



3.11 Mineral Resources

3.11.1 Affected Environment

3.11.1.1 Overview

The study area for mineral resources includes the proposed ROWs and groundwater development areas and the broader geographical area within the water resources region of study as shown in **Figure 3.11-1**. Mineral resources can be classified in a variety of ways (e.g., metallic, non-metallic, energy minerals). For purposes of this EIS, the BLM classification for different mineral groups is used.

Within legal constraints, publicly-owned minerals are available for exploration, development, and production, while subject to existing regulations, standard terms and conditions, and stipulations. Federally owned minerals in the public domain are classified into specific categories and these categories only apply to minerals in the federal mineral estate. These categories are locatable, leasable, and salable minerals. The classifications are based on legislation passed by the U.S. Congress.

Locatable Minerals

Locatable minerals include precious and base metallic ores and nonmetallic minerals such as bentonite, gypsum, chemical grade limestone, and chemical grade silica sand. Uncommon varieties of sand, gravel, building stone, pumice, rock, and cinders also are managed as locatable minerals. Locatable minerals are acquired under the General Mining Law of 1872, as amended, and Surface Use and Occupancy Act of July 23, 1955 (American Geological Institute [AGI] 1997).

Important occurrences of metallic locatable minerals in the project area include gold, silver, copper, lead, zinc, uranium, beryllium, and tungsten (ENSR 2004a; Smith and Milligan 1999). Within the area of study, historic mining began shortly after the end of the Civil War. Mining districts such as the Pioche, Mount Hamilton, and Robinson (formerly the Ruth) districts were founded between 1865 and 1875. These mining districts produced some of the richest copper, silver, and zinc ores mined in the U.S. during the mining boom that lasted from 1870 to about 1895. Active mining today occurs at the Robinson District outside of Ely (copper and gold) and at the Bald Mountain Mine in northwest White Pine County (just outside of the project area). There is high potential for additional mining of precious and base metals in the project region because of recent high commodity prices, but there are no proposals for new mines. The locations of active mining claims in the project area are shown in **Figure 3.11-1**.

Non-metallic locatable minerals also occur in the area and include perlite, gypsum, clay, and building limestone. Currently, the major commodities being mined include gold, copper, perlite, gypsum, and limestone (NBMG and USGS 2009; UGS and USGS 2009).

QUICK REFERENCE

AGI – American Geological Institute

CFR – Code of Federal Regulations

NBMG – Nevada Bureau of Mines and Geology

NDOT – Nevada Department of Transportation

USGS – United States Geological Survey

Mineral Classifications

The BLM classifies minerals as:

- Locatable (precious and base metallic ores and nonmetallic minerals)
 - Leasable (fluid (e.g., oil, gas, geothermal) and solid [e.g., coal phosphates])
 - Salable (common mineral materials [e.g., sand and gravel])
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Figure 3.11-1 Active Mining Claims

Leasable Minerals

Leasable minerals are those minerals that are leased to individuals for exploration and development. The leasable minerals have been subdivided into two classes: fluid and solid. Fluid minerals include oil and gas, geothermal resources and associated by-products, oil shale, native asphalt, oil impregnated sands, and any other material in which oil is recoverable only by special treatment after the deposit is mined, or quarried. Solid leasable minerals are specific minerals such as coal and phosphates. These minerals are associated with the following laws: Mineral Leasing Act of 1920, as amended and supplemented, Mineral Leasing Act for Acquired Lands of 1947, as amended, and the Geothermal Steam Act of 1970, as amended (AGI 1997). Leasable minerals are acquired by applying to the federal government for a lease to explore and develop the minerals.

The important leasable minerals that have moderate to high potential in the project area include oil and gas and geothermal energy. Coal, although present, does not occur in quality or quantity to justify mining (ENSR 2004a). Numerous exploratory wells have been drilled for oil and gas in the water resources region of study, but to date, no commercial production has been established. Outside of the project region, in northeastern Nye County, Railroad Valley has been responsible for most of the oil production in Nevada (Garside and Hess 2007; Nevada Division of Minerals 2009). Oil production in Nevada has declined from 4.0 million barrels in 1990 to less than 500,000 barrels in 2006. The USGS has determined that undiscovered hydrocarbon resources consist of a mean of 1.6 billion barrels of oil, 1.8 trillion cubic feet of natural gas, and 85 million barrels of natural gas liquids. These resources occur in what is defined as the Eastern Great Basin hydrocarbon assessment unit that includes the eastern half of Nevada and the Great Basin portion of western Utah (USGS 2005). Oil, gas, and geothermal leases are shown on **Figure 3.11-2**.

Geothermal water also is a major potential fluid mineral resource in the project region. Eastern Nevada and western Utah have a somewhat lower geothermal potential than other areas in the Great Basin, but the lower potential is relative to the Great Basin as a whole. Because geothermal conditions are so favorable in the Great Basin, the potential resource may be a moderate potential when compared to other parts of the U.S. (Coolbaugh et al. 2005). According to Coolbaugh et al. (2005), it is possible that lateral flow in the carbonate aquifer that underlies the project area attenuates the upward movement of fluids resulting in lower heat flow to the surface. However, estimated subsurface temperatures at 6.0 kilometers (3.7 miles) in the project area range from 150 to over 200 °C (Hess 2008). There are a few hot springs in Lincoln County at Caliente and Ash springs that are used for direct-use applications (spa and heating) and there are several hot wells (temperature greater than 37 °C in the northern Spring Valley near Cherry Creek in White Pine County (Shevenell and Garside 2005). Warm springs with temperatures greater than 25 °C occur in western Juab and northwest Millard counties (Blackett and Wakefield 2002). However, there are no large-scale geothermal power generating facilities in the project area or are proposed in the near future (Hess 2008).

Salable Minerals

Salable minerals are common mineral materials that include sand, gravel, roadbed, ballast, and common clay and are sold by contract with the federal government. These have been identified as all other minerals not designated as leasable or locatable. These minerals are regulated under the Mineral Material Act of July 23, 1947, as amended, and the Surface Use and Occupancy Act of July 23, 1955 (AGI 1997). Sand and gravel resources are abundant in alluvial fan deposits along the mountain fronts. The resources generally are extracted at community pits managed by the BLM and at pits operated by the NDOT (ENSR 2004a).

3.11.1.2 Rights-of-way Areas

Locatable Minerals

No locatable minerals have been identified within the ROWs for the Proposed Action and alternatives.

Leasable Minerals

No leasable mineral production has been identified within the ROWs for the Proposed Action and alternatives. However, there is a high potential for oil and gas resources in the valley areas where most proposed project activities would take place (ENSR 2004b). There also is a moderate potential for geothermal resources in the valley areas.

Salable Minerals

No sand and gravel pits are located within the ROWs for the Proposed Action and alternatives. Community resources are present throughout the project area.

3.11.1.3 Groundwater Development Areas

No locatable minerals or leasable mineral production have been identified for the groundwater development areas. However, potential future oil and gas and geothermal resources could be developed in the groundwater development basins. Gravel pits occur in the following locations within groundwater exploratory areas:

- Spring Valley North – adjacent to SH 983 (two locations); and
- Coyote Spring Valley – adjacent to U.S. 93.

Figure 3.11-2 Fluid Mineral Leases

3.11.2 Environmental Consequences

3.11.2.1 Rights-of-way

Issues

The issues and concerns regarding potential impacts of the proposed ROW construction and maintenance to locatable, leasable, and mineral (salable) materials are listed below:

- Potential interference with existing mineral extraction operations.
- Potential for reduced access to underlying minerals.
- Potential interference with future mining operations.

Assumptions

The following assumptions were used in the impact analysis for minerals for ROW construction and maintenance:

- The BLM could approve development of minerals within ROW corridors, since the ROW is granted subject to existing rights of other parties, including the U.S. according to 43 CFR, § 2805.14.
- Under U.S. law, mineral rights and uses take precedence over other rights associated with a property (BLM 2009). Conflicts between different ownership of mineral and surface estates are referred to as “split estate” disputes. However, in the case of the ROWs proposed for this project, the federal government will in most cases be the surface and mineral estate owner, but the precedence of mineral rights applies to ROWs granted under the FLPMA. In 43 CFR, § 2805.15, the U.S. retains ownership of land resources including minerals.

Methodology for Analysis

The following lists the steps in the analysis of impacts to mineral resources:

- Review information regarding the location of existing mineral extraction operations in the vicinity of the proposed facilities as well as information regarding potential mineral resources that may be present in proposed ROWs.
- Determine if proposed ROW activities and facilities have the potential to create concerns and issues as identified above.
- Determine the compatibility of existing mineral extraction operations with proposed ROW facilities and maintenance of those facilities (i.e. surface mining likely would not be compatible; subsurface mining may be compatible).

3.11.2.2 Proposed Action, Alternatives A through C

Construction and Facility Maintenance

The proposed main and lateral ROWs do not cross and are not adjacent to active mining claims (**Figure 3.11-1**). However, the proposed ROWs cross active or pending oil and gas leases in Cave and Lake valleys. As of August 30, 2009, no production has been established on the oil and gas leases. There are a number of salable mineral materials pits near proposed ROW alignments in southern Spring, north Las Vegas, Delamar, and Pahranaagat valleys. Proposed project pipeline and power facilities do not cross these present mineral operations. Establishment of ROWs under the Proposed Action and Alternatives A through C is not expected to interfere or preclude the extraction of minerals. Therefore, construction in the proposed ROWs would not impact access to or extraction of minerals, unless there are temporary restrictions to access (e.g., an open trench across an access road). Restriction of access during construction would be temporary and limited to the period of active construction.

Active Mining Claims
No active mining claims are crossed or adjacent to the proposed main and lateral pipelines.

It is anticipated that the pipeline trench would be backfilled with materials derived from the trench excavation, and it might be necessary to obtain some construction sand and gravel from local, existing commercial sources for use as pipe

padding, road base, or surface facility pads. The demand for sand and gravel would not substantially affect the long-term availability of construction materials in the area because sand and gravel resources in the area are readily available.

Establishment of the proposed ROWs and subsequent construction is not expected to preclude access to exploration and production of minerals or constitute an important loss of mineral resources. Construction of ROW facilities may require limited amounts of sand and gravel resources, but would have small impact on the potential supply of aggregate resource.

The ROWs for the proposed facilities may be in place for the duration of the project. At this time, it cannot be predicted what mineral commodities located within the proposed ROWs would become commercially viable in the future. Once ROW facilities are in place, any applications for mining operations, issuance of leases, or granting of mineral entry would have to be done with consideration of the established use of the ROWs. However, it should be noted that owners of mineral rights or their lessees have right of entry that take precedence over other uses.

Proposed mitigation measures:

None.

Conclusion. The proposed construction and permanent ROWs would not be located within currently active locatable, leasable, or salable mineral development areas. Construction activities could temporarily limit road access to adjacent mineral development areas until roadways intercepted by pipeline excavation are restored, or detours are provided. It is assumed that pipeline trenches would not remain open longer than 1 month at any 1 location. The permanent project ROWs are not expected to preclude future access to exploration and mineral production. The project would not consume a large fraction of the available aggregate (sand and gravel) resources because of the widespread availability of these commodities.

Residual impacts include:

- Potential temporary (likely no longer than 1 month) access restrictions to ongoing mineral extraction sites until roadways are restored after construction completion.

3.11.2.3 Alternative D

Construction and Facility Maintenance

The proposed construction and permanent ROWs would not be located within currently active locatable, leasable, or salable mineral development areas. The proposed ROW surface area would be less than that for the Proposed Action because no facilities would be located in northern Spring Valley and Snake Valley in White Pine County. Construction activities could temporarily limit road access to adjacent mineral development areas until roadways intercepted by pipeline excavation are restored, or detours are provided. It is assumed that pipeline trenches would not remain open longer than 1 month at any 1 location. The permanent project ROWs are not expected to preclude future access to exploration and mineral production. The project would not consume a large fraction of the available aggregate (sand and gravel) resources because of the widespread availability of these commodities.

Conclusion. Proposed construction and permanent ROWs would not preclude access to the exploration and development of mineral resources and project demand for aggregate resources would be minor compared to available resources.

Proposed mitigation measures:

None

Residual impacts include:

- Potential temporary (likely no longer than 1 month) access restrictions to ongoing mineral extraction sites until roadways are restored after construction completion.

3.11.2.4 Alternatives E and F

Construction and Facility Maintenance

The proposed construction and permanent ROWs would not be located within currently active locatable, leasable, or salable mineral development areas. The proposed ROW surface area would be less than that for the Proposed Action because no facilities would be located in Snake Valley. Construction activities could temporarily limit road access to adjacent mineral development areas until roadways intercepted by pipeline excavation are restored, or detours are provided. It is assumed that pipeline trenches would not remain open longer than 1 month at any 1 location. The permanent project ROWs are not expected to preclude future access to exploration and mineral production. The project would not consume a large fraction of the available aggregate (sand and gravel) resources because of the widespread availability of these commodities.

Conclusion. Proposed construction and permanent ROWs would not preclude access to the exploration and development of mineral resources and project demand for aggregate resources would be minor compared to available resources.

Proposed mitigation measures:

None

Residual impacts include:

- Potential temporary (likely no longer than 1 month) access restrictions to ongoing mineral extraction sites until roadways are restored after construction completion.

3.11.2.5 Alignment Options 1 through 4

There would be no differences in potential impacts to mineral resources when comparing the Alignment Options 1 through 4 to the relevant segments of the Proposed Action.

3.11.2.6 No Action

Under the No Action Alternative, there would be no potential impacts from the proposed project to mineral resources.

3.11.2.7 Comparison of Alternatives

For mineral resources there would be no impact differences between the alternatives.

3.11.2.8 Groundwater Development and Groundwater Pumping

Issues

Groundwater Development Construction and Facility Maintenance

The issues and concerns regarding potential impacts of the proposed groundwater development and maintenance to locatable, leasable, and salable mineral resources are listed below:

- Potential interference with existing mineral extraction operations.
- Potential for reduced access to underlying minerals.
- Potential interference with mining operations.

Groundwater Pumping

- The major issue of concern with regard to mineral resources is that groundwater pumping could limit the amount of water potentially available for use in mineral operations.

Assumptions

Groundwater Development Construction and Facility Maintenance

The following assumption was used in the impact analysis for groundwater development and maintenance effects on minerals:

- Presumably, the BLM could approve development of minerals within groundwater development areas, since the development would essentially be carried out on ROW grants which are subject to existing rights of other parties including the U.S. according to 43 CFR, § 2805.14.
- Under U.S. law, mineral rights and uses take precedence over other rights associated with a property (BLM 2009). Conflicts between different ownership of mineral and surface estates are referred to as “split estate” disputes. However, in the case of the ROWs proposed for this project, the federal government will in most cases be the surface and mineral estate owner, but the precedence of mineral rights applies to ROWs granted under the FLPMA. In 43 CFR, § 2805.15, the U.S. retains ownership of land resources including minerals.
- The location of wells and collector pipelines is not known at this time and final routes for those lines would be determined with consideration for active and potential mineral uses.

Groundwater Pumping

The following assumption was used in the impact analysis for minerals for groundwater pumping effects on minerals:

- The precise location of proposed groundwater pumping facilities is not known at this time; however, no groundwater wells are planned in active mining districts.

Methodology for Analysis

Groundwater Development Construction and Facility Maintenance

The following lists the steps in the analysis of impacts of groundwater development to mineral resources:

- Review information regarding the location of existing mineral extraction operations in the vicinity of the proposed facilities, as well as information regarding potential mineral resources that may be present in groundwater development areas.
- Determine if proposed activities and facilities have the potential to create concerns and issues as identified above.
- Determine the compatibility of existing and proposed mineral extraction operations with groundwater development and maintenance (i.e., surface mining likely would not be compatible; subsurface mining may be compatible).

- Determine the likelihood that additional mineral resources would be developed in the future (mine or quarry would be expanded).
- Develop possible location alternatives for water transportation components. Describe methods for ensuring mining road and utility access across active pipeline construction areas.
- Mitigation measures discussed in this resource section focus on new measures. Where applicable, some of the ROW mitigation measures may apply to surface disturbance activities associated with groundwater development. These ROW mitigation measures also would be considered in subsequent NEPA tiers.

Groundwater Pumping

The following lists the steps in the analysis of impacts of groundwater pumping to mineral resources:

- Review the present consumptive water use for minerals in relation to projected drawdown of the various alternatives.
- Determine qualitative risk for potential effects to minerals development or use of water supplies.

3.11.2.9 Proposed Action

Groundwater Development Area

The groundwater development areas generally do not overlap with active mining claims except for claims on the east side of the Delamar Valley and claims on the east side of the Spring Valley (**Figure 3.11-1**). As of April 2011, no oil and gas production has been established in the proposed groundwater development areas. Establishment of groundwater development areas is not expected to interfere or preclude the extraction of minerals. Therefore, construction in the proposed groundwater areas would not impact access to or extraction of minerals, unless there are temporary restrictions to access (i.e., an open trench across an access road). Restriction of access during construction would be temporary and limited to when construction would be occurring.

It is anticipated that pipeline trenches would be backfilled with materials derived from the trench excavation, and it might be necessary to obtain some construction sand and gravel from local existing commercial sources for use as pipe padding, road base, or surface facility pads. These demands for sand and gravel would not substantially affect the long-term availability of construction materials in the area because of the ubiquitous nature of sand and gravel resources in the area.

The proposed groundwater development facilities may be in place indefinitely. At this time, it cannot be predicted what mineral commodities located within the proposed areas would become commercially viable in the future, especially oil and gas. Once groundwater development facilities are in place, any applications for mining operations, issuance of leases, or granting of mineral entry would have to be done with consideration of the established use of the groundwater development areas. However, it should be noted that owners of mineral rights or their lessees have right of entry that take precedence over other uses.

Conclusion. Construction and maintenance of the proposed groundwater development facilities would not prevent access to future mineral development or constitute an important loss of mineral resources or mineral availability because of the dispersed nature of the groundwater development areas relative to the expanse of areas with mineral resource potential.

Proposed mitigation measures:

None.

Potential residual impacts include:

- Potential temporary (likely no longer than 1 month) access restrictions to ongoing mineral extraction sites until roadways are restored after construction completion.

Groundwater Pumping

Withdrawal of groundwater could limit the amount of water potentially available for use in mineral operations. Based on current use, potential consumption of water by mining and milling operations in the basins proposed for pumping is relatively small (about 4,963 acft of active water rights) (Nevada Water Division of Water Resources 2011) and most of the rights are in the Spring Valley (**Table 3.11-1**). It is possible that proposed pumping in the Spring Valley could affect mining and milling water rights. The mining and mineral water rights consist of wells, springs, and streams. Some of the drawdown effects that would be specific to mineral operations would include the following:

- An increase in the depth to groundwater, resulting in a requirement for deeper water supply wells.
- Potential flow reduction in perennial springs, seeps, and streams.
- Potential surface and groundwater right quantity reductions.

Table 3.11-1 Active Water Rights Project Area

Basin	Basin Number	Active Water Rights, Mining and Milling (Acre-feet)
Steptoe	179	84,522
Cave ¹	180	0
Dry Lake ¹	181	18
Delamar ¹	182	25
Lake	183	833
Spring ¹	184	4,920
Tippett	185	0
Snake ¹	195	0
Hamlin	196	0
Dry Valley	198	0
Spring	201	0
Patterson	202	508
Panaca	203	0
Clover	204	0
Lower Meadow Valley Wash	205	57
Kane Springs	206	0
White River Valley	207	72
Pahroc	208	0
Pahranagat	209	0
Coyote Springs Valley	210	0
Las Vegas Valley	212	1,728
Black Valley	215	1,980
Garnet	216	134
Hidden Valley (North)	217	0
California Wash	218	0
Muddy River	219	0

¹Groundwater Development Valleys.

Source: Nevada Division of Water Resources (2011).

Section 3.3, Water Resources, provides a detailed discussion of potential effects from groundwater pumping and proposed mitigation. Because of the general lack of mining and milling water rights in the groundwater pumping basins, the effects to those rights are expected to be small. However, mining and milling water rights in Dry Lake, Delamar, Lake, and Spring valleys could be affected to varying degrees. The risk to mining and milling water rights would range from low to high depending on the particular location of the water right. Groundwater pumping would not unreasonably restrict access to existing mining and milling water rights in Dry Lake, Delamar, Lake, and Spring

valleys, and the effects could vary depending upon the location of the water right. However, senior water rights would be protected in accordance with Nevada State water law.

Conclusion: Groundwater pumping has the potential to impact potential sources of water for mineral development, but those effects are highly dependent on the location of the source. Senior water rights would be protected in accordance with Nevada State water law.

Proposed mitigation measures:

None.

Potential residual impacts include:

- The COM Plan and water resources monitoring and mitigation measures could be effective in reducing impacts to water sources for mineral development. It is not possible to determine the level of impact at this time. Residual effects on some water sources for mineral development could occur when considering the long recovery period for groundwater. Some unavoidable adverse effects on mineral development could occur at some locations.

3.11.2.10 Alternatives A through F

Groundwater Development Areas

The impacts to mineral resources that could result from construction and facility maintenance of groundwater development areas for Alternatives A through F are summarized in **Table 3.11-2**.

Table 3.11-2 Summary of Mineral Resource Impacts, Proposed Mitigation, and Residual Effects for Alternatives A through F Groundwater Development

Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Construction and Facility Maintenance					
Same as the Proposed Action.	Same as the Proposed Action.	Same as the Proposed Action.	Alternative D would disturb less area (no facilities in White Pine County) as compared to the Proposed Action and would avoid temporary road access limitations to adjacent mineral resources.	Same as the Proposed Action, with the following exception: <ul style="list-style-type: none"> • No temporary road access limitations to adjacent to potential mineral development areas in the Snake Valley. 	Same as the Proposed Action, with the following exception: <ul style="list-style-type: none"> • No temporary road access limitations to adjacent to potential mineral development areas in the Snake Valley.
Recommended Mitigation					
None.	None.	None.	None.	None.	None.
Residual Impacts					
Potential temporary (likely no longer than 1 month) access restrictions to ongoing mineral extraction sites until roadways are restored after construction completion.					

Groundwater Pumping

The impacts of pumping on mineral resources for Alternatives A through F are summarized in **Table 3.11-3**.

Table 3.11-3 Summary of Mineral Resource Impacts, Proposed Mitigation, and Residual Effects for Alternatives A through F Groundwater Pumping

Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Due to the general lack of mining and milling water rights, potential impacts of pumping on mineral resources is expected to be low; Alternative A would be lower than the Proposed Action.	Same as the Proposed Action.	Same as Alternative A.	Same as Alternative A except that there would be no impact risk to mineral resource development in the White Pine portion of Spring or Snake valleys.	Same as Alternative A except that there would be less impact risk to mineral resource development in Snake Valley.	Same as Alternative A except that there would be less impact risk to mineral resource development in Snake Valley.
Recommended Mitigation					
Same as the Proposed Action.	Same as the Proposed Action.	Same as the Proposed Action.	Same as the Proposed Action.	Same as the Proposed Action.	Same as the Proposed Action.
Residual Impacts					
Potential temporary (likely no longer than 1 month) access restrictions to ongoing mineral extraction sites until roadways are restored after construction completion.					

3.11.2.11 No Action

Groundwater Development Area

There would be no impacts due to groundwater development since there would be no project.

Groundwater Pumping

Under the No Action, groundwater pumping would continue under status quo condition as described in Chapter 2.0, Section 2.2.

3.11.2.12 Alternatives Comparison

Groundwater Development Area

In terms of potential impacts to mineral resources by groundwater development, the alternatives would be essentially the same.

Groundwater Pumping

The potential for adverse impacts to mining and milling water rights varies with the proposed volume pumping for any given alternative. Based on the foregoing, the Proposed Action and Alternative B would pose the highest risk to mineral water rights in Spring Valley because of proposed pumping of over 91,000 afy (Table 2.1-2). The other proposed groundwater pumping valleys (Delamar, Dry Lake, and Cave valleys) do not have large appropriated mineral water use rights (Table 3.11-1).

3.11.3 Cumulative Impacts

3.11.3.1 Impacts Common to All Alternatives

Climate Change Effects

Climate change already appears to be influencing both natural and managed ecosystems of the American Southwest (Breshears et al. 2005, Westerling et al. 2006, Seager et al. 2007) and models indicate the likelihood of the Southwest being a climate change “hotspot” in the coming decades (Diffenbaugh et al. 2008). Recent warming in the Southwest is among the most rapid in the nation, significantly more than the global average in some areas (USGCRP 2009). Projections suggest continued strong warming in the region, with significant increases in temperature (USGCRP 2009) and decreases in precipitation (Seager et al. 2007). A warmer atmosphere and an intensified water cycle are likely to mean not only a greater likelihood of drought for the Southwest, but also an increased risk of flooding (USGCRP 2009). Greater variability in patterns of precipitation can be anticipated in the future. In the coming century, mean global temperature could increase significantly, with an associated increase in both the frequency of extreme events (heat waves, droughts, storms) and the frequency and extent of wildfire (IPCC 2007; Westerling & Bryant 2008; Krawchuk et al. 2009). Under such conditions, future impacts could be substantial for some resources, impacting biodiversity, protected areas, and agricultural lands.

Climate Change Effects to Mineral Resources

Climate change effects were not evaluated for this resource because potential effects to mineral resources as a result of climate change cannot be directly quantified.

3.11.3.2 Issues

Rights-of-way and Groundwater Development Area Construction and Maintenance

- Potential long-term interference with existing mineral extraction operations.
- Potential for long-term reduced access to underlying minerals.
- Potential long-term interference with future mining operations.

Groundwater Pumping

- Groundwater pumping in the near and long-term has the potential to restrict water supplies for mineral extraction.

3.11.3.3 Assumptions

Rights-of-way and Groundwater Development Area Construction and Maintenance

- Long term is greater than 2 years.
- No changes in BLM ROW granting authority and ROW grant rights in the long-term.
- Precedence for right of mineral entry continues in the long-term.

Groundwater Pumping

- The precise location of proposed groundwater pumping facilities is not known at this time; however no groundwater wells are planned in active mining districts.
- A water right designated for mining and milling may not necessarily have a mining or milling operation associated with it.

3.11.3.4 Methodology for Analysis

Rights-of-way and Groundwater Development Areas

- Review information regarding the location of reasonably foreseeable future mineral extraction operations in the vicinity of the proposed facilities as well as information regarding potential mineral resources that may be present in groundwater development areas.
- Determine if proposed activities and facilities have the potential to create concerns and issues as identified above.

- Determine the compatibility of proposed mineral extraction operations with groundwater development and maintenance (i.e. surface mining likely would not be compatible; subsurface mining may be compatible).
- Determine the likelihood that mineral resources would be developed in ROWs and groundwater development areas in the long-term.

Groundwater Pumping

The following lists the steps in the analysis of impacts of groundwater pumping to mineral resources:

- Review the reasonably foreseeable projected consumptive water use for minerals in relation to projected drawdown of the various alternatives.
- Assess the qualitative risk for potential affects to water supply for minerals development.

3.11.3.5 Proposed Action, Alternatives A through F

Groundwater Development Area

Since construction and facility maintenance would result in minor to low level impacts to mineral resources, the Proposed Action and Alternatives A through F would add incremental minor to low level effects to other cumulative actions in the project study area.

Groundwater Pumping

As indicated in Section 3.3, Water Resources, cumulative groundwater drawdown effects in Spring Valley are dominated by the varying drawdown rates and volumes among the various GWD Project alternatives. With the exception of Alternative D, all pumping alternatives would develop groundwater throughout the length of Spring Valley. The Proposed Action and Alternative B would potentially extract the largest groundwater volumes in Spring Valley, followed by Alternatives A, D, E, and F. Due to its intermittent pumping, Alternative C would potentially extract the least groundwater. No specific mining proposals are included in the list of reasonably foreseeable projects in this EIS. Depending on the location of a future mining project, the proposed points of diversion for mining project water supply wells could be located over the GWD Project aquifer drawdown areas. As a consequence, mine water supply well depths likely would be greater than they would be in the absence of the GWD Project. Conversely, if a new mine development requires dewatering, ongoing pumping from the aquifer to be dewatered may be beneficial to mine operations. It should be noted that any new mining proposals would also have to obtain existing or be permitted new water rights in these basins by the NSE, and that currently no such proposals have been identified.