4.11 Mineral Resources

The purpose of this Section is to identify existing mineral resources within the Project area, analyze potential impacts to mineral resources associated with the development of the proposed Project, and identify mitigation measures that would avoid or reduce the significance of any identified impacts. Mineral resources of concern include salts, metals, industrial minerals (e.g. aggregate, sand and gravel) oil and gas, and geothermal resources that would be of value to the region and residents of the State. Thresholds of significance for the impact analysis are derived from Appendix G of the 2011 *CEQA Guidelines*.

The operation of the Project would be managed under a plan which incorporates additional safeguards and action criteria when adverse conditions occur attributable to the Project.

4.11.1 Environmental Setting

Regional Setting

The Project is located within the Eastern Mojave Desert, which is characterized by broad interior desert valleys and playas intersected by isolated mountain ranges. The geologic history of the region has resulted in the deposition of economically-valuable deposits of metals and evaporite minerals. The metals include gold, silver, copper, lead, and others. These metals are typically emplaced into a variety of host rocks through the injection of hydrothermal fluids, primarily by replacement (i.e., by solution and re-precipitation), or by open-space filling (e.g., veins, breccias, pore spaces). The evaporite minerals include salts such as sodium chloride (halite, rock salt, or table salt), calcium chloride, and calcium sulfate (gypsum), along with other less common evaporite minerals. The evaporites are typically derived from the evaporation of previously saline lakes or seas, or as salts dissolved out of sediments and rocks into surface water or groundwater and are transported to lower-elevation basins, where the salts accumulate. Lower elevation areas of playas or dry lakes[1] within closed basins commonly have high evaporite mineral concentrations in the soil and groundwater.

Local Setting

Playas in the local area have historically and are currently producing evaporite minerals. Tetra Technologies produces salts at Bristol and Cadiz Dry Lakes; National Chloride produces salts at Bristol Dry Lake. The Salt Products Company produces salt at Danby Dry Lake. The salt producing operations at Bristol and Cadiz Dry Lakes recover sodium chloride (also called halite, rock salt, or table salt) and calcium chloride (commonly used for brine for refrigeration plants, ice and dust control on roads, and desiccation) by pumping saline water from wells into trenches, where evaporation removes more water from the solution. Halite precipitates out as a solid, leaving the remaining solution concentrated calcium chloride. The operations at Danby Dry Lake produce only halite. **Figure 4.11-1** shows the extent of the salt mining operations within the

[1] The terms playas and dry lakes are generally synonymous, with the specific dry lake areas generally considered to be the innermost center areas of the playas.

Project area dry lakes as of February 16, 2003 (Bristol and Cadiz) and December 6, 2005 (Danby).[2]

California's Surface Mining and Reclamation Act of 1975 (SMARA) requires the State Geologist to classify land into mineral resource zones (MRZs) based on the known or inferred mineral resource potential of that land. The California Division of Mines and Geology has not yet identified nor is it currently working on identifying MRZs within the Project area.[3]

The USGS website for tracking active mining operations identified no active metals mining operations as of 2003 [4] within the view of the area represented in Figure 4.11-1. Although the Project area does not have any other active mining operations, the region, including the Project area, does have a history of mining for mineral resources dating back to the 1800's. **Figure 4.11-1** includes the locations of various historical inactive mining locations within and near the Project area, along with the salt producing operations. Most of these historical mining operations extracted metals, such as gold, silver, copper, and lead.

4.11.2 Regulatory Framework

The following summarizes the regulatory requirements applicable to mineral resources in the Project area.

Federal

The following federal laws and acts are implemented and enforced by the BLM. The BLM provides the mineral resource evaluations for federally-owned and managed lands.

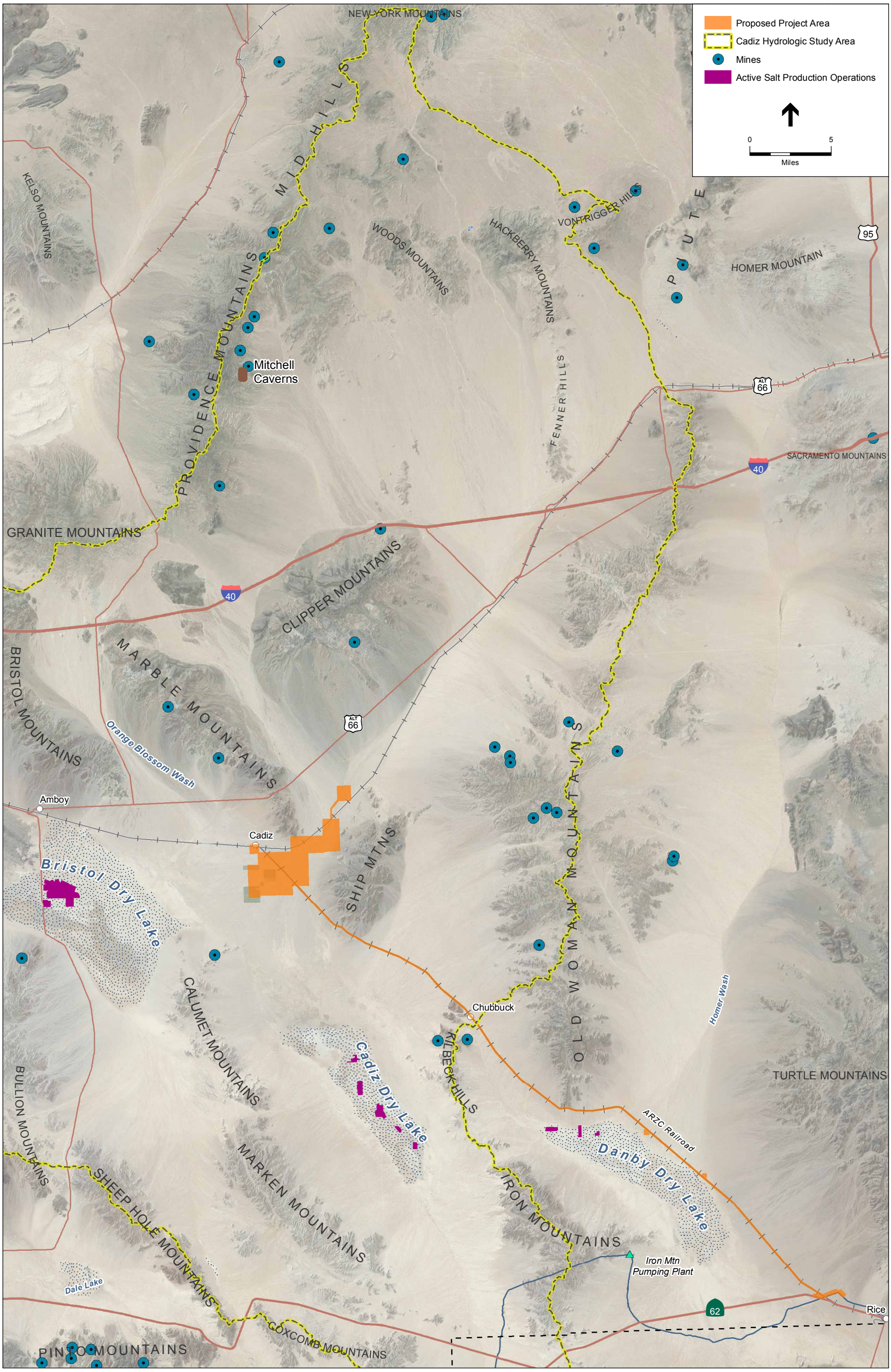
General Mining Law of 1872

Under the General Mining Law of 1872 (30 USC 29 and 43 CFR 3860, as amended), U.S. citizens are given the opportunity to explore for, discover, and purchase certain valuable mineral deposits on unreserved public domain land. Locatable deposits are those mineral deposits that are authorized to be claimed under the General Mining Law of 1872 (as amended).

Mineral Leasing Act of 1920

Leasable minerals are those commodities that may be acquired on federal public lands under the Mineral Leasing Act of 1920 (30 USC 181, as amended). Leasable minerals are subject to exploration and development through leases, permits, or licenses issued by the BLM.

2 Google Earth, accessed June 2011.
3 State Mining and Geology Board, *A Report of Mineral Land Classification and Designation Under the Surface Mining and Reclamation Act of 1975*, State Mining and Geology Board Information Report 2008-05, July 2008.
4 U.S. Geological Survey, *Active Mines and Mineral Plants in the U.S. 2003*, http://mrdata.usgs.gov/mineral-resources/active-mines.html, accessed April 2011.



SOURCE: Bing Maps, 2011; USDA, 2009; CA Natural Resource Agency, 2009; ESRI, 2010; Cadiz Inc., 2011; CH2MHill, 2010; and ESA, 2011

Cadiz Valley Water Conservation, Recovery, and Storage Project

Figure 4.11-1

Current Salt Production and Historical Mining Locations

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Materials Act 1947

Salable minerals include common varieties of sand, stone, crushed rock and gravel, pumice, pumicite, cinders, and ordinary clay. These commodities have relatively low unit value, but may have high bulk commercial or industrial value and importance depending on their proximity to markets. Salables are used chiefly for roadways and other construction. These minerals may be obtained under the Materials Act of 1947 (30 U.S.C. 601 et seq., as amended) and are disposed of at the discretion of the BLM by contract or permit.

State

The California Department of Conservation is the primary agency charged with mineral resource protection. The Department's main responsibility is conserving the earth's mineral resources through five program divisions: the State Mining and Geology Board (SMGB); the Division of Oil, Gas and Geothermal Resources (DOGGR); the Division of Land Resource Protection; the California Geological Survey; and the Office of Mine Reclamation. The SMGB operates within the Department of Conservation and serves as a regulatory, policy, and appeals body representing the State's interest in geology, geologic and seismologic hazards, conservation of mineral resources, and reclamation following surface mining activities.

The Department of Conservation is the primary state entity that evaluates and regulates mineral resources, including the SMARA discussed below.

State Surface Mining and Reclamation Act

The State SMARA, as amended, is the primary State law governing the conservation and development of mineral resources in California (Health and Safety Code, Division 2, Chapter 9, Section 2710, et seq.).[5] Specifically, it mandates the development of mineral land classifications to help identify and protect mineral resources in areas within the State that are subject to urban expansion or other irreversible land uses that would preclude mineral extraction. After classification of mineral resource areas, SMARA provides for the designation of lands containing mineral deposits of regional or statewide significance. In addition, SMARA was designed to provide guidelines for the proper reclamation of mineral lands.

In compliance with SMARA, the SMGB is responsible for establishing MRZs to classify lands that contain mineral deposits. According to the latest status report on the SMGB website, the SMGB has not yet completed MRZs and does not have any MRZ studies in progress for the Project area.[6]

[5] Mining also may be regulated by local government, which has the authority to prohibit mining pursuant to its general plan and local zoning laws.

[6] State Mining and Geology Board, *A Report of Mineral Land Classification and Designation Under the Surface Mining and Reclamation Act of 1975*, State Mining and Geology Board Information Report 2008-05, July 2008.

Local

San Bernardino County General Plan

The San Bernardino County General Plan addresses the conservation of mineral resources in Section V, Conservation Element, Part 6 – Minerals. The goal of the Conservation Element is to prevent the wasteful exploitation, destruction, and neglect of resources. Because the State has not yet prepared an MRZ map for the area where the Project is located, the County is unable to presently implement the State MRZ program. For discussion of the applicability of the County General Plan and Development Code policies to the Project, please see Section 4.10.3 (*Consistency with Land Use Plans*) of the Land Use and Planning Chapter.

4.11.3 Impact and Mitigation Analysis

Significance Criteria

Based on the *CEQA Guidelines,* Appendix G, a project may be deemed to have a significant effect on the environment with respect to mineral resources if it would:

- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State; or
- Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

Methodology and Assumptions

Mineral resource impacts are based upon the project's proximity to nearby mineral resources that are identified as being of importance on a local, regional, state, or federal level. Specifically, this Section addresses the potential environmental impacts related to the loss of existing or potential mineral resources. Mineral resource maps and known and potential locations of mineral resources and mining operations were identified to evaluate whether the proposed Project would impede access to these resources or disrupt on-going mining operations.

As described in Section 4.9, Hydrology and Water Quality, using data collected to date, Geoscience prepared a groundwater model to simulate the aquifer system in the Project area, including Fenner Valley, Fenner Gap, and the Cadiz Valley area that includes most of the Bristol Playa and the northern portion of the Cadiz Playa.[7] The groundwater model was used to simulate the potential response of the aquifer system to Project operations using two variations of the wellfield configuration and three variations of potential annual recharge volumes over a period of 50 years of groundwater production at 50,000 AFY, followed by 50 years of recovery (no groundwater production). The output of the simulations include the modeled drawdown of groundwater levels, the potential movement of the freshwater-saline water interface, and the amount of potential subsidence.

[7] GEOSCIENCE Support Services, Inc., *Cadiz Groundwater Conservation and Storage Project Phase I – Conservation Scenarios,* August 2011, Figure 1.

The modeled scenarios vary by recharge amounts. The Project scenario assumes an annual recharge of approximately 32,000 AFY in the Fenner Watershed and Orange Blossom Wash based on CH2M Hill's updated evaluation of recharge. This recharge volume estimate is derived from the USGS INFIL3.0 Model, is based on long-term precipitation records and represents the long-term average annual recharge within the Fenner Watershed that ultimately evaporates off of Bristol and Cadiz Playas.[8] Because earlier evaluations of available recharge predicted a lower potential range for recharge, two sensitivity scenarios were applied to model conservative, worst-case aquifer responses where the average annual recharge over a 100-year time period is reduced to 16,000 and 5,000 AFY respectively.[9] The modeling did not include recharge that occurs west, south, and east of the Bristol and Cadiz Dry Lakes. Consequently, the groundwater model provides the most conservative aquifer responses as the inclusion of recharge from other watersheds would reduce the predicted groundwater level drawdown and freshwater saline water interface movement.

Groundwater Management, Monitoring, and Mitigation Plan

The GMMMP prepared for the Project to provide for the adaptive management of the basin includes measures to monitor Project operations and potential effects on critical resources. The project design feature that is in regard to mineral resources is listed below:

- GMMMP Project Design Feature 6.5 – Brine Resources Underlying Bristol and Cadiz Dry Lakes (See this Section and Section 4. 9, Hydrology)

Groundwater Conservation and Recovery Component

Loss of Availability of Known Mineral Resources

Significance Threshold

Would the proposed Project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?

Impact Analysis

Most of the Project elements would be located outside of existing or potential mineral resource areas. Some portions of the 43-mile water conveyance pipeline cross areas of potential mineral resources (gypsum, metals and non-metals, sodium (salt), oil and gas, uranium and/or thorium) that are on public lands managed by the BLM. However, the BLM evaluation, largely based on limited data such as aerial surveys, determined these mineral resources are not in active use.[10] In addition, no impacts would occur from the water conveyance pipeline, which is to be located within ARZC ROW where potential future mineral resource exploration and use would not be permitted due to safety concerns for the rail line. Similarly, the wellfield facilities are located on private land that would not be required to provide access for mineral resource mining activities

8 CH2M Hill, *Cadiz Groundwater Conservation and Storage Project*, July 2010, page 4-8.
9 GEOSCIENCE Support Services, Inc., *Cadiz Groundwater Conservation and Storage Project Phase I – Conservation Scenarios,* August 2011, page 4.
10 Metropolitan Water District of Southern California and Bureau of Land Management, *Cadiz Groundwater Storage and Dry-Year Supply Program Final Environmental Impact Report and Final Environmental Impact Statement, Volume I,* September 2001, page 5-187, 5-188.

without permission from the land owner. Therefore, the Project would not affect availability of mineral resources other than salt, as discussed below, and the impact is considered less than significant.

With respect to Project facility impacts on salt production operations, all of the Project infrastructure would be constructed outside of the playas and far from the existing salt production operations. The Project wellfield is to be located within and just northeast of Fenner Gap, at least five miles from the edge of Bristol Playa, the closest playa. The water conveyance pipeline would pass just northeast of Danby Playa, but would have no impact on the playa because it consists solely of a shallowly buried pipeline that would not encounter groundwater, and therefore, would not require dewatering.

As described in Section 4.9, Hydrology and Water Quality, water levels beneath the playas are maintained by the inflow of groundwater from the entire Watershed (the combined recharge from Fenner, Orange Blossom Wash, Bristol, and Cadiz Watersheds) and surface water from direct precipitation and overland flow, when present. The depth to groundwater measured on May 5, 2011 in two wells (Wells HAL 1 and MW-5) located at the northeast margin of the Bristol Playa approximately ½-mile northeast of the playa edge where vegetation begins to occur were 93.40 and 85.05 feet below ground surface, respectively.[11] Trenches dug in central portions of Bristol Playa for salt production show water levels ranging from 8 to 12 feet deep.[12]

As noted above, Section 4.9, Hydrology and Water Quality describes the groundwater model prepared to simulate the aquifer system in the Project area under Project operations, including the potential drawdown of groundwater beneath the salt production operations on the Dry Lakes. **Table 4.11-1** below summarizes the model-predicted drawdown at the edge of Bristol and Cadiz Dry Lakes and the center of Bristol Dry Lake for both the end of the 50-year Project operation period and the subsequent 50-year recovery period.[13]

As shown on the table above, water levels would begin to recover once the 50-year pumping period has been completed. As described in the Geoscience report, complete recovery of water levels to pre-Project levels would occur in all scenarios.[14]

The salt production at the Dry Lakes begins with the excavation of trenches that expose saline groundwater. If the Project drawdown results in water levels too deep to initiate the salt concentration process by simple excavation, this impact would be considered significant because the salt production operators would have to initially fill the trenches with pumped saline groundwater, thus incurring an added operational cost. As shown in Table 4.11-1, lowering

11 Cadiz Inc., *Communication with ESA based on field measurements collected on* August 4, 2011.
12 HydroBio, *Fugitive Dust and Effects from Changing Water Table at Bristol Play, San Bernardino, California,* January 2011, page 7.
13 GEOSCIENCE Support Services, Inc., *Cadiz Groundwater Modeling and Impact Analysis, Volume 1,* September 2011, pages 51-52.
14 GEOSCIENCE Support Services, Inc., *Cadiz Groundwater Modeling and Impact Analysis*, Volume 1, September 2011, page 53.

TABLE 4.11-1
SUMMARY OF MODEL-PREDICTED DRAWDOWN UNDER OPERATION OF THE GROUNDWATER CONSERVATION AND RECOVERY ELEMENT OF THE PROJECT

		Depth to Groundwater (feet)			
Location	**Time**	**Modeled Existing**	**Project Scenario (32,000 AFY Natural Recharge)**	**Sensitivity Scenario 1 (16,000 AFY Natural Recharge)**	**Sensitivity Scenario 2 (5,000 AFY Natural Recharge)**
Edge of Bristol Dry Lake	End of 50 Years	33	68	95	118
	End of 100 Years		42	74	108
Center of Bristol Dry Lake	End of 50 Years	18	50	63	54
	End of 100 Years		33	62	79
Edge of Cadiz Dry Lake	End of 50 Years	7	21	59	72
	End of 100 Years		10	17	68

SOURCE: GEOSCIENCE Support Services, Inc., *Cadiz Groundwater Modeling and Impact Analysis, Volume 1*, September 2011, pages 51-52.

groundwater levels from the existing depth of 18 feet at the center of the Bristol Dry Lake to 50 feet or greater would result in levels too deep to continue current excavation practices used by operators to initiate the salt concentration process.

The salt concentration process continues by adding saline water pumped from wells tapping saline groundwater from beneath the Dry Lakes. If the Project drawdown results in water levels decreasing to below the top of the well screens for the saline water supply wells, this impact would be considered significant because the pumps would have to be lowered to below the decreased water level.

While Project operation would not result in loss of availability of the salt resource, it could make it more difficult or costly to mine and require a change in mining operations and/or well facilities. In this way, the Project could have a significant impact on existing salt mining operations, however, with mitigation it could be reduced to less than significant.

The GMMMP includes the project design features to verify model-predicted effects and confirm protection of critical resources. The project design feature relative to subsidence is GMMMP Project Design Feature 6.5 – Brine Resources Underlying Bristol and Cadiz Dry Lakes.[15] The Action Criteria and Corrective measures are summarized in **Table 4.11-2**.

[15] CH2M Hill, *Groundwater Management, Monitoring, and Mitigation Plan,* November 2011, pages 81-82.

TABLE 4.11-2
GMMMP PROJECT DESIGN FEATURE 6.5 –
BRINE RESOURCES UNDERLYING BRISTOL AND CADIZ DRY LAKES

Action Criteria	Corrective Measures
For effects to brine resources beneath Bristol or Cadiz Dry Lake, the action criteria shall be: 1. changes in groundwater levels larger than projected by the groundwater model simulations, or 2. changes in groundwater or brine water levels of greater than 50 percent of the water column above the intake of any of the salt mining companies' wells in comparison to pre-operational static levels in cluster wells at the margins of the dry lakes.	Corrective measures that would be implemented would be modification of Project operations to address impacts to the brine resources beneath Bristol or Cadiz Dry Lake would include one or more of the following actions: • Reduction in pumping from Project wells; or • Revision of pumping locations within the Project wellfield; or • Stoppage of groundwater extraction for a duration necessary to correct the predicted impact; or • Installation of an injection wells to mitigate the impact, or • Compensation to mining operators for the additional costs of pumping.

SOURCE: CH2M Hill, *Groundwater Management, Monitoring, and Mitigation Plan,* November 2011, pages 81-82.

Implementation of the project design features in Chapter 6.5 of the GMMMP would reduce the potential impacts to infrastructure to less than significant. Therefore, for purposes of this CEQA analysis of the Project, the project design features in Chapter 6.5 of the GMMMP are incorporated into this EIR as Mitigation Measure **MIN-1**. Implementation of Mitigation Measure **MIN-1** would ensure that the potential impacts for brines resources beneath Bristol and Cadiz Dry Lakes are mitigated to less than significant for the existing salt production operations.

Mitigation Measures

MIN-1: PDF 6.5 shall be implemented to address the potential impact for groundwater level drawdown on existing salt production operations. If changes in groundwater levels occur that are larger than projected by the groundwater model simulations or if changes occur in groundwater or brine water levels that are greater than 50 percent of the water column above the intake of any of salt mining companies' wells in comparison to pre-operational static levels in wells at the margins of the dry lakes, one or more of the following actions shall be implemented:

- Reduction in pumping from Project wells; or
- Revision of pumping locations within the Project wellfield; or
- Stoppage of groundwater extraction for a duration necessary to correct the predicted impact; or
- Installation of injection wells to mitigate the impact, or
- Compensation to mining operators for the additional costs of pumping.

Significance Conclusion

Less than significant with mitigation.

Loss of Availability of Locally Important Mineral Resources

Significance Threshold

Would the proposed Project result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

Impact Analysis

As noted in the Regulatory Framework Section above, neither the State nor the County have developed MRZ maps or designated mineral resource sites in the Project area. Therefore, there are no known designated mineral resource sites in the Project area in a local planning document. Based on existing mining operations as shown on Figure 4.11-1, and because the State has not yet prepared an MRZ map for the area and the County's inability to implement the State MRZ program in the Project area, the Project would not result in an impact to locally important mineral resources identified by local planning documents nor conflict with any plans.

Mitigation Measures

None required.

Significance Conclusion

No impact.

Imported Water Storage Component

This component is analyzed on a programmatic basis.

Loss of Availability of Known Mineral Resources

Significance Threshold

Would the proposed Project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?

Impact Analysis

As with the Groundwater Conservation and Recovery Component, all Imported Water Storage Project infrastructure would be constructed outside of the playas and the associated salt production operations. The wellfield expansion and spreading basins are to be located within and just northeast of Fenner Gap, at least five miles from the nearest playa and all on privately-owned land that would not be accessible for mining activities without permission from the owner. The Imported Water Storage component would require that imported water be recharged into the ground and stored for future extraction. The expanded wellfield of the Imported Water Storage Component could allow for greater extraction of water than would be occurring as part of the Groundwater Conservation and Recovery Component during certain periods. However, more importantly, the recharge of water back into the aquifer would reduce the potential impacts discussed above by increasing water levels in the basin. As such, the action of recharging water

back into the aquifer would have no impact to the existing salt production operations. Consequently, the Imported Water Storage component of the Project would not affect availability of saline water to the salt production companies and therefore, would have no impact**.**

Mitigation Measure

None required**.**

Significance Conclusion

No impact.

Loss of Availability of Locally Important Mineral Resources

Significance Threshold

Would the proposed Project result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan*?*

Impact Analysis

Neither the State nor the County have developed MRZ maps or designated mineral resource sites in the Project area. Therefore, there are no known designated mineral resource sites in the Project area. Therefore, the Project would not conflict with local mineral planning documents. Based on existing mining operations as shown on Figure 4.11-1, no locally important mineral resources would be affected by the Project.

Mitigation Measures

None required.

Significance Conclusion

No impact.

Mitigation Measure Summary Table

Table 4.11-3 on the following page presents the impacts and mitigation summary for Mineral Resources.

TABLE 4.11-3
IMPACTS AND MITIGATION SUMMARY

Proposed Project Impact	Mitigation Measure	Significance Conclusion
Groundwater Conservation and Recovery Component		
Loss of Availability of Known Mineral Resources	**MIN-1**	Less than significant with mitigation
Loss of Availability of Locally Important Mineral Resources	None required	No impact
Imported Water Storage Component		
Loss of Availability of Known Mineral Resources	None required	No impact
Loss of Availability of Locally Important Mineral Resources	None required	No impact