroughfare through Grass Valley that began in the 1870s as a wagon road and eventually became SH 21. The highway had feeder roads to Shoshone Wells and Cortez. Trails along the Mount Tenabo fan and pediment were used by mule skinners to haul cordwood and charcoal to the mines and mills, and trail systems across the valley in the Toiyabe Range are believed to have been used to carry water and wood. Another early mule trail/wagon road connected the mines on the west face of Mount Tenabo with the district's first mill in Mill Canyon, on the north side of the mountain (Zeier 1993).

Utilities

Utility sites contain features that are directly attributable to electricity, telephone service, and/or water conveyance. Sites and features include overhead utilities (poles, wire) and buried pipelines, although two sites located within the study area also contain water pumping stations. Simeon Wenban is credited with development of an elaborative but simple design to deliver water from pumps and springs in Grass Valley and the Toiyabe Range uphill to the Tenabo Mill. Wenban's system used gravity and steam pumps to deliver a reliable water supply through a series of buried pipes, which lasted (with modifications) from 1886 until the 1940s. The Consolidated Cortez Mill (1922-1930) included an electric power plant, which archaeological and archival evidence suggests created both the first use of electricity in the district and the first telephone system. Electricity is known to have gone from the plant to the mill and mines, and to the pump stations in the valley, and it is believed to have gone to the settlement of Cortez and possibly Wenban's house. The total length and breadth of the electric network within the district remains uncertain. Another telephone line passes through the mining district and connected the Gund Ranch south of Cortez with the railroad station at Beowawe. A branch telephone line may have gone to the Horse Ranch in Horse Canyon. The ranch telephone system appears to have operated from the 1920s to possibly as late as the 1970s.

Historic Residential Sites

Historic residential sites contain features indicative of some form of historic habitation or shelter, or in some cases, artifact clusters or other features (e.g., a cooking hearth or oven) suggesting the area may have served as a temporary camp. Sites containing habitation features in the study area include flattened areas

or rock rings believed to be used for tents, earth dugouts, and stone ruins. The main settlements of Shoshone Wells and Cortez are outside of the project boundary; the latter contains several extant wood-framed and adobe ruins. Most of the sites with habitation components are small, and probably represent single persons or small work groups employed in a variety of tasks on the periphery of the main mining areas. Woodcutting, charcoal production, and mineral exploration were likely the predominant employment in these marginal areas. Most of the sites likely were occupied for relatively short periods (one or two seasons, or a matter of months); hence, the habitation features reflect expedient construction and a general lack of architectural style.

Mining Districts

Mining districts in the study area contain a wide variety of industrial, residential, and other site types that reflect efforts to recover silver, gold, lead, barite, turquoise, and other marketable minerals over the last 130 years. Evidence of this past development is manifest in “property types,” or classes of physical remains that typify a particular activity. These property types include, but are not limited to, claim markers, cairns, quarries, tunnels, tailings, lime kilns, cordwood, camps, shafts, adits, pits, buildings/residences, cellars, cemeteries, or debris.

Precious metal exploration and mining has dominated the history of the project vicinity from the mid-19th century to the present day. Mining within what would become the Cortez Mining District began in 1863, and grew to encompass mines, mills, transportation networks, and residential areas, including the town sites of Shoshone Wells and Cortez. Mining has spanned not only the remainder of the 19th century, but the 20th and beginning of the 21st centuries as well. The history of the Cortez Mining District includes more than a century of technological developments in mining and milling, and reflects fundamental changes in the human population of the area. This occurred as various Euro-American ethnic groups, as well as Asians and Mexicans, were drawn by the mining industry to the Cortez vicinity, interacting with one another and with the existing Native American community.

During the early years of the Cortez Mining District, the two main camps were Shoshone Wells (Lower Cortez), located at a spring in the south end of Cortez Canyon, and Cortez (also know as Upper Cortez), which had its beginnings in 1886 when the Tenabo Mill was built. After its beginning, Cortez became the main commercial center for the mining district and existed into the 1940s or 1950s (Zeier 1993). The settlement had a post office, company store, school, and company boarding house. The main focal point for this community was the Tenabo Mill (1886-1915) and the later Consolidated Cortez Mill (1923-1929) (Hardesty and Hattori 1982). Based on the 1900 census records, Chinese mill laborers likely lived in the boarding house near the mill, while Chinese mine laborers lived near a community adjacent to the Garrison Mine above the main settlement. Though the post office was moved to Beowawe in 1923, the town remained viable until the last family moved away in 1942 (Zeier 1993).

The Cortez Mining District was proposed as an NRHP-eligible district in 1992 (Zeier 1993). The NRHP Historic District boundary is approximately 27,300 acres and encompasses Mount Tenabo, the pediment west of Mount Tenabo, Mill Canyon, and the south extension of the Cortez Mountains, as well as much of the proposed Cortez Hills Expansion Project. The NRHP Historic District boundary was never submitted to

the Keeper of the NRHP; however, the BLM and Nevada SHPO consider the district eligible under all four criteria (Zeier 1993). The Cortez Mining District is eligible under Criterion a for its association with events related to exploration, settlement, and ethnic heritage and under Criterion b because of its association with Simeon Wenban, an early and the most influential developer of the district. Milling technologies utilized during the late nineteenth and early twentieth centuries reflect important industrial evolutionary developments and constitute the basis for the district's eligibility under Criterion c. Research issues have been defined for the district, making it eligible under Criterion d (Hattori and Zeier 1993; Hardesty and Hattori 1982). Historic properties that are associated with development of the Cortez Mining District but outside the proposed NRHP Historic District boundary are treated as contributing elements of the district.

3.8.1.6 Ethnographic Sites

Possible ethnohistoric sites contain artifacts or features from both the traditionally 'historic' and 'prehistoric' class that are in a context suggesting the materials may be related. Whether the two classes of artifacts are in fact deposited at the same time is a primary research issue; however, it is possible that these sites represent a period in which Native Americans were adopting European implements, utensils, and structures. As examples of possible ethnohistoric sites located in the ***study*** area, one site contains a historic artifact scatter with a possible tent platform, hearth, and metate. Another site has a possible piñon pole, a charcoal stain with burned bone fragments, and a food can modified into a bucket. A third site is a mixture of prehistoric and historic artifacts with the prehistoric materials dating to the Terminal Archaic period, as evidenced by Desert Side-notched projectile points and trade beads. The associated historic artifacts date to the early exploration and exploitation of the area by Euro-Americans, ca. 1860s to 1880s. Another site has both Desert Side-notched projectile points and a piñon pole. Some of these possible ethnohistoric sites also contain older prehistoric components, and research may be able to show repeated and prolonged use of certain areas by indigenous populations.

3.8.1.7 Multi-component Sites

Multi-component sites are predominantly artifact scatters and camps that contain evidence of use by different cultural groups or by the same group over different periods. Occasionally, multi-component sites are evidence of ethnohistoric sites. These sites include diagnostic artifacts and typically have the potential for buried remains; multi-component sites are often considered eligible to the NRHP. These sites are important because they provide evidence of settlement, migration of people and technology, and use of the land by a specific cultural group or groups, or for specific periods in time.

3.8.2 Environmental Consequences

The NHPA requires that federal agencies take into account the effect of a proposed undertaking on historic properties. The National PA and the Nevada Protocol govern the roles and responsibilities of the BLM, the ACHP, and the Nevada SHPO for review and comment on the undertaking and effects on historic properties. Historic property, as defined by the regulations implementing Section 106, means "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP maintained by the NPS." Potential impacts to historic properties are assessed using the "criteria of

adverse effect" (36 CFR 800.5[a][1]), as defined in the implementing regulations for the NHPA. "An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association." The analysis of effects using these criteria is limited to those resources that are listed in the NRHP or have been recommended as eligible. There are five broad categories of effect: 1) physical destruction or alteration of a property or relocation from its historic location; 2) isolation or restriction of access; 3) change in the character of the property's use, or of physical features within the property's setting, or the introduction of visible, audible, or atmospheric elements out of character with the significant historic features of the property; 4) neglect leading to deterioration or vandalism; and 5) transfer, sale, or lease from federal to non-federal control without adequate and legally enforceable restrictions or conditions to ensure preservation of the historic significance of the property.

Under NEPA, effects to NRHP-eligible properties can be direct or indirect. Potential direct effects can include physical damage resulting from surface-disturbing activities, including access to construction areas by large machinery, development of mine facilities (e.g., open pits; waste rock, heap leach, and tailings facilities), improvement of existing access roads, blasting vibrations, demolition activities, use of staging areas for storage of equipment and supplies, and future maintenance activities. These physical effects can occur to both known sites and subsurface sites that could be discovered and disturbed during surface disturbing activities. Indirect effects to historic properties often are not quantifiable and can occur both within and outside of the APE. Potential indirect effects can include changes in erosion patterns due to construction, soil compaction, or vegetation removal; fugitive dust; off-road vehicle traffic associated with construction or maintenance activities; and increased vandalism, including illegal artifact collection, due to increased access. Other potential indirect effects can include the introduction of visual or auditory elements out of character with a property that disrupts the property's setting. These effects can result from introducing modern structures and associated auditory emissions into an otherwise rural or natural setting.

3.8.2.1 Proposed Action

Direct and Indirect Impacts

As a result of the Class III inventories, ***120*** NRHP-eligible properties were identified within the APE (**Table D-1** in Appendix D). Of these, ***13*** are prehistoric sites, ***75*** are historic sites, and ***32*** are multi-component sites. ***Eight*** of the NRHP-eligible properties ***also*** contain possible ethnohistoric features or components. ***Of the 120 NRHP-eligible properties in the APE, 116 could be affected by the Proposed Action. Of these, 13 are prehistoric, 75 historic, and 28 multi-component.*** The majority of prehistoric sites consist of lithic and tool scatters and groundstone. Historic sites include, but are not limited to, woodpiles, charcoal platforms, residential features, debris scatters, roads, and buried pipelines. In general, the multi-component sites contain a prehistoric lithic scatter and historic component or possible ethnohistoric feature or component.

Only those sites that are eligible for the NRHP under Criteria a, b, or c were identified as those that could be visually affected by the Proposed Action. Based on Class I and Class III inventories, computer simulations,

and field reconnaissance, visual effects to ***29*** properties eligible for the NRHP under Criteria a, b, or c could occur as a result of the Proposed Action. All of these ***29*** NRHP-eligible properties are located within or adjacent to the project boundary. The ***29*** NRHP-eligible properties located ***within or*** adjacent to the project boundary include charcoal and cordwood sites, historic residential sites, possible burials, utilities sites, transportation sites, ***Shoshone Wells,*** the Garrison Mine and Consolidated Cortez Mill Complex, the historic Chinese Cemetery, and Cortez townsite.

Mitigation for Adverse Effects to Historic Properties

The 2005 Cortez PA outlines the steps to be taken to: 1) identify cultural resources; 2) evaluate them for eligibility for listing on the NRHP; 3) identify potential adverse effects; 4) develop measures to avoid, reduce, or mitigate adverse effects; and 5) address inadvertent discoveries. Additionally, the PA assigns roles and responsibilities for implementation of the PA, which ensures that all interested parties are given an opportunity to comment on the effects of an undertaking on NRHP-eligible properties and any mitigation for such effects.

In consultation with the Nevada SHPO and interested Tribes, BLM would determine whether construction and operation of the Proposed Action would have an adverse effect on any historic properties listed on, or eligible for listing on, the NRHP. If BLM determines a property would be adversely affected, mitigation would be proposed in accordance with the PA. Mitigation may include, but not be limited to, one or more of the following measures: 1) avoidance through changes in the construction and/or operational design; 2) data recovery, which may include the systematic professional excavation of a historic property or the preparation of photographic and/or measured drawings documenting standing structures; 3) the use of landscaping or other techniques that would minimize or eliminate effects on the historic setting or ambience of standing structures; and 4) the development of interpretive materials.

In accordance with the PA, ***a Historic Properties Treatment Plan (HPTP) intended to mitigate effects of the Proposed Action on NRHP-eligible properties has been developed and reviewed by the BLM. The HPTP is under review by the Nevada SHPO and would be finalized following the*** **ROD** ***to incorporate any changes required by the Agency Preferred Alternative and Nevada SHPO comments. The BLM's*** **ROD** ***would require CGM to implement the finalized HPTP.*** For historic properties eligible under National Register criteria a, b, or c, other forms of mitigation may be considered in the treatment plan in lieu of, or in addition to, data recovery (e.g., oral history, historic markers, exhibits, interpretive brochures, or publications). If data recovery is the preferred treatment option for a historic property, the BLM would ensure that the treatment is developed based on an appropriate research design and reviewed and approved by the BLM and SHPO. Following BLM and SHPO review and consultation, the BLM would ensure that the treatment plan is implemented within the timelines set forth in the plan.

The potential for the discovery of unanticipated cultural resources during construction activities exists within proposed disturbance areas and could result in direct impacts. As provided in the PA, if any previously unknown cultural resources are discovered during construction on BLM-administered lands, all construction activities would cease within 300 feet of the discovery, and the BLM Authorized Officer would be notified of the find. Steps would be taken to protect the site from vandalism or further damage until the BLM Authorized

Officer can evaluate the nature of the discovery as outlined in the PA. Construction would not resume in the area of the discovery until the BLM Authorized Officer has issued a notice to proceed.

Although cultural resources inventories were conducted within the entire ***study*** area, subsurface sites may be missed during the course of field investigations. If construction or other project personnel discover what may be human remains, funerary objects, or items of cultural patrimony on federal land, construction would cease within 300 feet of the discovery, and the BLM Authorized Officer would be notified of the find. Any discovered Native American human remains, funerary objects, or items of cultural patrimony found on federal land would be handled in accordance with the Native American Graves Protection and Repatriation Act (NAGPRA) and procedures detailed in the PA. Non-Native American human remains would be handled in accordance with Nevada law and the PA. Construction would not resume in the area of the discovery until the BLM Authorized Officer has issued a notice to proceed.

If human remains and associated funerary objects are discovered on private land during construction activities, construction would cease within 300 feet of the discovery and the county coroner or sheriff would be notified of the find. Treatment of any discovered human remains and associated funerary objects found on private land would be handled in accordance with the provisions of applicable Nevada law and the PA.

Increases in both surface activities and the number of workers during construction could increase the potential for indirect impacts at archaeological sites. Indirect impacts are difficult to quantify and control; however, they can include the loss of surface artifacts due to illegal collection and inadvertent destruction. To minimize indirect impacts to cultural resources from increased numbers of people in the area, project-related personnel ***have been and*** would ***continue to*** be trained on site avoidance and protection measures, including information on the statutes protecting cultural resources and CGM policies (see Section 2.4.11, Applicant-committed Environmental Protection Measures).

3.8.2.2 Grass Valley Heap Leach Alternative

Under this alternative, the Grass Valley Heap Leach Facility would be moved approximately 1.5 miles south of the proposed location, and the ancillary facilities area would be expanded (**Figure 2-12**). A total of ***116*** NRHP-eligible properties could be affected under this alternative***, which is the same as*** the Proposed Action (**Table D-1**, Appendix D). Potential effects to these NRHP-eligible properties would be the same as described under the Proposed Action, based on implementation of the applicant-committed environmental protection measures and the PA.

Only those sites that are NRHP-eligible under Criteria a, b, or c were identified as those that could be visually affected by the Grass Valley Heap Leach Alternative. As a result of Class I and Class III inventories and visual simulations, ***29*** NRHP-eligible properties were identified that could be visually affected by this alternative. These are the same NRHP-eligible properties that would be visually affected under the Proposed Action.

3.8.2.3 Crescent Valley Waste Rock Alternative

Under this alternative, the Canyon Waste Rock Facility would not be constructed. Alternately, a waste rock facility would be developed in Crescent Valley (**Figure 2-14**). A total of ***96*** NRHP-eligible properties were identified that could be affected under this alternative (**Table D-1**, Appendix D) as compared to ***116*** NRHP-eligible properties under the Proposed Action. Of the ***96*** NRHP-eligible properties, 11 are prehistoric, ***60*** are historic, and ***25*** contain both prehistoric and historic components. ***Seven*** of the NRHP-eligible properties ***also*** contain possible ethnohistoric features or components. ***The nature of p***otential effects to these NRHP-eligible properties would be the same as described under the Proposed Action, based on implementation of the applicant-committed environmental protection measures and the PA.

Only those properties that are eligible for the NRHP under Criteria a, b, or c were identified as those that could be visually affected by the Crescent Valley Waste Rock Alternative. Based on Class I and Class III inventories and computer simulations, visual impacts to ***42*** NRHP-eligible properties could occur as a result of this alternative. ***Therefore, 13*** **additional** ***NRHP-eligible sites would be visually affected under this alternative compared to the Proposed Action.***

3.8.2.4 Cortez Hills Complex Underground Mine Alternative

Under this alternative, surface facilities would not be developed at the Cortez Hills Complex. Alternately, the surface facilities associated with the underground mining would be located within existing disturbance areas at the Cortez Complex (**Figure 2-16**). ***Two*** NRHP-eligible propert***ies were*** identified that could be affected under this alternative (**Table D-1**, Appendix D) as compared to ***116*** NRHP-eligible properties under the Proposed Action. ***Of the two*** NRHP-eligible propert***ies*****, one is prehistoric and one is historic**. The nature of potential effects to ***these*** NRHP-eligible propert***ies*** would be the same as described under the Proposed Action, based on implementation of the applicant-committed environmental protection measures and the PA.

Only those sites that are NRHP-eligible under Criteria a, b, or c were identified as those that could be visually affected by the Cortez Hills Complex Underground Mine Alternative. Based on the results of Class I and Class III inventories and visual simulations, no properties eligible under Criteria a, b, or c would be visually affected under this alternative.

3.8.2.5 Revised Cortez Hills Pit Design Alternative

Under the Revised Cortez Hills Pit Design Alternative (Figure 2-21), the total number of NRHP-eligible sites that could be directly or indirectly affected would be the same as under the Proposed Action.

3.8.2.6 No Action Alternative

Under the No Action Alternative, the proposed Cortez Hills Expansion Project facilities would not be constructed. The existing mining and ore processing activities associated with the Pipeline/South Pipeline Project and activities associated with the Cortez Underground Exploration Project would continue under existing authorizations. No additional ground-disturbing activities beyond those currently authorized would occur at the mine site. Prior to construction of the authorized facilities, adverse effects to NRHP-eligible properties located in the area of the facilities were, or would be, fully mitigated in accordance with Section 106 of the NHPA and NEPA. Therefore, no effects to historic properties would occur under the No Action Alternative.

3.8.3 Cumulative Impacts

The cumulative effects study area for cultural resources is shown in **Figure 3.8-1**. Past and present actions and RFFAs are identified in **Table 2-*18*** and shown in **Figure *2-26***. Any mining or other ground-disturbing activities within the cumulative effects study area could affect NRHP-eligible sites in those areas. As directed by law, cultural resources inventories and consultations would be conducted for any projects involving public lands, and adverse effects would be avoided or mitigated as appropriate. All activities associated with the proposed Cortez Hills Expansion Project would be in accordance with guidelines established in the 2005 Cortez PA (Appendix D). In addition, impacts to known NRHP-eligible properties and any previously unknown NRHP-eligible properties that may be discovered during construction activities would be mitigated in accordance with the PA. Therefore, the proposed project is not expected to contribute to cumulative effects to NRHP-eligible properties.

Cumulative effects to NRHP-eligible properties under the Grass Valley Heap Leach, Crescent Valley Waste Rock, ***Revised Cortez Hills Pit Design,*** and Cortez Hills Complex Underground Mine alternatives would be the same as described for the Proposed Action.

3.8.4 Monitoring and Mitigation Measures

All adverse effects under the NHPA and direct and indirect impacts under NEPA to known NRHP-eligible properties identified within the APE would be mitigated in accordance with the PA (Appendix D) and the treatment plan prepared for the project. Any previously unknown NRHP-eligible properties that may be discovered during construction activities would be mitigated in accordance with the PA. Therefore, no additional mitigation or monitoring is recommended.

3.8.5 Residual Adverse Effects

No residual adverse effects are anticipated, as all known NRHP-eligible sites would be mitigated in accordance with the PA (Appendix D) and the treatment plan prepared for the project. Any previously unknown NRHP-eligible sites that may be discovered during construction and development activities would be mitigated in accordance with the PA.