Office of Energy Projects

December 2010

FERC/DEIS-D-0238

DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR HYDROPOWER LICENSE

Eagle Mountain Pumped Storage Hydroelectric Project—FERC Project No. 13123-002

California

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, DC 20426

FEDERAL ENERGY REGULATORY COMMISSION

WASHINGTON, DC 20426

OFFICE OF ENERGY PROJECTS

To the Agency or Individual Addressed:

Reference: Draft Environmental Impact Statement

Attached is the draft environmental impact statement (draft EIS) for the proposed Eagle Mountain Pumped Storage Hydroelectric Project (No. 13123-002), which would be located in two depleted mining pits in the inactive Eagle Mountain mine in Riverside County, California, near the town of Desert Center, California.

This draft EIS documents the view of governmental agencies, non-governmental organizations, affected Indian tribes, the public, the license applicant, and Federal Energy Regulatory Commission (Commission) staff. It contains staff evaluations of the applicant's proposal and the alternatives for licensing the Eagle Mountain Project.

Before the Commission makes a licensing decision, it will take into account all concerns relevant to the public interest. The draft EIS will be part of the record from which the Commission will make its decision. The draft EIS was sent to the U.S. Environmental Protection Agency and made available to the public on or about December 23, 2010.

Copies of the draft EIS are available for review in the Commission's Public Reference Branch, Room 2A, located at 888 First Street, N.E., Washington DC 20426. The final EIS also may be viewed on the Internet at www.ferc.gov/docs-filing/elibrary.asp. Please call (202) 502-8222 for assistance.

Attachment: Draft Environmental Impact Statement

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COVER SHEET

a. Title:	Licensing the Eagle Mountain Pumped Storage Hydroelectric Project, FERC Project No. 13123-002
b. Subject:	Draft Environmental Impact Statement
c. Lead Agency:	Federal Energy Regulatory Commission
d. Abstract:	On June 22, 2009, Eagle Crest Energy Company filed an application for an original license with the Commission for the proposed Eagle Mountain Pumped Storage Hydroelectric Project, which would be located on the site of the inactive Eagle Mountain mine, in Riverside County, California, near the town of Desert Center, California. The proposed project would occupy 1,059.26 acres of federal lands administered by the U.S. Bureau of Land Management and 1,162 acres of private lands owned by Kaiser Eagle Mountain, LLC (Kaiser). The estimated annual production from the proposed project would be a maximum of 4,308 gigawatt-hours of on-peak generation. The staff's recommendation is to license the project as proposed, with certain modifications and additional measures recommended by the agencies and staff.
e. Contact:	Kenneth Hogan Federal Energy Regulatory Commission Office of Energy Projects 888 First Street, N.E. Washington, DC 20426 (202) 502-8434
f. Transmittal:	This draft environmental impact statement to license the Eagle Mountain Pumped Storage Project is being made available for public comment on or about December 23, 2010, as required by the National Environmental Policy Act of 1969[1] and the Commission's Regulations Implementing the National Environmental Policy Act (18 CFR, Part 380).

[1] National Environmental Policy Act of 1969, amended (Pub. L. 91-190. 42 U.S.C. 4321-4347, January 1, 1970, as amended by Pub. L. 94-52, July 3, 1975, Pub. L. 94-83, August 9, 1975, and Pub. L. 97-258, §4(b), September 13, 1982).

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FOREWORD

The Federal Energy Regulatory Commission (Commission), pursuant to the Federal Power Act (FPA)[2] and the U.S. Department of Energy Organization Act[3] is authorized to issue licenses for up to 50 years for the construction and operation of non-federal hydroelectric development subject to its jurisdiction, on the necessary conditions:

> That the project…shall be such as in the judgment of the Commission will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water-power development, for the adequate protection, mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat), and for other beneficial public uses, including irrigation, flood control, water supply, and recreational and other purposes referred to in section 4(e)…[4]

The Commission may require such other conditions not inconsistent with the FPA as may be found necessary to provide for the various public interests to be served by the project.[5] Compliance with such conditions during the licensing period is required. The Commission's Rules of Practice and Procedure allow any person objecting to a licensee's compliance or noncompliance with such conditions to file a complaint noting the basis for such objection for the Commission's consideration.[6]

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[2] 16 U.S.C. §791(a)-825r, as amended by the Electric Consumers Protection Act of 1986, Public Law 99-495 (1986) and the Energy Policy Act of 1992, Public Law 102-486 (1992).

[3] Public Law 95-91, 91 Stat. 556 (1977).

[4] 16 U.S.C. § 803(a).

[5] 16 U.S.C. § 803(g).

[6] 18 C.F.R. §385.206 (2009).

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ACRONYMS AND ABBREVIATIONS

AAQS	California Ambient Air Quality Standards
ACEC	Areas of Critical Environmental Concern
Advisory Council	Advisory Council on Historic Preservation
APE	area of potential effects
applicant or Eagle Crest	Eagle Crest Energy Company
AQMD	Air Quality Management District
Basin Plan	Water Quality Control Plan for the Colorado River Basin within California
BLM	Bureau of Land Management
BMP	best management practice
CAISO	California Independent System Operator
California DFG	California Department of Fish and Game
California GS	California Geology Survey
California SHPO	California State Historic Preservation Officer
CAMA	California-Arizona Maneuver Area
CARB	California Air Resources Board
CDCA	California Desert Conservation Area
CDNPA	California Desert Native Plants Act
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CH_4	methane
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
Commission	Federal Energy Regulatory Commission
CRA	Metropolitan Water District of Southern California's Colorado River Aqueduct
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dBA	A-weighted decibel scale
DWMA	Desert Wildlife Management Area
Eagle Mountain Project	Eagle Mountain Pumped Storage Hydroelectric Project
ECORP	ECORP Consulting, Inc.
EIR	environmental impact report
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
°F	degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
Forest Service	U.S. Department of Agriculture, Forest Service
FPA	Federal Power Act

FWS	U.S. Department of the Interior, Fish and Wildlife Service
gpm	gallons per minute
GWh	gigawatt-hour
HPMP	Historic Properties Management Plan
Interior	U.S. Department of the Interior
JTNP	Joshua Tree National Park and wilderness area
Kaiser	Kaiser Eagle Mountain, LLC
kV	kilovolt
kW	kilowatt
mg/L	milligrams per liter
Ma	mega-anum, or million years ago
Metropolitan Water District	Metropolitan Water District of Southern California
MOU	Memorandum of Understanding
MW	megawatt
MWh	megawatt-hour
NAAQS	National Ambient Air Quality Standards
National Register	National Register of Historic Places
NECO Plan	Northern and Eastern Colorado Desert Coordinated Management Plan
NERC	North American Electric Reliability Corporation
NHPA	National Historic Preservation Act of 1966
N_2O	nitrous oxide
NO_2	nitrogen dioxide
NOx	nitrogen oxides
O_3	ozone
OHV	off-highway vehicle
PA	Programmatic Agreement
Park Service	National Park Service, Joshua Tree National Park
Pb	lead
PGA	peak ground acceleration
$PM_{2.5}$	particulate matter greater than 2.5 microns in diameter
PM_{10}	particulate matter greater than 10 microns in diameter
PMF	probable maximum flood
PSD	Prevention of Significant Deterioration
REA	ready for environmental analysis
Regional Water Board	Regional Water Quality Control Board
ROW	right-of-way
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SD1	Scoping Document 1
SD2	Scoping Document 2
SIP	State Implementation Plan
SO_2	sulfur dioxide

State Water Board	State Water Resources Control Board
TCP	traditional cultural property
THPO	Tribal Historic Preservation Office
USGS	U.S. Geological Survey
WEAP	Worker Environmental Awareness Program
VOC	volatile organic compound
VRM	Visual Resource Management

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EXECUTIVE SUMMARY

This draft environmental impact statement (draft EIS) evaluates the environmental effects associated with licensing the proposed 1,300-megawatt (MW) Eagle Mountain Pumped Storage Hydroelectric Project (Eagle Mountain Project or project), which would be located on the site of the inactive Eagle Mountain mine, in Riverside County, California, near the town of Desert Center. The project would operate as a closed system and is not located on a perennial river. The project would supply system peaking capacity and transmission regulating benefits to the regional electrical grid. The proposed project would occupy 1,059.26 acres of federal lands administered by the U.S. Bureau of Land Management (BLM) and 1,162 acres of private lands owned by Kaiser Eagle Mountain, LLC.

Proposed Action

The project as proposed by Eagle Crest Energy (Eagle Crest or applicant) would use reservoirs created from two inactive mining pits near the town of Desert Center, California. The project would consist of: (1) an upper and lower reservoir[7] with surface areas of 191 and 163 acres, respectively; (2) an underground powerhouse with four reversible pump-turbine units each rated at 325 MW for a total generating capacity of 1,300 MW; (3) a 13.5-mile-long transmission line; and (4) groundwater supply facilities. Project facilities are described in more detail in section 2.2.1. The project would operate as a pumped storage facility that would involve pumping water from the lower reservoir to the upper reservoir during periods of low energy demand, and then releasing to the lower reservoir to generate electricity during periods of high demand.

Eagle Crest proposes the following measures for the protection and enhancement of environmental resources during project construction and/or operation: (1) implement the Phase 1 Pre-Design Site Investigation Plan since access to the project site is currently limited; (2) implement the Erosion and Sediment Control Plan; (3) develop and implement a water management plan; (4) develop a network of groundwater monitoring wells; (5) develop measures to prevent effects such as subsidence (from increased groundwater levels) on the operation of Metropolitan Water District of Southern California's Colorado River Aqueduct (CRA); (6) install a reverse osmosis desalination facility to maintain water quality in the reservoirs at the level of the source water; (7) implement the Invasive Species Monitoring and Control Plan; (8) implement the Revegetation Plan for disturbed areas during construction; (9) construct security and game fencing to exclude larger terrestrial wildlife from entering project areas; (10) implement the Desert Tortoise Removal and Translocation Plan; (11) implement the Raven Monitoring and Control Plan; (12) design, install, and maintain facility lighting to

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[7] As part of the project's construction, Eagle Crest would need to install two saddle dams at the upper reservoir/mine site.

limit light pollution; (13) acquire land to mitigate for the desert tortoise habitat that may be disturbed by the project; (14) maintain recreational access to areas near the proposed project during construction; (15) implement the December 2009 Historic Properties Management Plan (HPMP); and (16) limit the effects of project construction and operation on air quality and noise. These and other proposed measures are described in detail in section 2.2.4.

Alternatives Considered

This draft EIS analyzes the effects of proposed project construction and operation and recommends conditions for any license that may be issued for the project. In addition to the applicant's proposal, we consider two alternatives: (1) the applicant's proposal with staff modifications (staff alternative); and (2) no action—whereby the project would not be constructed.

Under Eagle Crest's proposal with staff modifications, the project would operate as proposed by Eagle Crest but would also include the following expanded or additional measures: (1) construct the project transmission line along the State Water Resources Control Board's (State Water Board's) recommended route, rather than the applicant's proposed route; (2) connect the project to the grid by terminating the transmission line at the State Water Board's recommended substation location south of Interstate 10 about 6 miles east of the proposed substation location; (3) monitor water quality and levels of the reservoirs, brine ponds, and leakage during project operation; (4) make modifications to the stream channel along Eagle Creek, including the reservoirs and water seepage areas; (5) prepare a groundwater hydrologic budget report; (6) modify the proposed Invasive Species Monitoring and Control Plan to include criteria for success and an adaptive management plan if initial efforts are not successful; (7) modify the proposed avian protection plan to include measures to reduce avian collisions with the transmission line and monitor avian injury and mortality associated with the line; (8) survey for the spadefoot toad (a BLM sensitive species and a state of California species of special concern) before construction and, if found, implement measures to avoid disturbance to this species; (9) modify the current Raven Monitoring and Control Plan to include monitoring populations of desert tortoise predators before and after construction and associated mitigation and control measures; and (10) consult with BLM, participating tribes, and the California State Historic Preservation Officer (SHPO) to revise the December 2009 HPMP. The recommended staff modifications include, or are based in part on, recommendations made by the federal and state resource agencies that have an interest in the resources that may be affected by the project's construction and operation.

Public Involvement and Areas of Concern

Before filing its license application, Eagle Crest conducted a pre-filing consultation process under the traditional licensing process. The intent of the Federal Energy Regulatory Commission's (FERC or Commission) pre-filing process is to initiate public involvement early in the project planning process and to encourage citizens,

governmental entities, tribes, and other interested parties to identify and resolve issues before an application is formally filed with the Commission. After the application was filed, staff conducted scoping to determine which issues and alternatives should be addressed. Scoping Document 1 (SD1) was distributed for comment to interested parties on December 17, 2008. Staff held public scoping meetings in Palm Desert, California, on January 15 and 16, 2009. In SD1, staff requested clarification of preliminary issues concerning the Eagle Mountain Pumped Storage Hydroelectric Project and identification of any new issues that need to be addressed in the EIS. A revised scoping document (SD2), addressing these comments, was issued on June 5, 2009. On January 11, 2010, staff requested conditions and recommendations from state and federal resource agencies in response to the notice of ready for environmental analysis.

The primary environmental issues associated with licensing the project are the effects of the proposed project's construction and operation on groundwater, water quality, and terrestrial species, including several state sensitive bat species, the BLM sensitive dessert bighorn sheep, and the threatened desert tortoise.

Project Effects

Geology and Soils

Constructing the project would require the movement of about 3 million cubic yards of material for the construction of the two saddle dams and liners for the proposed reservoirs, additional surface excavation for the proposed water lines, and infrastructure associated with the proposed transmission line and substation. Under the applicant's proposal, erosion and sediment transport would be controlled during construction through implementation of the proposed Erosion and Sediment Control Plan.

Water Resources

Groundwater levels would be affected by withdrawals that the applicant plans to make from a series of proposed wells in the Chuckwalla Basin to fill the reservoirs and replace water lost to evaporation. After the reservoirs are filled, high evaporation rates would degrade the water quality in the reservoirs and seepage from the reservoirs could affect nearby groundwater quality. Changes to the current surface water flow patterns during the very rare rainfall events would be affected by the proposed construction of the project. The reservoirs and other proposed infrastructure are designed to withstand the probable maximum flood inflow from Eagle Creek and smaller watersheds that would occasionally reach the proposed reservoirs. Under the applicant's proposal, groundwater withdrawal would be limited to less than the historical levels associated with agricultural irrigation. Monitoring wells and other methods would determine the amount of seepage from the proposed reservoirs, the water level change due to pumping, water quality effects due to project operations, and the potential for subsidence and hydrocompaction near existing key infrastructure, including the CRA. A reverse osmosis system would

remove salts and metals from the reservoirs to help maintain the water quality of the reservoirs and counteract degradation associated with evaporation.

Under the staff alternative, additional monitoring of the reservoirs and brine ponds would occur, and our modifications would provide more protection, warning, opportunities, and measures to rectify possible negative effects of the proposed project that could occur during project operation, including additional measures to protect water quality and perform stream channel modifications along Eagle Creek.

Terrestrial Resources

Construction of the proposed project would disturb lands within the footprint of the project facilities, including the reservoirs, access roads, substation, transmission lines, and other areas. The disturbance associated with filling the project reservoirs has the potential to affect bats that roost in rock crevices within the existing mine craters and alter migration movement for bighorn sheep. Construction of the transmission line has the potential to disturb desert vegetation and associated wildlife habitat that is slow to regenerate within the desert ecosystem. This disturbance would be associated with grading of access roads, storage areas, and pull sites associated with construction of the transmission line and water supply pipeline. Under the applicant's proposal and the staff alternative, site-specific mitigation, monitoring, and compliance programs would be implemented during project construction and operation to limit invasive species colonization and environmental effects on special-status plant and animal species. Specifically, the applicant would implement measures in its Worker Environmental Awareness Program, Revegetation Plan, and Invasive Species Monitoring and Control Plan to limit potential effects on terrestrial resources. Security fencing is proposed to limit access to the majority of the central project area by bighorn sheep, deer, coyotes, foxes, and badgers. It is also designed to provide safe access to a project-created source of drinking water. Eagle Crest also plans to develop and implement a transmission line design plan, based on industry and regulatory standards, to protect raptors from electrocution hazards.

Under the staff alternative, the proposed Invasive Species Monitoring and Control Plan would be modified to include criteria for success and an adaptive management plan if initial efforts do not prove successful. Additionally, the reservoirs and water seepage areas would be monitored for invasive plants. The transmission line design plan would also be modified to include an avian protection plan that, in addition to the applicant's proposed measures to prevent electrocutions, would also include measures to reduce potential for avian collisions with the transmission line and a protocol to monitor and report avian injury and mortality associated with the transmission line. Pre-construction surveys for the spadefoot toad would occur in all proposed construction areas not previously surveyed, and if this species is found, measures to avoid disturbance would be followed.

Threatened and Endangered Species

Two special-status species have the potential to occur in the project area: Coachella Valley milkvetch (*Astragalus lentiginosus* var. *coachellae*) and the desert tortoise (*Gopherus agassizii*), but only the desert tortoise has been observed in the project area. Construction of the transmission line and water pipeline would occur within desert tortoise habitat. The operation of heavy machinery and grading in this area has the potential to adversely affect desert tortoise through vehicular collisions, burrow collapse, and vegetation removal. In addition, following construction, the transmission line could provide nesting and perching habitat for ravens, a desert tortoise predator. Eagle Crest would implement measures in its Desert Tortoise Removal and Translocation Plan and Raven Monitoring and Control Plan to protect the threatened desert tortoise during construction and operation of the project. Additionally, Eagle Crest would purchase and protect land to compensate for desert tortoise habitat that would be disturbed during construction of the proposed project or lost as a result of the project.

Under the staff alternative, the applicant's proposed plan to monitor and control ravens would be modified to include baseline and post-construction surveys for additional desert tortoise predators, including coyotes, wild dogs, and gulls, and would include mitigation and control measures for these additional species.

Recreation, Land Use, and Aesthetics

Construction and operation of the project could adversely affect recreation, land use, and aesthetics in the project area through increased nighttime sky lighting, limits to some access routes, and inundation of some of the remaining but currently non-economical ore reserves. Recreation resources in the region are primarily provided and managed by the National Park Service (Park Service) and BLM. Much of the land in the proposed project area is public land managed by BLM or land associated with the Eagle Mountain mine. Under the applicant's proposal, construction schedules would be coordinated with BLM for any temporary road and access closures. A directional lighting plan and other measures, including a night sky monitoring program, is proposed to limit the effects of the project lighting. Coordination of proposed project construction and operation with the possible landfill construction and operation is planned. During construction, visual effects would be limited and mitigated by these proposed measures.

Eagle Crest's proposed 13.5-mile-long transmission line would parallel the existing Eagle Mountain Road for about 4.5 miles before crossing the Chuckwalla Valley in a southeasterly direction to connect to the proposed interconnection collector substation on the western edge of Desert Center. In its draft environmental impact report for the Eagle Mountain Project, the State Water Board identified its recommended substation location and transmission line route as the environmentally superior interconnection alternative for the project. The State Water Board's recommended substation would be located immediately south of Interstate 10 and about 6 miles east of the applicant's proposed substation. The State Water Board's recommended transmission

line route would diverge from the applicant's proposed line after crossing the CRA. The State Water Board's recommended transmission line route would then parallel the existing 160-kilovolt Southern California Edison transmission line for about 10.5 miles going southeast to a point just north of the proposed substation, then it would travel south about 2 miles to the recommended substation location. Under the staff alternative, the proposed transmission line would be designed and constructed following the State Water Board's recommended transmission line route to the substation located south of Interstate 10 and about 6 miles east of Desert Center. When compared to the proposed transmission line route, the staff alternative route would be slightly longer; however, it would be largely co-located with existing transmission line structures outside of the Desert Wildlife Management Area and, therefore, have less effect on the threatened desert tortoise and its habitat.

Cultural Resources

The cultural history of the project area includes use by Native Americans, during early mineral exploration, for military training maneuvers, and for iron ore extraction. Construction of the proposed project could affect cultural resources during excavation associated with the proposed water pipeline, construction of the proposed substation and transmission line, and construction of the proposed reservoirs in the existing inactive mining pits and the associated infrastructure, such as the transmission line and substation.

Under Eagle Crest's proposal, cultural resources would be protected under provisions specified in its HPMP filed with the Commission in December 2009. However, the *Overview and Executive Summary* of the HPMP does not correctly identify the Eagle Mountain mine, town site, and associated railroad as a potential historic property. Additionally, the HPMP does not appropriately address reporting during construction, annual HPMP implementation reporting, curation of recovered archaeological materials, cultural resources monitoring requirements and protocols, consultation with Native American tribes regarding employee training, and public interpretation programs. Under the staff alternative, the HPMP would be revised to address these omissions and also include: (1) a detailed discussion of the expanded area of potential effects (APE) alternatives, including revised APE maps; (2) a description of the sites documented by Schaefer (2010) and located within the expanded APE; (3) inclusion of a detailed plan and schedule for National Register of Historic Places evaluations; and (4) an assessment of effects and identification of measures to resolve adverse effects of project construction, operations, and maintenance on any of sites identified within the specific staff recommended transmission line corridor and substation location, including documentation of appropriate consultation with the participating tribes, BLM, and the California SHPO. Finally the revised HPMP would include a measure for handling newly discovered paleontological remains and reporting such discoveries to BLM. The anticipated Programmatic Agreement would incorporate the revised HPMP.

Under the staff alternative, the HPMP would be revised to adequately address these measures that would ensure adverse effects on historic properties would be addressed over the term of any license issued.

Socioeconomics

No residences or businesses would be displaced due to the construction and operation of the project. Operation of the Eagle Mountain mine, which was, by far, the largest employer in the area, ended in the 1983. Under Eagle Crest's proposal, project construction would provide about 100 jobs during the peak construction period and would provide tax revenues to county and local governments. Project operation would provide about 30 jobs, as well as substantial property tax payments.

Air Quality and Noise

Construction of the proposed project would include emissions from heavy equipment and dust and noise production. Under Eagle Crest's proposal, air quality measures, including means to limit dust production and emissions from construction-related vehicles and equipment, would be implemented. Noise levels are proposed to be limited by compliance with applicable noise ordinances and equipping construction machinery with noise reduction measures.

Conclusions

Based on its analysis, staff recommends licensing the project as proposed by Eagle Crest with some staff modifications and additional measures, as described above under *Alternatives Considered*.

In section 4.2 of the draft EIS, we compare the total project cost to the cost of obtaining power from a likely alternative source of power in the region, for each of the alternatives identified above. During the first year of operation, under the applicant's proposal, the project would produce power at a cost that is $134,054,460, or about $31.12/megawatt-hour (MWh), less than the cost of alternative power. Under the staff alternative, the project would produce power at a cost that is $133,163,420, or about $30.91/MWh, less than the cost of alternative power. Under the no-action alternative, the project would not be constructed and would provide no power.

Staff chose the staff alternative as the preferred alternative because: (1) the project would provide a dependable source of electrical energy for the region (4,308,000 MWh annually); (2) the 1,300 MW of electric energy generated from a renewable resource may offset the use of fossil-fueled, steam-electric generating plants, thereby conserving non-renewable resources and reducing atmospheric pollution; (3) pumped storage projects store power during off-peak periods that can be provided rapidly during on-peak periods and could provide a valuable addition to the stability of the regional electrical grid; and (4) the recommended environmental measures proposed by Eagle Crest, as modified by staff, would adequately protect and enhance

environmental resources affected by the project. The overall benefits of the staff alternative would be worth the additional costs of the proposed and recommended environmental measures.

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, DC

Eagle Mountain Pumped Storage Hydroelectric Project
FERC Project No. 13123-002—California

1.0 INTRODUCTION

1.1 APPLICATION

On June 22, 2009, Eagle Crest Energy Company (Eagle Crest or applicant) filed an application for an original license with the Federal Energy Regulatory Commission (Commission or FERC). The proposed 1,300-megawatt (MW) Eagle Mountain Pumped Storage Hydroelectric Project (Eagle Mountain Project, or project) would be located in two depleted, inactive mining pits in the Eagle Mountain mine in Riverside County, California, near the town of Desert Center, California (figure 1). The proposed project would occupy 1,059.26 acres federal lands administered by the U.S. Bureau of Land Management (BLM) and 1,162 acres of private lands owned by Kaiser Eagle Mountain, LLC (Kaiser).[8] The proposed project would generate an average of a maximum of 4,308 gigawatt-hours (GWh) of energy annually. Eagle Crest proposes to construct and operate this pumped-storage project to provide system peaking capacity and transmission regulating benefits to regional electric utilities.

[8] A land exchange is an exchange of state-owned land for privately owned land or for other publicly owned land. As part of a nearby landfill proposal, BLM would exchange about 3,500 acres of public land within the area for offsite private lands to support the landfill project in the mine area. If the land exchange were not to be consummated, the project boundary for the proposed project would include nearly 1,059 acres of federal land managed by BLM. However, if a land exchange between BLM and Kaiser is achieved, the amount of federal lands affected by the proposed project would be decreased to 675.63 acres.

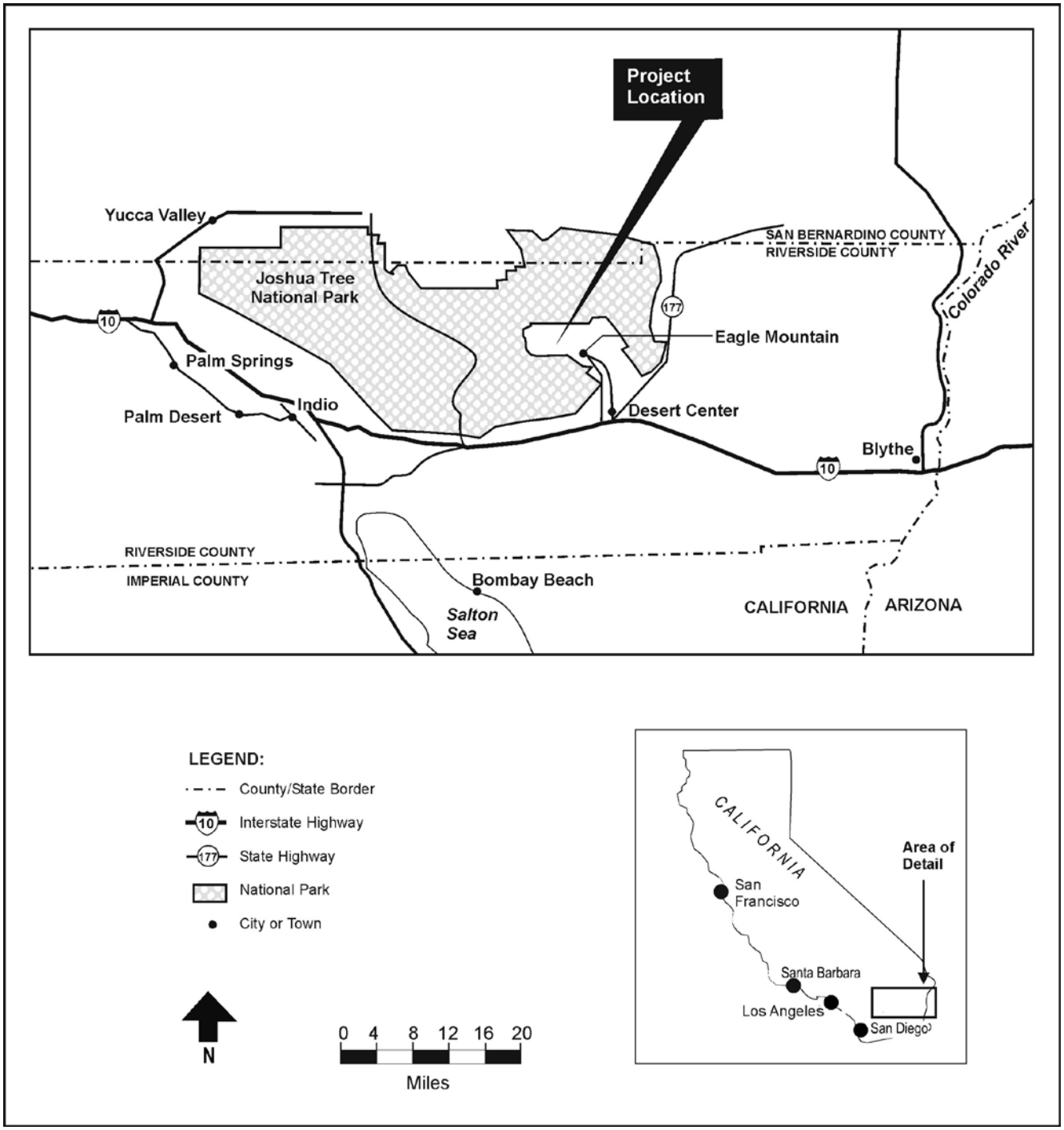

Figure 1. Location of Eagle Mountain Pumped Storage Hydroelectric Project (Source: Eagle Crest, 2009a, as modified by staff).

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The Commission must decide whether to issue a license to Eagle Crest for the Eagle Mountain Project and what conditions should be placed on any license issued. In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (such as flood control, irrigation, or water supply), the Commission must give equal consideration to: (1) energy conservation; (2) the protection of, mitigation of damage to, and enhancement of fish and wildlife resources; (3) the protection of recreational opportunities; and (4) the preservation of other aspects of environmental quality.

Issuing an original license for the Eagle Mountain Project would allow Eagle Crest to generate electricity for the term of that license, making electrical power from a renewable resource available to its customers.

This draft environmental impact statement (draft EIS) assesses the effects associated with the construction and operation of the project and alternatives to the proposed project. It also includes recommendations to the Commission on whether to issue an original license, and if so, includes the recommended terms and conditions to become a part of any license issued.

In this draft EIS, staff assesses the environmental and economic effects of constructing and operating the project: (1) as proposed by the applicant, and (2) with staff-recommended measures. Staff also considers the effects of the no-action alternative. Important issues addressed are the effects of the proposed project's construction and operation on groundwater, water quality, terrestrial species, and recreation activities.

1.2.2 Need for Power

The Eagle Mountain Project would provide hydroelectric generation during the daytime to meet part of southern California's power requirements, resource diversity, and capacity needs. The project would then use available nighttime energy to pump water back to the upper reservoir for re-use. The project would have an installed capacity of 1,300 MW and would generate about 4,308 GWh annually, while consuming 5,744 GWh annually to pump water back up to the upper reservoir.

The North American Electric Reliability Corporation (NERC) annually forecasts electrical supply and demand nationally and regionally for a 10-year period. The Eagle Mountain Project would be located on the southern end of the California-Mexico subregion of the Western Electricity Coordinating Council region of NERC. According

to NERC's most recent 2009 forecast, summer peak demands and annual energy requirements for the United States' portion of the California-Mexico subregion are projected to grow at annual rates of 0.9 percent and 1.2 percent from 2009 through 2018, respectively (NERC, 2009). NERC projects summer and winter resource capacity margins (generating capacity in excess of demand) will not drop below target reserve levels during the 2009–2018 period.

As noted above, pumped storage facilities are net energy consumers. The amount of energy produced as water passes from the upper reservoir to the lower reservoir through the turbines is less than the amount of energy required to operate the plant and to pump water back up to the upper reservoir. However, the benefits of pumped storage facilities are realized when the price for pumping is much less than the value of generation. Typically, there are sources of power such as nuclear, solar and wind projects that can provide power at low rates during night-time or low-demand hours, compared to rates available during day-time, high-demand hours. Therefore, the pumped storage facility can provide power during the day when energy demands are high, and can use power from other facilities during the night when energy demand is low. Power benefits of pumped storage projects are discussed further in section 4.1, *Power and Developmental Benefits of the Project*.

Staff concludes that power produced by the Eagle Mountain Project would help to provide renewable energy to the California-Mexico subregion in both the short and long term and that during overnight hours, the project may serve as a user for power that is continually produced by other facilities that might not otherwise be used.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

A license for the Eagle Mountain Project is subject to numerous requirements under the Federal Power Act (FPA) and other applicable statutes. Staff summarizes the major regulatory requirements in table 1 and describes them below.

Table 1. Major statutory and regulatory requirements for the Eagle Mountain Hydroelectric Project (Source: staff).

Requirement	Agency	Status
Section 18 of the FPA (fishway prescriptions)	U.S. Department of the Interior, Fish and Wildlife Service (FWS)	No section 18 prescriptions were filed.
Section 4(e) of the FPA (land management conditions)	U.S. Bureau of Land Management	No section 4(e) conditions were filed.
Section 10(j) of the FPA	FWS	No 10(j) recommendations were filed.

Requirement	Agency	Status
Clean Water Act—water quality certification	State Water Resources Control Board (State Water Board)	Eagle Crest filed its application on September 22, 2009; it was received by the State Water Board on September 24, 2009. On October 8, 2009, the State Water Board determined that the application met the requirements for a complete application. However, on September 15, 2010, Eagle Crest simultaneously withdrew and resubmitted its application, and the approval is pending.
Endangered Species Act Consultation	FWS	The Commission is requesting concurrence from FWS on its findings in a letter issued concurrently with this draft EIS.
Coastal Zone Management Act Consistency	California Coastal Commission	Eagle Crest filed consistency certification on March 26, 2009; in a letter dated April 28, 2009, the California Coastal Commission agreed that the project is outside of, and would not affect, a California coastal zone.
National Historic Preservation Act	California State Historic Preservation Officer (California SHPO)	Eagle Crest consulted with the California SHPO and prepared a Historic Properties Management Plan (HPMP) to address potential adverse effects on historic properties associated with the project.

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretary of Commerce or the Secretary of the U.S. Department of the Interior (Interior). Neither the Secretary of Commerce nor the Secretary of the Interior filed section 18 prescriptions or requested that a reservation of authority to prescribe fishways under section 18 be included in any license issued for the project.

1.3.1.2 Section 4(e) Conditions

Section 4(e) of the FPA provides that any license issued by the Commission for a project within a federal reservation will be subject to and contain such conditions as the Secretary of the responsible federal land management agency deems necessary for the adequate protection and use of the reservation. BLM, which manages 1,059.26 acres of land that would be occupied by the project, did not file section 4(e) conditions.

1.3.1.3 Section 10(j) Recommendations

Under section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

No 10(j) recommendations were filed.

1.3.2 Clean Water Act

1.3.2.1 Water Quality Certification

Under section 401 of the Clean Water Act (CWA), a license applicant must obtain certification from the appropriate state pollution control agency verifying compliance with the CWA. On September 26, 2008, Eagle Crest applied to the State Water Board for 401 water quality certification for the Eagle Mountain Project. The State Water Board received this request on September 26, 2008. Subsequently, on September 22, 2009, Eagle Crest simultaneously withdrew and resubmitted its request, which was received by the State Water Board on September 24, 2009. However, on September 15, 2010, Eagle Crest simultaneously withdrew and resubmitted its request. On October 14, 2010, the State Water Board determined that the application was acceptable for processing. The water quality certification is due by September 15, 2011.

1.3.2.2 California Environmental Quality Act[9]

The State Water Board prepared a draft environmental impact report (EIR), dated July 2010, to provide the public, governmental and/or responsible agencies, and other interested parties with information about the environmental effects of the proposed Eagle Mountain Project. The proposed action of developing and operating the pumped storage hydroelectric facility requires evaluation of the project under the California Environmental Quality Act (CEQA) because it requires discretionary approval by the State Water Board (State CEQA Guidelines §15357). The State Water Board is the state of California's lead agency for implementing CEQA (State CEQA Guidelines §15367).

State CEQA Guidelines §15126.6 require that an EIR describe and evaluate the comparative merits of a range of alternatives to the project that could feasibly attain most of the objectives of the project but would avoid or substantially lessen significant effects. An EIR is not required to consider alternatives that are infeasible; however, State CEQA Guidelines §15126.6(b) specify that the EIR evaluate alternatives capable of avoiding or substantially lessening significant effects of the project, even if these alternatives could impede to some degree attainment of project objectives, or impose additional costs.

The alternatives evaluated in the draft EIR were identified based on a range of alternatives that could feasibly accomplish most of the basic project objectives and could avoid or substantially lessen one or more significant effects (State CEQA Guidelines §15126.6(c)). Alternatives analyzed in the draft EIR included the proposed project, a no project alternative, a longer construction period to limit the daily emissions of nitrogen oxide, and different transmission line routes and substation locations.

The State Water Board recommended an alternative for the transmission route and substation location that is based on its analysis in the draft EIR and is shown in figure 2. The State Water Board's recommended substation would be located immediately south of Interstate 10 and about 6 miles east of the applicant's proposed substation. It would diverge from the applicant's proposed line after crossing the Metropolitan Water District of Southern California's Colorado River Aqueduct (CRA) and would then parallel the existing 160-kilovolt (kV) Southern California Edison (SCE) transmission line for about 10.5 miles going southeast to a point just north of the proposed substation. The State Water Board's route then would travel south about 2 miles to its recommended substation. The State Water Board draft EIR states that this route was chosen because it would reduce biological, land use, and aesthetics impacts, although short-term air quality impacts and visual impacts would be significant and unavoidable. Staff's analysis of the State Water Board's recommended transmission line and substation location is presented in section 3.3, *Proposed Action and Action Alternatives*, and staff's recommendations are presented in section 5.0, *Conclusions and Recommendations.*

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[9] Information for this section is from the Eagle Mountain Pumped Storage Project Draft Environmental Impact Report (State Water Board, 2010).

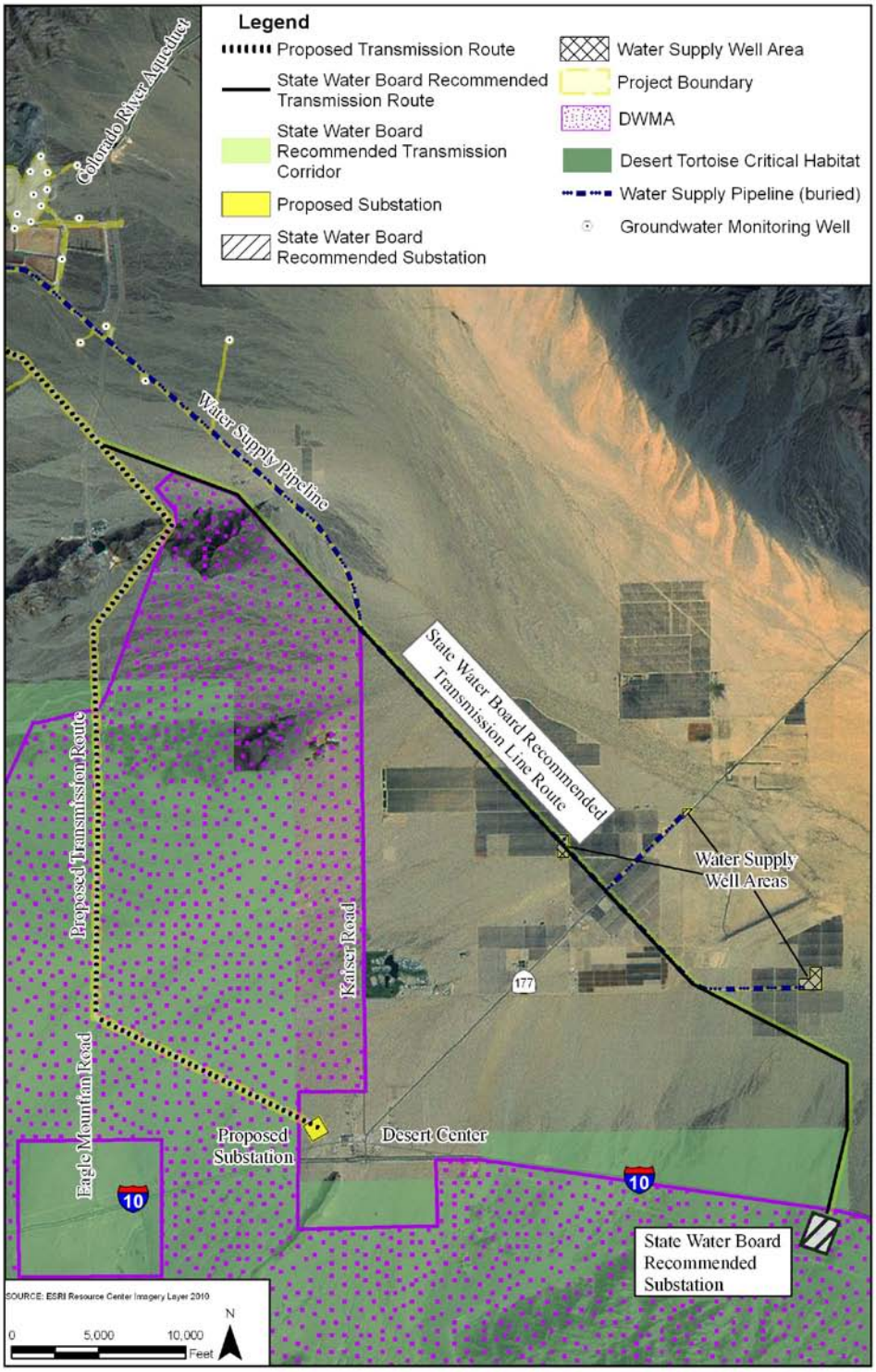

Figure 2. Transmission line routes (Source: Eagle Crest, 2010a, as modified by staff).

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species. Two federally listed species are known to occur in the Eagle Mountain Project vicinity: the Coachella Valley milkvetch and desert tortoise. There is also critical habitat for the desert tortoise in the proposed project boundary. Staff's analyses of project effects on threatened and endangered species are presented in section 3.3.4, *Threatened and Endangered Species*, and our recommendations in section 5.2, *Comprehensive Development and Recommended Alternative*.

Eagle Crest's Worker Environmental Awareness Program (WEAP) and Desert Tortoise Removal and Translocation Plan would protect desert tortoise from construction-related effects, and the applicant-proposed compensation would mitigate the reduction in desert tortoise habitat. The staff-recommended desert tortoise predator control plan would also help minimize any potential effects associated with increased predation risk. However, implementation of these plans would require transporting tortoises, which causes increased stress and could result in mortality. Additionally, construction of the staff-recommended substation would permanently reduce available habitat within designated critical habitat for desert tortoise. Therefore, staff concludes that licensing of the Eagle Mountain Project, as proposed with staff-recommended measures, may adversely affect the desert tortoise and associated critical habitat. Staff also concludes the project would not affect Coachella Valley milkvetch because this species does not occur in areas of potential project effects. Commission staff requested formal consultation with the U.S. Department of the Interior, Fish and Wildlife Service (FWS) by letter issued December 23, 2010.

1.3.4 Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 U.S.C. § 1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

The project is not located within the state-designated Coastal Management Zone, and the project would not affect California's coastal resources. Therefore, the project is not subject to the California coastal zone program review, and no consistency

certification is needed for the action. By letter dated April 28, 2009, the California Coastal Commission concurred with this conclusion.[10]

1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties (TCPs), and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

To meet the requirements of section 106, the Commission intends to execute a Programmatic Agreement (PA) for the protection of historic properties from the effects of the construction, operation, and maintenance of the Eagle Mountain Project. The terms of the PA would ensure that Eagle Crest addresses and treats all historic properties identified within the project's area of potential effects (APE) through the implementation of a Historic Properties Management Plan (HPMP) with staff modifications. The executed PA would be incorporated into any Order issuing a license.

1.4 PUBLIC REVIEW AND CONSULTATION

The Commission's regulations (18 CFR, sections 4.38) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the ESA, the NHPA, and other federal statutes. Pre-filing consultation must be complete and documented according to the Commission's regulations.

1.4.1 Scoping

Before preparing this draft EIS, staff conducted scoping to determine what issues and alternatives should be addressed. A scoping document (SD1) was distributed to interested agencies and others on December 17, 2008. It was noticed in the Federal Register on December 24, 2008. Two scoping meetings, both advertised in the *Desert Sun*, were held on January 15 and 16, 2009, in Palm Desert, California, to request oral comments on the project. A court reporter recorded all comments and statements made at the scoping meetings, and these are part of the Commission's public record for the

[10] This record of the correspondence is from the license application, exhibit E, page 1-8.

project. In addition to comments provided at the scoping meetings, the following entities provided written comments on SD1:

Commenting Entity	Date Filed
Metropolitan Water District of Southern California	February 10, 2009
Kaiser Ventures, LLC	February 13, 2009
Citizens for the Chuckwalla Valley	February 17, 2009
County Sanitation Districts of Los Angeles County	February 17, 2009
Riverside County Fire Department	March 5, 2009
U.S. Department of the Interior, Bureau of Reclamation	March 24, 2009

A revised scoping document (SD2), addressing these comments, was issued on June 5, 2009.

1.4.2 Interventions

On January 14, 2010, the Commission issued a notice that Eagle Crest had filed an application to license the Eagle Mountain Project. This notice set March 15, 2010, as the deadline for filing protests and motions to intervene. In response to the notice, the following entities filed motions to intervene:

Intervenor	Date Filed
Citizens for the Chuckwalla Valley	March 1, 2010
State Water Resources Control Board	March 2, 2010
Metropolitan Water District of Southern California[11]	March 10, 2010
Kaiser Eagle Mountain LLC[11]	March 10, 2010
County Sanitation District No. 2 of Los Angeles County[11]	March 12, 2010

[11] Intervention in opposition.

1.4.3 Comments on the License Application

A notice requesting conditions and recommendations was issued on January 11, 2010, and an errata notice[12] was issued on January 14, 2010. The following entities commented:

Commenting Agency and Other Entity	Date Filed
Brendan Hughes	March 1, 2010
Kaiser Eagle Mountain, LLC	March 10, 2010
National Parks Conservation Association	March 11, 2010
Joshua Tree National Park	March 11, 2010
Metropolitan Water District of Southern California	March 11, 2010
U.S. Department of the Interior	March 12, 2010
Johnney Coon	March 12, 2010
County Sanitation District No. 2 of Los Angeles County	March 12 and 18, 2010
Timothy Anderson	March 13, 2010
U.S. Department of the Interior, Bureau of Land Management	August 23, 2010

Eagle Mountain filed reply comments on April 23, 2010.

[12] The errata corrected the deadline for filing motions to intervene and protests; comments, recommendations, terms and conditions, prescriptions; and reply comments. It also corrected the paragraph about who may submit comments, a protest, or a motion to intervene and provided a procedural schedule.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

The no-action alternative is license denial. Under the no-action alternative, the project would not be built, and the environmental resources in the project area would not be affected.

2.2 APPLICANT'S PROPOSAL

2.2.1 Project Facilities

The proposed pumped storage project would consist of an upper reservoir, upper water conveyance system, powerhouse, a lower reservoir, lower water conveyance system, transmission system, water supply system, water treatment system, and miscellaneous facilities. Figure 3 shows the project area and proposed layout.

The upper reservoir site would include: (1) a 191-acre reservoir (in the existing central mining pit) with a total storage capacity of 20,000 acre-feet and a useable storage of 17,700 acre-feet; (2) one 1,300-foot-long, 120-foot-high saddle dam on the south side of the reservoir and about 4,000 feet to the northwest, and another 1,100-foot-long, 60-foot-high saddle dam on the western side of the reservoir; (3) a 100-foot-long spillway with a 100-foot-wide by 30-foot-long spillway stilling basin; (4) an upper reservoir spillway channel about 4,000 feet long; (5) a 14,000-foot-long section of Eagle Creek that would transport upper reservoir spillway flows to the lower reservoir; and (6) an upper reservoir inlet/outlet structure.

The upper water conveyance system (figures 3 and 4) would include: (1) a 29-foot-diameter by 3,963-foot-long upper pressure tunnel; (2) a 33-foot-diameter by 1,348-foot-long vertical tunnel shaft; (3) a 90-foot-diameter by 165-foot-high underground surge tank attached to the vertical tunnel shaft; (4) a 29-foot-diameter by 1,560-foot-long lower tunnel; and (5) a manifold that transitions from the lower tunnel to four 15 foot-diameter by 500-foot-long penstock tunnels. The powerhouse facility would consist of: (1) a 72-foot-wide, 130-foot-high, and 360-foot-long underground powerhouse; (2) four reversible pump-turbine units rated at 325 MW each, for a total installed capacity of 1,300 MW; and (3) a separate 46-foot-wide, 40-foot-high, and a 431-foot-long transformer gallery.

The lower reservoir site would include: (1) a 163-acre reservoir (in the existing eastern mining pit) with a total storage capacity of 21,900 acre-feet and a useable storage of 17,700-acre-feet; (2) a reservoir inlet/outlet structure; (3) a 15-foot-wide reservoir spillway; and (4) a reservoir spillway discharge channel extending 6,665 feet from the spillway to an alluvial fan in the Chuckwalla Valley.

The lower water conveyance system would include: (1) four 17-foot-diameter by 75-foot-long draft tube tunnels; (2) a manifold that transitions from the draft tube tunnels to the tailrace tunnel; and (3) a 33-foot-diameter by 6,835-foot-long tailrace tunnel.

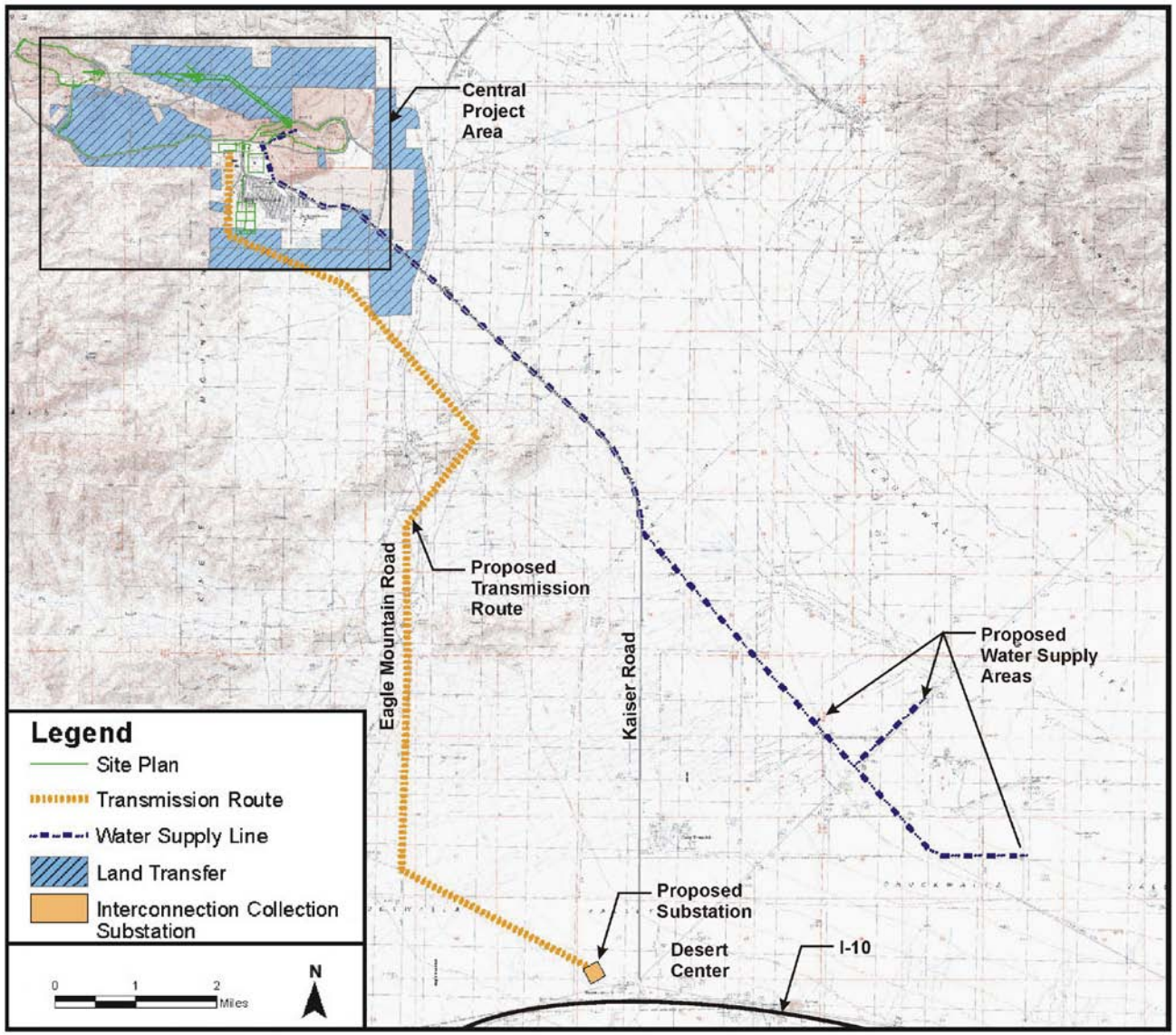

Figure 3. Proposed facilities and reservoirs and existing features of the Eagle Mountain Project (Source: Eagle Crest, 2009a, as modified by staff).

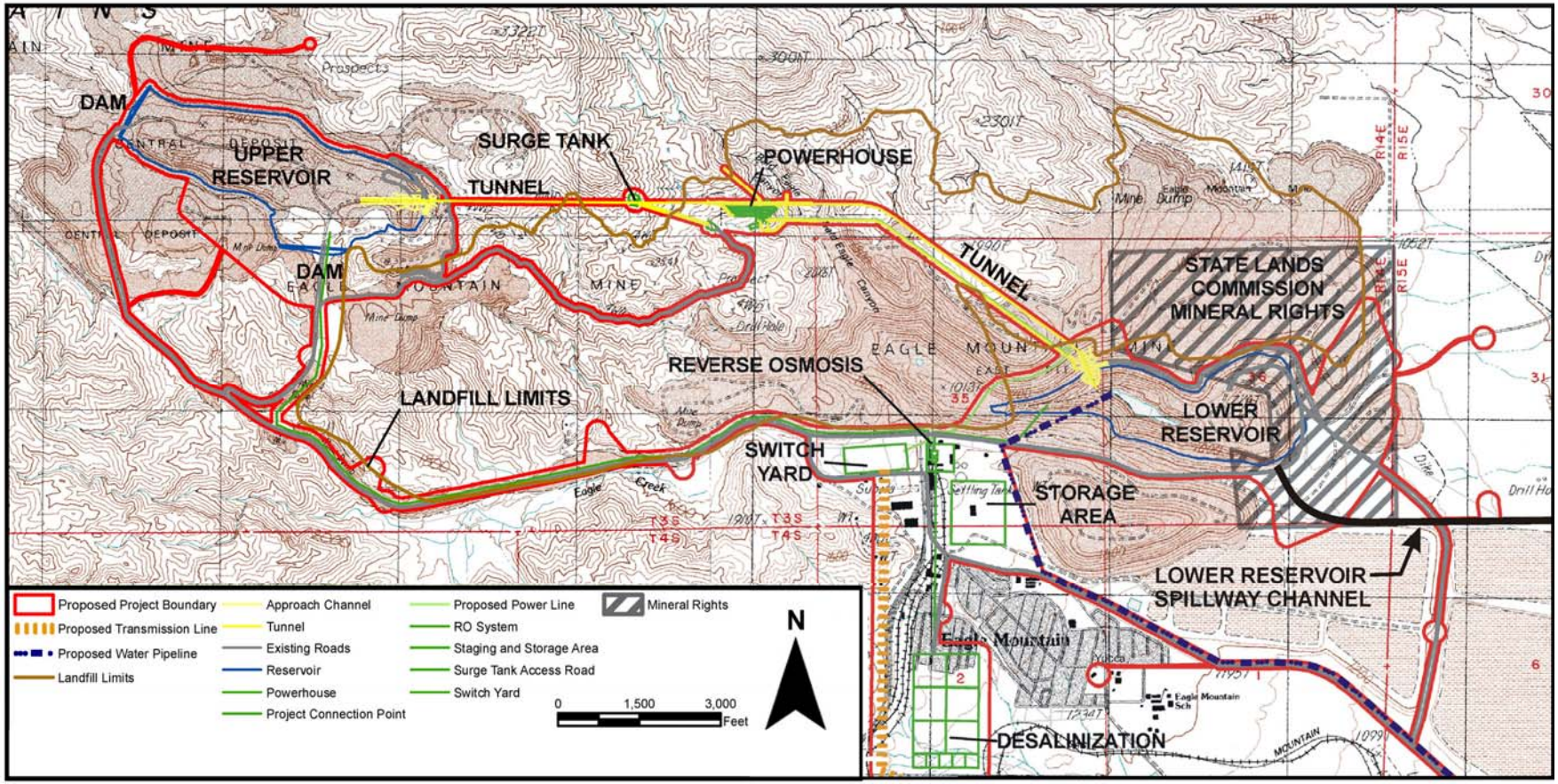

Figure 3. Proposed facilities and reservoirs and existing features of the Eagle Mountain Project (continued) (Source: Eagle Crest, 2009a, as modified by staff).

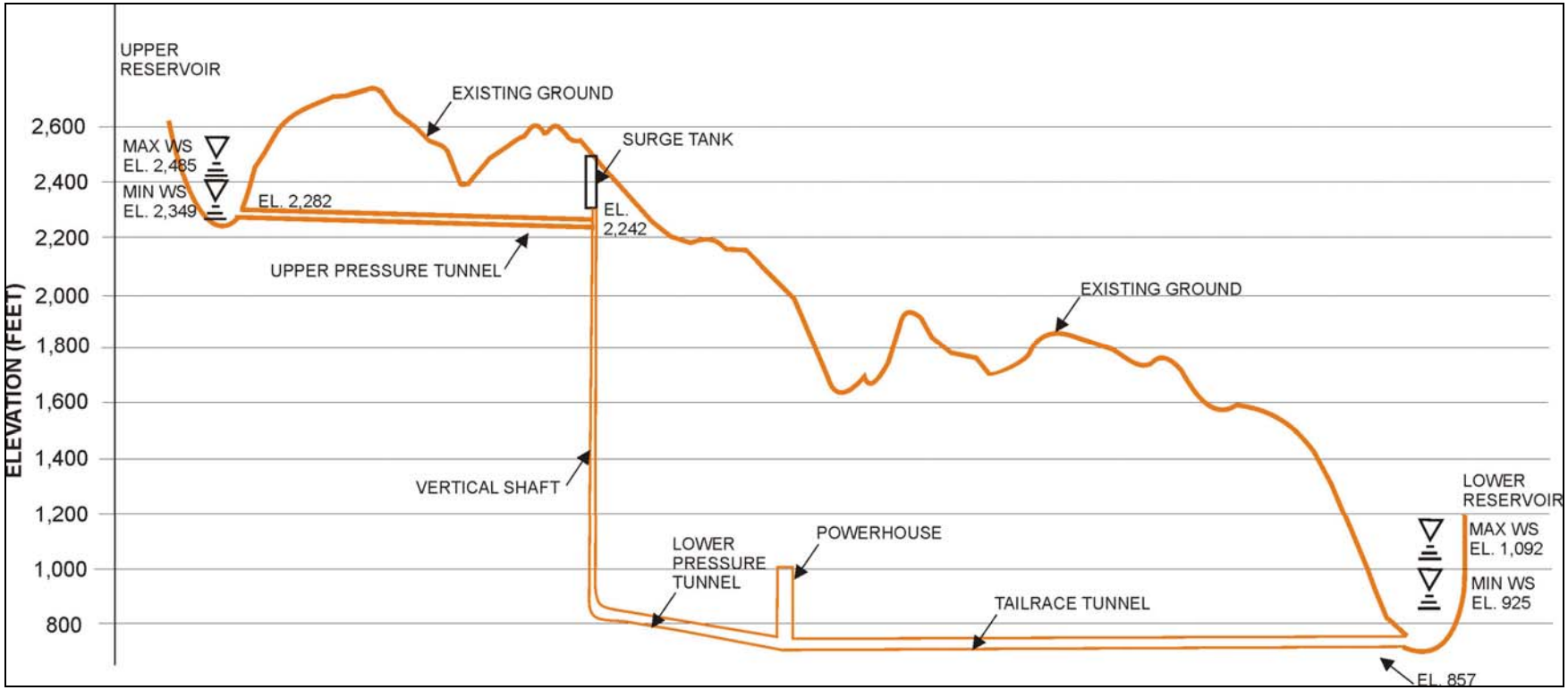

Figure 4. Profile of the proposed Eagle Mountain Pumped Storage Project underground facilities (Source: Eagle Crest, 2009a, as modified by staff).

The transmission system would include: (1) four 6,000-foot-long, 18-kV underground transmission cables that extend through the powerhouse access tunnel and a vertical transmission shaft to the ground surface and then 4,000 feet overhead to a switchyard; (3) a 500-foot-wide by 1,100-foot-long switchyard; (4) a 13.5-mile-long, double circuit 500-kV transmission line from the switchyard to a new interconnection collector substation; and (4) an interconnection collector substation located at the point of interconnection with SCE's planned Devers-Palo Verde No. 2 500-kV transmission line at Desert Center.

The water supply system would include: (1) three water supply wells with pumps; and (2) a underground water supply pipeline, ranging from 12- to 24-inches in diameter, totaling 15.3 miles, and extending from the wells to the lower reservoir.

The water treatment system would include: (1) a reverse osmosis system; (2) pipelines from the upper and lower reservoirs to the reverse osmosis facility; and (3) desalination facilities with piping from the reverse osmosis facilities.

The miscellaneous facilities would include: (1) a 28-foot-wide, 28-foot-high, by 6,625-foot-long access tunnel to the underground powerhouse (see figure 4); (2) about 6 miles of permanent construction and access roads; (3) staging, storage, and administration areas near the switchyard; and (4) appurtenant facilities.

2.2.2 Project Safety

As part of the licensing process, the Commission would review the adequacy of the proposed project facilities. Special articles would be included in any license issued, as appropriate. Commission staff would inspect the licensed project both during and after construction. Inspection during construction would concentrate on adherence to Commission-approved plans and specifications, special license articles relating to construction, and accepted engineering practices and procedures. Operational inspections would focus on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance. In addition, any license issued would require an inspection and evaluation every 5 years by an independent consultant and submittal of the consultant's safety report for Commission review.

2.2.3 Project Operation

The proposed project, configured with the four reversible pump-turbine units and tunnels, would use off-peak energy to pump water from the lower reservoir to the upper reservoir during periods of low electrical demand and generate peak energy by passing the water from the upper to the lower reservoir through the tunnels and generating units during periods of high electrical demand. The low demand periods are expected to be during weekday nights and throughout the weekend, and the high demand periods are expected to be in the daytime during week days, especially during the summer months. Eagle Crest hopes to use available power produced by existing and proposed wind and/or

solar projects in the area to provide at least a portion of the pumping power to the project. The proposed project would also be able to provide ancillary services to the electric grid, including load following, system regulation through spinning and non-spinning reserve,[13] and immediately available standby generating capacity.

The project would normally function as a closed system once one reservoir is initially filled. The source of the water for initial filing and replacing water lost to evaporation is proposed to be from proposed groundwater wells located more than 10 miles away in the Chuckwalla Valley, which would be transported to the project via a buried pipeline. During normal operations, water would pass back and forth through the powerhouse between the two reservoirs and the emergency spillways at the reservoirs would be used only during very large and exceedingly rare rainfall events or during emergency circumstances.

The proposed energy storage volume would permit operation of the project at full capacity for up to 9 to 10 hours each weekday, with up to 12 to 14 hours of pumping each weekday night and additional pumping during the weekend to fully recharge the upper reservoir. The amount of daily fluctuation in the proposed upper and lower reservoir levels would be about 100 to 150 feet. The amount of active storage in the upper reservoir would be 17,700 acre-feet.

2.2.4 Proposed Environmental Measures

Eagle Crest proposes the following mitigation, protection, and enhancement measures:

Geology and Soils Resources

- Implement the Erosion and Sediment Control Plan filed July 7, 2010, that describes the erosion and sediment control practices to minimize soil erosion in construction areas and prevent sediment transport into stormwater discharges away from the construction site (Measure GEO-1).

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[13] Spinning reserve is the on-line reserve capacity that is synchronized to the grid system and ready to meet electric demand within 10 minutes of a dispatch instruction by the California Independent System Operator (CAISO). Spinning Reserve is needed to maintain system frequency stability during emergency operating conditions and unforeseen load swings.

Non-spinning reserve is off-line generation capacity that can be ramped to capacity and synchronized to the grid within 10 minutes of a dispatch instruction by the CAISO and that is capable of maintaining that output for at least 2 hours. Non-spinning reserve is needed to maintain system frequency stability during emergency conditions.

Water Resources

- Develop a groundwater level monitoring network (including existing and new monitoring wells) to confirm that wells would be maintained at historical levels (Measure WS-1).
- Construct two extensometers[14]—one in the upper Chuckwalla Valley near Observation Well 3 (OW-3) and the other in the Orocopia Valley near OW-15—to measure potential subsidence that could affect the operation of the Metropolitan Water District's CRA (Measure WS-2).
- During the initial fill pumping period, monitor existing wells on neighboring properties whose water production may be impaired by project groundwater pumping; if project pumping would adversely affect these wells, replace or lower the pumps, deepen the existing well, construct a new well, and/or compensate owner for increased pumping costs (Measure WS-3).
- Monitor groundwater in the project vicinity by using existing and proposed monitoring wells on a quarterly basis for the first 4 years of project pumping (i.e., initial project pumping period); possibly extend monitoring from quarterly to bi-annually or annually, depending on findings and prepare annual reports for submittal to the Commission and State Water Board, confirming actual drawdown conditions (Measure WS-4).
- To effectively control seepage from the upper and lower reservoirs, an array of seepage recovery wells would be installed outside the down-gradient end of each of these two reservoirs. A testing program would be initially employed during final engineering (prior to project operations) to confirm the assumed hydrogeologic conditions (e.g., aquifer characteristics and bedrock fracture interconnectedness) and seepage recovery well pumping rates (Measures SR-1 and SR-2).
- Alternatively, manage seepage from the reservoirs, which if left unimpeded could raise groundwater levels by up to 3 feet (implementation of this alternative would require confirmation of groundwater level rises and water quality of the resulting seepage) (Alternative Measure SR-1A).
- Develop a groundwater level monitoring network (including existing and new monitoring wells) to confirm that seepage recovery well pumping would be effective at managing groundwater levels beneath the CRA and in the Eagle Creek Canyon portion of the proposed landfill, and record groundwater levels, water quality, and production at the project seepage recovery wells (Measure SR-3).

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[14] An extensometer is a device that measures soil subsidence.

- Maintain seepage from the upper reservoir below the bottom of the elevation of the landfill liner and maintain seepage from the lower reservoir to prevent a significant rise in water levels beneath the CRA (Measure SR-4).
- Using the network of groundwater monitoring wells proposed under Measure WS-1, monitor groundwater levels on a quarterly basis for the first 4 years of project pumping; possibly extend monitoring from quarterly to bi-annually or annually, depending on findings (Measure SR-5). Unlike WS-4, this measure would focus on assessing seepage conditions in the project vicinity, rather than drawdown conditions as a result of project pumping in the Desert Center area.
- Install a reverse osmosis desalination facility and brine disposal lagoon to remove salts and metals form reservoir water and maintain total dissolved solids concentrations at the level of the source water (Measure GQ-1).
- Implement a monitoring program for groundwater quality to assess and limit groundwater effects on surrounding properties by sampling reservoirs, seepage recovery wells, and wells upgradient and downgradient of the reservoirs and brine disposal lagoon on a quarterly basis for the first 4 years (Measure GQ-2).
- Replace four existing wells located within the proposed reservoir area with wells located outside of reservoirs (Measure LF-1).
- Release excess water from the reservoirs during large rainfall events, such as the 100-year event and up to and including the probable maximum flood (PMF).

Terrestrial Resources

- Concurrent with final design engineering, develop a comprehensive site-specific mitigation and monitoring program in consultation with the Biological Technical Advisory Team composed of the applicant's staff, their consultants and staff from resources managing agencies (Measure BIO-1).
- Designate a project biologist who would be responsible for implementing and overseeing the biological compliance program (Measure BIO-2).
- Implement the WEAP filed October 27, 2009, to ensure that project construction and operation would be conducted within a framework of safeguarding environmentally sensitive resources (Measure BIO-3).
- Regularly submit reports to the relevant resource agencies, documenting project activities, mitigation implemented, and mitigation effectiveness, and providing recommendation, as needed (Measure BIO-4)
- During construction in native habitats, restrict surface disturbance to the smallest area necessary to complete the construction; design new spur roads

and improvements to existing roads in a way that would preserve existing desert wash topography and flow patterns (Measure BIO-5).

- Use pre-construction surveys to identify special-status plant populations and species protected by the California Desert Native Plants Act (CDNPA), and establish avoidance areas in construction zones for special plant resources. Where avoidance is not feasible, salvage and transplant any species that can be reasonably transplanted in an approved area (Measure BIO-6).
- Consult with the County Agricultural Commissioner for direction regarding disposal of protected plants (Measure BIO-7).
- Implement the Revegetation Plan filed October 27, 2009, for areas that are temporarily disturbed during construction (Measure BIO-8).
- Implement the Invasive Species Monitoring and Control Plan filed October 27, 2009, to minimize the spread of invasive non-native vegetation (Measure BIO-9).
- Implement requirements of the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO Plan) to avoid disturbance of impoundments and restrict surface flow to impoundments. If avoidance is not possible, construct a new impoundment as close as feasible to replicate and replace each lost impoundment (Measure BIO-10).
- For construction activities scheduled to occur between February 15 and July 30 in vegetated habitat, survey all potential nesting sites for active bird nests (Measure BIO-11).
- Develop and implement a plan to manage evaporation ponds to minimize their attractiveness and access to migratory birds and establish a monitoring program to identify bird usage of the evaporation ponds, effectiveness of bird deterrents, and water quality. Based on monitoring results, implement adaptive management (Measure BIO-12).
- If requested, complete a Phase III survey, including a nesting season survey, followed by a winter survey if no burrows or owls are observed during the nesting season survey, and a pre-construction survey, to further assess burrowing owl use of the project area and potential effects. (With California Department of Fish and Game (California DFG) approval, the pre-construction survey may obviate the need for the Phase III survey) (Measure BIO-13).
- Limit the construction to September 1 through February 1, if burrowing owls are present, to avoid disruption of breeding activities; avoid disruption of burrowing owl nesting activities; use a minimum of a 250-foot buffer to avoid active nests until fledging has occurred (Measure BIO-14).

- Determine through pre-construction surveys if 0.25-mile construction buffers would be required during prairie falcon or golden eagle nesting seasons (Measure BIO-15).
- Conduct pre-construction surveys for all burrows that might host badger or kit fox, avoiding active burrows, where possible, and mark the perimeters of all avoidance areas with 3-foot-high and no more than 10-foot-apart, wooden stakes. Where avoidance is infeasible, encourage occupants to leave their burrows (Measure BIO-16).
- Conduct pre-construction surveys to determine the existence, location, and condition of bat roosts and identify foraging habitat. Based on results of surveys, develop a mitigation plan to avoid roosting and foraging effects on resident bats, minimize disturbance, or, as an inescapable measure, evict bats (Measure BIO-17).
- Construct security fencing around portions of the central project area to exclude larger terrestrial wildlife, including bighorn sheep, deer, coyotes, foxes, and badger, from entering project areas that pose hazards (Measure BIO-18).
- Restrict construction and maintenance activities to minimize project effects (Measure BIO-19).
- In areas without wildlife exclusion fencing or those areas that have not been cleared of tortoises, conduct construction activities only during daylight hours (Measure BIO-20).
- Close, temporarily fence, or cover pipeline trenches each day. Conduct inspections (by an approved biological monitor) of any open trenches at first light, midday, and at the end of each day to ensure animal safety (Measure BIO-21).
- Design, install, and maintain facility lighting to prevent casting of light into adjacent native habitat (Measure BIO-22).
- Develop and implement a transmission line design plan that considers adequate separation of energized conductors, ground wires, and other metal hardware, adequate insulation, and any other measures necessary to protect raptors from electrocution hazards and design and construct raptor-friendly transmission lines in strict accordance with the industry standard guidelines set forth in *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006*, by Avian Power Line Interaction Committee, Edison Electric Institute, and Raptor Research Foundation (Eagle Crest, 2010b, section 2, comment 2-3).

Threatened and Endangered Species

- Remove all tortoises from harm's way during the construction period (Measure DT-1).
- Ensure that no construction or maintenance that requires surface disturbance in unfenced areas on the linear facilities would occur without biological monitors (Measure DT-2).
- Enclose the substation and other hazardous areas with a permanent tortoise exclusion fence to keep adjacent tortoises from entering the site (Measure DT-3).
- Transport removed tortoises to another part of their home range; move any tortoises found in the central project area to a location immediately adjacent to its capture site outside the fenced construction area, and implement other measures of the Desert Tortoise Removal and Translocation Plan filed October 27, 2009 (Measures DT-4 and DT-7).
- Implement the Raven Monitoring and Control Plan filed October 27, 2009 (Measure DT-5).[15]
- Purchase about 160 acres of land to compensate for the Category I and Category III Desert Tortoise Habitat that would be disturbed (Measure DT-6).

Recreation Resources

- Coordinate construction schedules with BLM and provide posted notices of construction activity and any temporary road/access closure (Measure REC-1).

Land Use

- Provide construction access to and from the substation site from the Eagle Mountain Road exit and follow the Frontage Road east to the site (Measure LU-1).
- Two weeks prior to beginning construction, locally post notices stating hours of operation for construction near the Desert Center community and along State Route 177 (Measure LU-2).

Aesthetic Resources

- Incorporate directional lighting, light hoods, low pressure sodium bulbs or LED lighting, and operational devices in final design to allow surface night-lighting in the central site to be turned on as needed for safety. Also, fund

[15] Implementation of the Raven Monitoring and Control Plan replaces Measure DT-5 as presented in the final license application.

night sky monitoring to be conducted after consultation with the National Park Service (Park Service) during the post licensing design period (to represent baseline conditions) and during construction and a trial operational period (AES-1).

- Combine and organize staging areas and areas needed for equipment operation and material storage and assembly within construction lands to the extent feasible to minimize total footprint needed (AES-2).
- For construction of the water pipeline, reduce, to the extent possible, side cast soils to reduce color contrast with the surrounding landscape. Backfill the pipeline disturbed zone and revegetate with native vegetation immediately following completion of pipeline construction (AES-3).
- Employ visual mitigation in the design of the transmission line to minimize visual effects (AES-4).
- Use existing access roads and construction laydown areas to the extent feasible and revegetate with native vegetation immediately following construction (AES-5).

Cultural Resources

- Implement the project's revised HPMP (including Measures CLT-1, -2, -3).

Air Quality

- Periodically water or apply suitable surfactant for short-term stabilization of disturbed surface areas and storage piles (Measure AQ-1).
- Prevent project-related trackout onto paved surfaces by using a variety of construction management strategies (Measure AQ-2).
- Stabilize graded site surfaces upon completion of grading when subsequent development is delayed or expected to be delayed by more than 30 days, except when precipitation dampens the disturbed surface (Measure AQ-3).
- Limit areas of active surface disturbance (such as grading) to no more than 15 acres per day (Measure AQ-4).
- Reduce non-essential earth-moving activities during windy conditions, and cease clearing, grading, earth-moving, or excavation activities if winds exceed 25 mph averaged over a 1-hour duration (Measure AQ-5).
- Develop and implement a transportation management plan for employees (Measure AQ-6).
- Strictly abide by the applicable state law requirements for diesel truck idling (Measure AQ-7).

- Use electrical drops in place of temporary electrical generators, and substitute low- and zero emitting construction equipment and/or alternative fueled or catalyst equipped diesel construction equipment wherever economically feasible (Measure AQ-8).
- Obtain proper South Coast Air Quality Management District (SCAQMD) permits for electrical generators (Measure AQ-9).
- Properly tune and maintain heavy-duty diesel trucks in accordance with manufacturers' specifications to ensure minimum emissions under normal operations (Measure AQ-10).
- Use 2002 model or newer construction equipment, where feasible (Measure AQ-11).
- Retrofit older off-road construction equipment with appropriate emission control devices prior to onsite use, where feasible (Measure AQ-12).
- Work collaboratively on a cost-share basis with the Park Service to complete a 2-year air monitoring study.

Noise

- Comply with the County of Riverside General Plan applicable noise ordinance codes during construction (Measure NOI-1).
- Equip construction machinery with properly operating and maintained noise mufflers and intake silencers (Measure NOI-2).

2.3 STAFF ALTERNATIVE

Under Eagle Crest's proposal with staff modifications, the project would be operated as proposed, but would also include the following:

- Construct the project transmission line along the State Water Board's recommended transmission line route. This route would diverge from the applicant's proposed line after crossing the CRA and would then parallel the existing 160-kV SCE transmission line for about 10.5 miles going southeast to a point just north of the proposed substation, then it would travel south about 2 miles to the State Water Board's recommended substation location.
- Connect the project to the electrical grid by terminating the transmission line at the State Water Board's recommended substation located immediately south of Interstate 10 and about 6 miles east of the applicant's proposed substation.
- Perform channel modifications and other measures to contain flows associated with the PMF to the Eagle Creek channel and to direct these flows toward the proposed lower reservoir.

- Develop and implement a reservoir-level monitoring plan to ensure that water levels are managed properly within operational restraints and help determine possible water-level effects on terrestrial resources.
- Develop and implement a brine pond-level monitoring plan to ensure that the ponds are managed properly and help determine if a leak has developed in the linings of the ponds.
- Implement a more comprehensive monitoring well placement and monitoring program around the proposed brine and solidification ponds to allow for the earlier detection of leaks in the lining of the ponds. The monitoring methods would be designed to determine if the water levels in the ponds are falling at the expected rate based on inflow and evaporation rates and the monitoring wells would be placed partly horizontally beneath the ponds.
- In addition to a comprehensive groundwater monitoring program, develop a groundwater hydrologic budget report that incorporates data on pumpage, seepage recovery, precipitation, evaporation, and groundwater flow direction.
- Modify the proposed Invasive Species Monitoring and Control Plan to include criteria for success and an adaptive management plan to be implemented if initial efforts do not prove successful. Include the reservoirs and water seepage areas with other areas to be monitored for invasive plants on an annual basis following vegetation establishment.
- Modify the proposed avian protection plan to include measures, in addition to Eagle Crest's proposed design measures for reducing potential electrocution, to reduce potential for collision injuries, provide methods for surveying and reporting project-related raptor mortality, incorporate a worker education plan pertaining to avian–power line interactions, and include procedures for managing nesting on power line structures. The modifications to the plan should be prepared after consultation with FWS. Conduct pre-construction surveys for the spadefoot toad in all areas of proposed construction activity not previously surveyed in 2009 or 2010, and implement the same protection measures proposed for the central project area.
- Amend the proposed Raven Monitoring and Control Plan to include baseline and post-construction survey methods for predators other than just ravens, including coyote, wild dogs, and gulls and develop mitigation measures to be implemented if increases in population levels are detected, and develop a desert tortoise predator control plan, as the Park Service recommends. Include a survey schedule that includes initiation of post-construction surveys during the second year after project completion, followed by surveys once every 5 years.
- Consult with BLM, participating tribes, and the California SHPO to revise the December 2009 HPMP to include: (1) clarification in the HPMP's *Overview*

and Executive Summary that the Eagle Mountain mine, town site, and associated railroad are potential historic properties; (2) requirements for annual reporting during construction and an annual HPMP implementation report; (3) a plan to address curation of recovered archaeological materials; (4) clarification of when cultural resources monitoring and which monitoring protocols would be required; (5) a requirement for consultation with Native American tribes regarding employee training and public interpretation programs; (6) a detailed discussion of the expanded APE alternatives, including revised APE maps; (7) a description of the sites documented by Schaefer (2010) and located within the expanded APE; (8) inclusion of a detailed plan and schedule for National Register evaluations, assessment of effects, and identification of measures to resolve adverse effects of project construction, operations, and maintenance on any of sites identified within the specific Commission staff's recommended transmission line corridor and substation location, including the documentation of appropriate consultation with the participating tribes, BLM, and California SHPO; and (9) measures for handling newly discovered paleontological resources and the reporting of such discoveries to BLM. The anticipated PA would implement the HPMP.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

Eagle Crest chose the proposed project location based several factors, including the proximity of the two inactive mining pits, which would greatly decrease the cost of dam construction, and the elevation difference (about 1,500 feet) between the pits, which is key for a pumped storage facility. Furthermore, the site is only about 13 miles from a major transmission line. Eagle Crest also chose this site because of its proximity to existing and proposed renewable energy generation facilities and the Chuckwalla aquifer, the proposed source for water. None of the other nearby locations has the combination of these attributes, and no other sites were considered for this project.

Before choosing its proposed reverse osmosis system, Eagle Crest considered several other water treatment alternatives, including thermal processes, conventional demineralization using IX resin, and electrical demineralization. These other measures were determined to be much more costly and impractical for the project.

Eagle Crest also considered several other transmission alignments, but they were determined to be impractical. These alternatives include the following:

- A connection at the Danvers substation near Palm Springs that would require a route of 83 miles and was determined to be very expensive. This transmission alignment also would have had right-of-way (ROW) issues and likely would have had substantial effects on the natural and human environment, including the Aqua Caliente Band of Cahuilla Indians.

- A connection to SCE's proposed midpoint substation with a route that would have been slightly longer than 50 miles and would have crossed both the Chuckwalla Valley dune thicket, an area of critical environmental concern and also Interstate 10. The length of the route and issues associated with crossing these two areas made this route impractical.
- The addition of the proposed double circuit 500-kV line to the existing transmission towers owned by Metropolitan Water District was determined to be infeasible due to the size and weight of the proposed lines on the existing infrastructure.
- A location of a possible substation near the intersection of Eagle Mountain Road and Interstate 10 was determined to be infeasible due to cultural resources concerns and the location of an existing high pressure gas line.

Eagle Crest considered the possibility of using the Metropolitan Water District's CRA for its water supply, rather than the Chuckwalla aquifer. However, Eagle Crest determined that this option was infeasible because of the need to purchase replacement water (for the CRA water that Eagle Crest would use) from the San Joaquin Valley (which also supplies Los Angeles), so water from the heavily regulated and vital CRA could be used. This option would have been especially impracticable during drought years, and Metropolitan Water District stated that it would not agree to this proposal. Finally, quagga mussels are found in the CRA, and these organisms would be problematic for the proposed project.

3.0 ENVIRONMENTAL ANALYSIS

In this section, staff presents: (1) a general description of the project vicinity; (2) an explanation of the scope of staff's cumulative effects analysis; and (3) staff's analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area. Under each resource area, historic and current conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed mitigation, protection, and enhancement measures, and any potential cumulative effects of the proposed action and alternatives. Staff conclusions and recommended measures are discussed in section 5.2, *Comprehensive Development and Recommended Alternative*, of this draft EIS.[16]

3.1 GENERAL DESCRIPTION OF THE PROJECT AREA

The proposed project would be located at the edge of the Eagle Mountains in southeastern California in Riverside County in the western Sonoran Desert, commonly called the "Colorado Desert," which includes the area between the Colorado River Basin and the Coast Ranges south of the Little San Bernardino Mountains and the Mojave Desert. The proposed project would be located south and east of Joshua Tree National Park and wilderness area (JTNP), just about 2 miles from the closest JTNP boundary (see section 3.3.5, *Recreation, Land Use, and Aesthetics*, for more about the JTNP).

Rainfall amounts are low, ranging from about 3 to 5 inches per year. Winter temperatures average about 54°F, and summer temperatures are extreme, commonly reaching 110+°F for long periods. The period of extremely warm weather is also lengthy, extending from mid-spring through the fall.

Gently sloping to undulating rocky slopes and valleys are found in the area of the proposed project's linear features (i.e., water pipeline and transmission line). Elevations range from about 400 to 2,500 feet. No perennial streams or natural wetlands exist in the project vicinity. Drainages in this part of Riverside County are generally limited to high-energy runoff via desert washes that are usually dry. As water from these events quickly percolates into the surrounding soil or evaporates, the establishment of wetland vegetation is precluded.

Drainage patterns reflect the local topography. Along the broad rocky slopes, drainage is primarily characterized by scattered, well-defined washes and networks of numerous narrow runnels. The runnels are several yards wide, sandy to cobbly drainages

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[16] Unless otherwise indicated, our information is taken from the application for license for this project (Eagle Crest, 2009a) and additional information filed by Eagle Crest (Eagle Crest, 2010, 2009b–d) and the State Water Board EIR (State Water Board, 2010).

that carry periodic runoff to a regional drainage. They are often incised, from a half to several yards deep, and vegetated along the banks by shrubs and trees. By contrast, the more numerous, smaller and shallow runnels are typically only a yard or less wide, 1 to 3 inches deep, and irregularly vegetated by locally common shrub species.

Soils generally range from soft sand to coarse-sand loams, with Aeolian patches of loose sand and intermittent incipient dunes. Boulders and cobbles are common in the upper bajadas and toeslopes, with smaller particles downslope. Desert pavement[17] is intermittently present in the immediate area of the central project area.

Numerous transmission lines and service roads cross the area south of the project site. The CRA extends through the Coxcomb Mountains northeast of the project area and continues in a southwesterly direction, passing the eastern portion of the project area as an open channel before converting into a tunnel to the Metropolitan Water District's pumping plant.

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing National Environmental Policy Act (40 CFR §1508.7), a cumulative effect is the impact on the environment that results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions taking place over time, including hydropower and other land and water development activities.

Based on review of the license application and agency and public comments, staff identified water resources, terrestrial resources (including federally listed threatened and endangered species), land use, recreation, and air quality as having the potential to be cumulatively affected by the proposed project in combination with other past, present, and foreseeable future activities. These resources were selected because of the potential that they could be cumulatively affected by the development of this project in addition to other residential and agricultural groundwater uses, the CRA, the proposed Eagle Mountain landfill, proposed solar energy and wind energy developments, and other actions that staff identifies in its analysis.

3.2.1 Geographic Scope

The geographic scope of the analysis defines the physical limits or boundaries of the proposed action's effect on the resources. Because the proposed action would affect the resources differently, the geographic scope for each resource may vary.

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[17] Desert pavement, which occurs only in the drier parts of the Sonoran Desert, is a surface made up of a closely packed mosaic of stones that accumulate as the finer dust and sand particles are blown away by the wind.

The geographic scope for water resources would be the Chuckwalla Valley Aquifer and potentially adjacent, hydrologically connected aquifers, such as the Pinto Basin Aquifer. This geographic scope was selected because the groundwater to be used for this project, as well as other reasonably foreseeable projects, would be withdrawn from the Chuckwalla Valley Aquifer, and staff may determine that cumulatively groundwater-level effects may extend to adjacent basins.

The geographic scope for terrestrial resources would be lands above the Chuckwalla Valley Aquifer and Pinto Basin Aquifer, which includes portions of JTNP. This broad area was identified to address the potential for subsidence related to groundwater withdrawal to cumulatively effect terrestrial plants and wildlife. Other project effects would also be limited to this geographic area.

The geographic scope for recreation, land use, and aesthetics is the greater Chuckwalla Valley from the Coxcomb Mountains to the east, the Chuckwalla Mountains to the south and JTNP to the north and west. This area offers the recreation opportunities, landscapes, and the visual resources, which are typical of the region, and may also be cumulatively affected by other reasonably foreseeable projects.

The geographic scope for other resources, including geological resources and soils; terrestrial and threatened and endangered species; cultural; socioeconomics; and air quality and noise, would be that portion of the Chuckwalla Valley and Interstate 10 corridor sufficient to encompass all project facilities, as well as construction and operation effects.

3.2.2 Temporal Scope

The temporal scope of the cumulative effects analysis in the draft EIS includes past, present, and future actions and their respective effects on each resource that could be cumulatively affected. Based on the potential term of an original license, the temporal scope will look 50 years into the future, concentrating on the effect on the resources from existing and reasonably foreseeable future actions. The historical discussion will be limited, by necessity, to the amount of available information for each resource. Staff identified the present resource conditions based on the license application, agency comments, and comprehensive plans.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

In this section, staff discusses the effect of the project alternatives on environmental resources. For each resource, staff first describes the affected environment, which is the existing condition and baseline against which staff measures effects. Staff then discusses and analyzes the specific site-specific and cumulative environmental issues.

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this EIS. Staff presents recommendations in section 5.2, *Comprehensive Development and Recommended Alternative.*

3.3.1 Geologic and Soil Resources

3.3.1.1 Affected Environment

General Geologic Setting

The proposed project site is located in the northeastern portion of the Eagle Mountains near the lower western edge of the Mojave Desert Physiographic Province of California, slightly east of the southern limits of the adjacent Transverse Ranges Physiographic Province. The Eagle Mountains are bounded on the northeast by the Coxcomb Mountains, the southeast by Chuckwalla Valley, and the north by Pinto Basin (figure 5). To the south are the Orocopia Mountains (west) and the Chuckwalla Mountains (east). A broad valley containing Smoketree Wash forms the edge of the Eagle Mountains to the west. The Cottonwood Mountains are to the southwest of the project area.

The major rock units in the region include Jurassic- to Cretaceous-age plutonic intrusive rocks and Paleozoic and Precambrian metamorphic and meta-sedimentary rocks (Jennings, 1967). At the Eagle Mountain site, the meta-sedimentary rocks generally trend northwest and are surrounded and underlain by intrusive granitic rocks. The meta-sedimentary rock units have been folded into a northwest-trending anticline, which continues into the north-central Eagle Mountains. Iron ore deposits composed of magnetite and hematite are typically found along the northeast limb of this anticline.

Localized outcrops of Tertiary-age volcanic rocks are found in the region, principally at the northern end of the Chuckwalla Valley. Younger Pleistocene-age basalt is present in the north-central portion of the Eagle Mountains. Deposits of Quaternary-age alluvium fill the Pinto Basin and Chuckwalla Valley, locally reaching depths of greater than 2,000 feet (Eagle Crest, 1994). Alluvial deposits include both cobbles/gravels and finer grained units that form alluvial fans at the mouths of major drainages from the adjacent highlands.

Regional structural trends are reflected in the alignments of faults in and near the Eagle Mountain site. East-west trending faults are present at distances of about 5 miles, both to the north and south of the site, while northwest-trending faults are present locally along the eastern edge of the Eagle Mountains. The latter group of faults includes the Bald Eagle Canyon fault zone and several smaller faults that traverse the planned tunnel alignments. None of these faults have experienced deformation within the last 11,000 years as indicated by the unbroken alluvial deposits that overlie them (Eagle Crest, 1994).

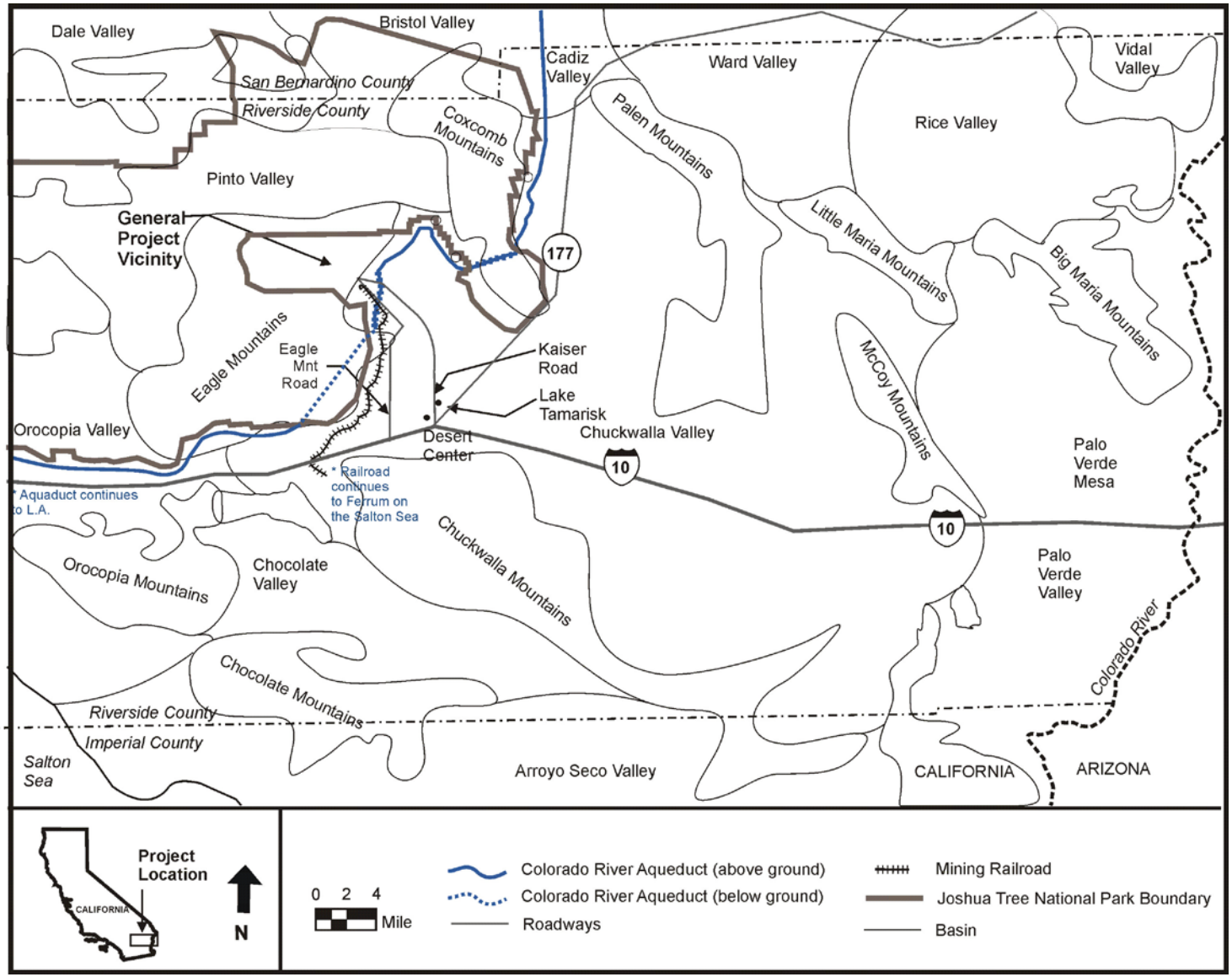

Figure 5. Mountains and groundwater basins in the project area (Source: Eagle Crest, 2009a, as modified by staff).

The proposed project site is cut by a series of northeast-trending dikes.[18] The dikes have near-vertical dips and lie at nearly right angles to the northwest-trending faults. Where exposed, dikes that cross the northwest-trending faults are not offset by the faults (Eagle Crest, 1994).

Range-front faulting has been recognized to the east of the Eagle Mountain site, along the eastern side of the Chuckwalla Valley parallel to the base of the Coxcomb Mountains. Vertical displacements along this fault zone may be up to several thousand feet, with the western side being displaced downward relative to the eastern side (Eagle Crest, 1994). Range-front faults do not appear to be present along the eastern side of the Eagle Mountains.

Project Area Geology

Bedrock geologic units present at the site can be generally classified as either igneous or meta-sedimentary. In general, the younger igneous rocks intruded into the older meta-sedimentary rocks, leaving the meta-sediments as remnant roof pendants atop the plutonic rock. Areal near-surface exposures of the rock units in the project area are shown on figure 6.

Unconsolidated alluvial deposits are found in several locations within the project site area (figure 6). The alluvial deposits include sands, silts, gravels, and debris-flow deposits (Eagle Crest, 1994). The most substantial alluvial deposits are found on the eastern edge of the site area, where they form a laterally extensive alluvial fan that extends and thickens to the east into the Chuckwalla Valley. The thickness of the alluvial fan is on the order of a few tens of feet near the mountain front and thickens steadily to the east.

Some of these alluvial deposits are exposed in the east wall of the eastern mining pit, in an area that would underlie the lower reservoir (Eagle Crest, 1994). Elsewhere within the area of the proposed project, alluvial deposits are confined to laterally discontinuous, generally thin deposits along the bottoms of the canyons (Eagle Crest, 1994). These deposits are typically composed of sandy gravel, but may vary locally from sand and gravelly sand to gravel and generally range up to 50 feet in thickness. The thickest deposits are found near the mouths of canyons. Older alluvial deposits in the upper portions of the canyons may be locally cemented (Eagle Crest, 1994). An alluvial fan is exposed near the base of the north wall in the eastern mining pit of the inactive Eagle Mountain mine (Eagle Crest, 1994). At the base of this feature, and interbedded with some of the soils characteristic of the upper portions of the fan, are a series of debris flows. In the east wall of the eastern mining pit, debris flow deposits rest directly on bedrock (Eagle Crest, 1994).

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[18] A dike is an intrusive igneous body that normally has a thickness much smaller than its other two dimensions.

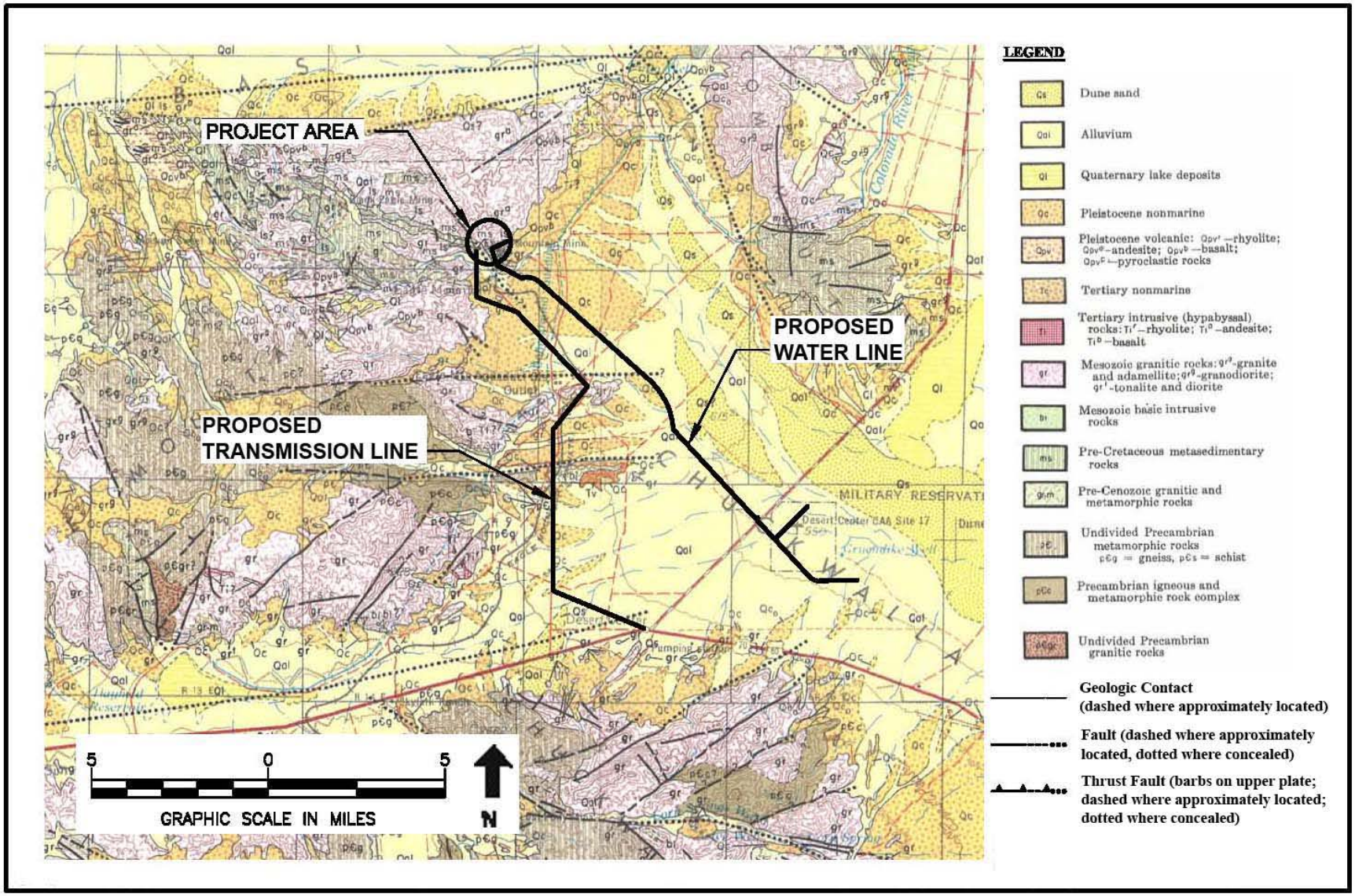

Figure 6. Eagle Mountain Project area geologic map (Source: Eagle Crest, 2009a).

Mining byproducts generated by the former Eagle Mountain operations were deposited in numerous areas near the site (see figure 6). These byproducts include several distinctly different materials, including both bedrock and alluvial overburden, and tailings produced as a result of the mining and separation of iron ore bearing rock from host rock. The tailings include both fine and coarse varieties. Investigations in 1990 (Kaiser Steel Resources, Inc., 1990, as cited in Eagle Crest, 1994) indicated that recoverable precious metals (e.g., gold, silver, or any of the minerals of the platinum group) are not present in the proposed project area. Eagle Crest states that the tailings would be suitable for use in project construction.

Soil Resources

General Project Area

The soils within the proposed project area are generally sandy and have developed in a mid-latitude, low desert environment at elevations ranging from 1,000 to 2,800 feet above mean sea level (msl). Slopes range from nearly level to extremely steep and include both north- and south-facing exposures as well as numerous intermediate aspects. Vegetation is Sonoran desert shrubland (Eagle Crest, 1994). Soils within the proposed project area can be divided into the following mapping units.

In areas of 2 to 5 percent slope, soils are very deep, excessively drained, sand and loamy sand horizons formed in alluvial fan deposits at the eastern foot and within valley bottoms of the Eagle Mountains. The water erosion hazard of these soils is moderate because of minimal vegetative protection. The less-steep soil unit is situated near the east side of the eastern mining pit and beneath the proposed lower reservoir spillway, while the slightly steeper soil unit is situated in part beneath the proposed desalination and staging, storage, and administration areas.

In areas of slopes greater than 15 to 75 percent, there are rock outcrops; shallow, excessively drained, very gravelly sand; and very gravelly loamy sand. These soils have formed on mountain slopes in colluvial deposits derived from crystalline bedrock. The water erosion hazard of these soils is severe because of steep slopes and minimal vegetative protection. This soil unit is found in various locations around the project area, including between the central and eastern mining pits and near the desalinization area.

Soils in areas of mine dumps and tailings consist of mixed cobbles and soil deposited by human activity. These deposits have not been stable long enough to develop characteristic soil profiles. This unit is found throughout the project area, particularly in areas immediately adjacent to the central and eastern mining pits.

The excavations of the central and eastern mining pits are characterized by disturbed rock outcrops or a thin mantle of mixed soil and cobbles deposited by human activities.

Water Supply and Transmission Line Corridors

Specific areas of the water supply and transmission line corridors have not been mapped in detail according to the applicant, although limited soils mapping was performed by Kim (1993, as cited in Eagle Crest, 1994) in the Desert Center area, which is in the vicinity of the proposed linear feature corridors. The proposed water supply corridor extends through a desert basin environment crossed by numerous washes. The soils of this area are gravelly loamy sands with particle size decreasing with distance from the mountains. The soils have low runoff, with moderately rapid to rapid permeability.

Soils, slopes, and vegetation coverage within the proposed transmission line corridor and the BLM utility corridor area are similar to those along the proposed water supply corridor. Specifically, soils within the transmission line corridor have developed primarily on valley fill alluvium. The soils are excessively drained fine sands, sands, gravelly sands, and cobbly sands. In some areas, the soils are deep (5 to 6 feet deep) with a moderate water erosion hazard, are found on nearly level to moderately steep slopes, and have formed on alluvial fans and valley fill. In other areas, the soils are shallow, are found on nearly level to steep slopes, have formed on hill and mountainsides, and are subject to severe water erosion on steeper slopes.

Geologic Hazards

Potential geologic hazards at the proposed project area include ground rupture from active faulting, strong ground motions from earthquakes, landslides or rockfalls (induced by earthquake, rainfall and saturation, or other triggers), and liquefaction and seismic settlement.

Seismicity

There are numerous active[19] and potentially active[20] faults and fault zones located within 100 miles of the proposed project area (Eagle Crest, 1994; Geosyntec, 1996). Based on the Fault Activity Map of California, the nearest active faults to the site are the Hot Springs fault and the paralleling San Andreas fault (Coachella segment), located about 30 miles and 33 miles southwest of the site, respectively.

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[19] Active faults (Bryant and Hart, 2007) are defined as faults along which seismically induced (tectonic) displacement has occurred in the past 11,000 years (the Holocene epoch). The California Division of Safety of Dams criterion for active faults (Fraser, 2001) is noted displacement within the last 35,000 years.

[20] Potentially active faults are defined as faults along which tectonic displacement has occurred between 11,000 and 1.6 million years before present (ypb) (the Pleistocene epoch). Inactive faults are defined as faults along which tectonic displacement has not occurred in the past 1.6 million years (i.e., before the Quaternary period).

The Alquist-Priolo Earthquake Zoning Act (Bryant and Hart, 2007) establishes zones around "sufficiently active and well-defined" faults in California wherein site-specific fault location studies are required to mitigate fault surface rupture hazards prior to construction intended for human occupancy. The closest "zoned" faults to the project area are the Hidden Springs fault, located 29 miles to the southwest, the aforementioned Hot Springs fault, and the mid-east portion of the Pinto Mountain fault, located 32.5 miles to the northwest.

Potentially active faults are also frequently considered in a seismic hazard assessment since they can represent active faults that have a greater (more than 11,000 years) recurrence interval. In addition to the aforementioned faults, potentially active late Quaternary faults considered capable of generating significant seismic events include the Blue Cut fault, with the nearest segment mapped about 4 miles north of the site; the Salton Creek fault, about 23.5 miles to the southwest; and eastern segments of the Pinto Mountain fault, located 30.5 miles northwest of the site. In addition to these fault-specific sources, previous investigations of seismic exposure at the project area (Eagle Crest, 1994; GeoSyntec, 1996) considered non-specific area sources including the Southeast Transverse Ranges, the San Bernardino Mountains, the Eastern Mojave, the Sonoran, and the Salton seismo-tectonic zones.

Locally, six major structural lineaments have been found to trend across the proposed reservoir sites or are within 2,000 feet of the proposed project area (GeoSyntec, 1992, as cited in Eagle Crest, 1994). Three of these are bedrock faults (Fault A, Bald Eagle Canyon fault, and eastern mining pit fault), two are intrusive dikes, and the last formed from differential erosion along prominent joints in the bedrock (see figure 6). Field investigations indicated that the lineaments trend northwest across the site in a direction consistent with a pattern of regional faulting believed to have existed since Miocene time (i.e., about 5 to 22 million years ago [Ma]) (Proctor, 1993, as cited in Eagle Crest, 1994; Shlemon, 1993). Analyses performed as part of these investigations indicated that no displacement has occurred along these local faults in the past 40,000 to 100,000 years (GeoSyntec, 1993). Site mapping indicated that cross-cutting dikes of volcanic rock, dated as 124 million years or more in age (GeoSyntec, 1993), are not offset by Fault A and the Bald Eagle Canyon fault. This suggests that the most recent movement of these faults dates back to at least Mesozoic time ($\geq$65 Ma). The relationship of the cross-cutting dikes to the eastern mining pit fault is less certain, but the fault is readily exposed in the walls of the eastern mining pit beneath up to 270 feet of unbroken alluvium, estimated to be more than 100,000 years in age (Proctor, 1993, as cited in Eagle Crest, 1994).

Additional northwest-southeast fault segments were mapped; one in the western end of the eastern mining pit and another at western end of the proposed landfill footprint (GeoSyntec, 1993). Soil stratigraphic age dating of these features was hindered by lack of natural soil cover. However, GeoSyntec (1993, 1996) concluded that, due to the echelon structure of the northwest-southeast system of site area faults, formation of all the northwest-trending faults at the site occurred within a similar geologic age and

tectonic stress regime. Thus, these additional fault segments were also concluded to be at least pre-Holocene in age (<10,000 years). However, if the northwest-trending faults are collectively considered to be of similar age and origin, significant displacement has not occurred on these faults since the formation of the dikes more than 100 million years ago. As such, these faults are considered inactive. Further details of the investigations for on-site faults, including information from the Proctor (1993, as cited in Eagle Crest, 1994) and Shlemon (1993) studies, are contained in GeoSyntec (1993, 1996).

The California Geology Survey (California GS) provides a database of all known historical earthquakes of magnitude greater than 4.0 within the project region for the period from 1769 to 2000 (California GS, 2001). As seen in part in figure 6, the project site lies on the eastern edge of a region of high historical seismicity in southern California. Most seismicity in this area is associated with the San Andreas fault zone (southwest and west of the site), the San Jacinto fault zone (south and west of the site), or the Brawley fault zone (south of the site). Some seismicity is associated with the Pinto Mountain fault to the north of the site. Upon review of recorded seismicity in the region, and using the attenuation relationship developed by Sadigh as reported by Joyner and Bore (1988), GeoSyntec (1992, as cited in Eagle Crest, 1994) estimated that the strongest ground motion at the site from historical events was about 0.15 g,[21] using mean attenuation rates, and 0.27 g using mean plus one standard deviation.

Calculations of potential ground motion at the project site during an earthquake estimated the highest horizontal peak ground acceleration (PGA)[22] of 0.49 g that results from a magnitude 6.75 random event in the Southeast Transverse Ranges. A similar PGA of 0.48 g was estimated from a magnitude 7.5 event on the Blue Cut fault (Eagle Crest, 1994; GeoSyntec, 1996). Regional probabilistic studies on seismicity (Peterson et al., 2008) estimate that the site has a 2 percent probability of exceeding PGAs of between 0.35 and 0.46 g in the next 50 years. Analysis of probabilistic potential ground motions for the project area, based on U.S. Geological Survey (USGS) (Frankel et al., 2002) and California GS (2007) databases, indicates that, for return periods of 100 and 475 years, PGAs of 0.10 g and 0.19 g, respectively, are estimated.

Liquefaction

Liquefaction can occur when loose, saturated granular soils are subjected to strong ground motion, such as that induced by earthquakes. The ground vibrations cause a rise

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[21] 1 g is the acceleration due to gravity, where 1 g = 32.2 feet second^{-2}; used to measure the peak ground acceleration during an earthquake.

[22] PGA is a parameter used to measure the horizontal force experienced at a given location during an earthquake. This force has the potential to cause damage to structures depending on its magnitude and on how much horizontal force the structure can physically withstand.

in pore-water pressure,[23] which, if high enough, can cause the soil to lose strength and behave as a fluid. Liquefaction can result in settlements, lateral spreading, and other disruptions at the ground surface. The sandy sediments associated with the alluvial fan and valley floor features in the project area could have the potential for liquefaction and seismic settling. Groundwater conditions, which can affect the potential for liquefaction occurrence during an earthquake, are discussed in the *Groundwater* section.

Landslides and Mass Movements

In the proposed project area, there are potentially unstable slopes upon hillsides and mining pit walls due to their steepness and the nature of the underlying soil and rock types. Mass movements such as slope raveling and localized surficial slope failures and/or rock falls could occur here.

To date, USGS and California GS have not published any soil-slip susceptibility or landslide inventor maps of the project region; therefore, detailed mapping information is not available for evaluating the potential for landslide and mass movement activity in the proposed project area.

3.3.1.2 Environmental Effects

This section describes the potential project effects related to geology and soils resource issues deriving from construction and/or project operation activities. Prior to construction, the applicant proposes to conduct detailed subsurface investigations in the project area to support final project configuration and design. The details of these proposed site investigations are summarized by the applicant in section 12.6 of its license application (Eagle Crest, 2009a). In brief, these investigations would primarily involve soil/rock exploration boring and detailed geologic mapping efforts to further evaluate potential project-related reservoir seepage, hydrocompaction and subsidence, landslides and mass movements, liquefaction, and reservoir-triggered seismicity. In its letter filed October 27, 2009, Eagle Crest states that the subsurface investigations would be initiated within 60 days of licensing and receipt of site access, field work would be completed within 4 months of the start of field investigations, and the results would be filed with the Commission 6 months after the start of the field investigations.

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[23] Pore-water pressure is the force exerted by groundwater contained within the voids, or pores, of a soil or rock substrate. Excessive pore-water pressures can lead to soil or rock instabilities.

Effects of Project Construction and Operation Related to Seismic Issues

Earthquakes and Faults

There are no active faults in the proposed project area, based on the findings of past site-specific investigations (Geosyntec, 1993, 1996). Therefore, the risk of surface rupture at the project area caused by local faulting is considered to be very low as these faults were determined to be inactive within the past 40,000 years or more. The project facilities would be designed to resist the anticipated ground shaking related to earthquake activity in the region. As mentioned above, prior to construction, Eagle Crest proposes to conduct subsurface investigations, which would also include a geotechnical study in order to modify, if needed, the existing project designs.

Reservoir-triggered Seismicity

The proposed project would include constructing upper and lower reservoirs, which would occupy areas that are crossed by several inactive, northwest-trending faults. In general, reservoir impoundment or operation has the potential to activate fault movement, and hence produce earthquakes, which is a process defined as reservoir-triggered seismicity. This process occurs when reservoir impoundment alters the stress regime within the crust of the earth by increasing shear stress due to the weight of water, and reducing the shear strength (i.e., resisting force) by increasing pore-water pressures. While these changes are generally insufficient to generate failure in unfractured rock, it is possible that faulted rock under significant tectonic strain may be induced to slip by the compounding effects of reservoir impoundment (USCOLD, 1997). As such, zones of active faulting appear to be the most susceptible to reservoir-triggered seismicity. Further, the maximum credible earthquake for an area is not considered to change by reservoir filling actions, although the frequency of smaller earthquakes may be increased, at least on a temporary basis (FEMA, 2005).

To assess the actual occurrence of reservoir-triggered seismicity in the project area once implemented, Eagle Crest proposes to initiate a seismic monitoring program in the project area. Eagle Crest proposes to maintain the monitoring program before and after reservoir filling to assess whether these actions lead to reservoir-triggered seismicity.

Our Analysis

The proposed project area is crossed by several inactive faults and would be situated in a region with recorded seismic activity. The two proposed reservoirs would use the two inactive mining pits that were created by the excavation of vast quantities of overburden and ore-bearing rock. When either the upper or lower reservoirs are filled to maximum operation level, the deepest column of water in each would be less than the depth of mining excavation. Total water storage projected for both reservoirs is estimated at about 24,200 acre-feet compared to a total storage capacity of 41,900 acre-

feet.[24] Considering that the weight of water is about 2 (overburden) to 2.5 (ore rock) times less than that of the excavated material, the loads applied by the reservoirs at high water would be substantially less than that originally imposed prior to mining. As such, Eagle Crest reasonably asserts that the reservoir load may tend to restore some of the equilibrium lost through the site excavations rather than imposing potentially destabilizing stresses that could lead to earthquakes.

Although the maximum depth of stored water in the reservoirs would characterize both reservoirs as being "shallow and small"[25] (Baecher and Keeney, 1982), the initial filling of the reservoirs and the planned twice-daily movement of a relatively large mass of water could impose stress upon the underlying land surface. This stress could potentially trigger land movement, manifested either slowly via gradual earth movement or rapidly as a small earthquake. Several fault traces crossing beneath or close to the two proposed reservoirs could serve as the focus of these movements, despite the findings that these "inactive" faults have not experienced natural seismic activity within the past 40,000 years.

Based on the potential for naturally caused and reservoir-induced earth movements to occur in the project area during the 50-year lifetime of the proposed project, the staff sees the benefits associated with Eagle Crest's proposal to: (1) conduct a thorough subsurface investigation in the project area to better characterize existing conditions for the purpose of refining the final design of project features (i.e., implementation of a Geotechnical Study Plan as proposed in section 12.6 of Eagle Crest's final license application [Eagle Crest, 2009a]), and (2) establish a seismic monitoring program per the general recommendations of the International Commission on Large Dams (ICOLD, 2008) for reservoir projects. Continuing the applicant's proposed seismic monitoring program through the initial operation and life of the project would help determine if there is the potential of reservoir-triggered seismicity within the area.

Effects of Project Construction and Operation on Liquefaction

The proposed pumped storage reservoirs and associated facilities would be constructed on a combination of bedrock and alluvium. As discussed in greater detail in the *Groundwater* section, groundwater levels in the project area are typically hundreds of feet below the ground surface, although in the eastern mining pit, the most recent

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[24] For generation at a pumped storage facility to occur, water storage at both reservoirs is normally slightly more than half of the total available storage.

[25] "Shallow and small" reservoirs are considered by Baecher and Keeney (1982) to have a probability of reservoir-triggered seismicity that is "very near zero" and are defined as reservoirs having less than 302 feet of water depth and storing less than about 973,000 acre-feet of water volume.

available groundwater data (CH2M HILL, 1996) indicate a groundwater level that at times is about 20 feet below the lowest portions of the pit.

Liquefaction can occur when loose, saturated sandy soils are subjected to earthquakes. In its license application, Eagle Crest provides the screening criteria from the Southern California Earthquake Center for determination of liquefaction hazards (SCEC, 2009) and concludes that a liquefaction assessment is not required. The criteria are as follows:

1. the estimated maximum past, current, and future groundwater levels are determined to be deeper than 50 feet below the existing or proposed final site grade;
2. bedrock or other similar material that is considered to be non-liquefiable directly underlies the site;
3. the granular (i.e., sandy) soils underlying the site are all determined to be dense to very dense; and
4. the underlying soils have a clay content greater than 15 percent.

Eagle Crest further states that geologically mature alluvial fan and plain sediments, like those found on the eastern edge of the eastern mining pit, generally have a low potential for liquefaction based on their relatively high material density (Youd and Perkins, 1978).

To minimize the potential for a liquefaction hazard to occur, Eagle Crest proposes to maintain pre-project groundwater levels in areas influenced by reservoir seepage by installing a seepage recovery system as described in section 3.3.2, *Water Resources*, under the heading *Groundwater*. Eagle Crest indicates that the potential for liquefaction-induced settlements would be very low to non-existent because, coupled with implementation of the recovery system, the project would mostly lie on shallow bedrock, dense geologically mature sediments, or properly engineered and compacted fill.

Our Analysis

The project would include two reservoirs and associated facilities mostly built on bedrock with some portions of these structures (e.g., east side of the lower reservoir) built on alluvial sediments. Following the SCEC (1999) screening criteria, the proposed project fails to satisfy the first three of the four criteria, specifically for those project areas near the east side of the eastern mining pit. Groundwater levels beneath the proposed lower reservoir are reportedly within 50 feet of the existing ground surface, or bottom of the eastern mining pit. Further, the soil densities and the clay content levels in sediments underlying portions of the project area are not wholly known. Therefore, a liquefaction assessment in the project area and in areas where project-induced groundwater levels could rise within 50 feet of the surface (e.g., from reservoir seepage) would provide

needed information to address liquefaction concerns. Collecting data as part of Eagle Crest's subsurface investigations would allow Eagle Crest to perform the liquefaction assessment.

Effects of Project Operation on Subsidence and Hydrocompaction

Subsidence of the ground involves the downward settling of the land surface and can occur over variable rates, time periods, and spatial area. Common triggers for subsidence may be natural or human-made. In alluvial soils, like those found in the Upper Chuckwalla Valley, subsidence can occur from substantial lowering of the water level in an aquifer.

Hydrocompaction is a process whereby oversaturation of the subsurface sediments by rising groundwater levels cause sediments to consolidate and settle, thereby leading to the subsidence of the land surface. This process can be triggered by the rising of the water table in alluvial sediments.

Because these processes primarily involve an alteration of groundwater levels, discussions of the effects of the project on subsidence and hydrocompaction in the project area and the Chuckwalla Valley groundwater basin are found in the *Groundwater* section.

Effects of Project Construction on Soil Erosion

Infrequent, short-duration, high-intensity rainfall events can mobilize large amounts of loose soil and sediment in the project area. Disturbed soils and mine tailings within the inactive mine area, as well as other disturbed surfaces such as dirt roads, supply the source material during runoff events, resulting in surface and channel erosion, material transport, and high turbidity in receiving waters. There would be some increases in soil erosion resulting from construction of the project, specifically related to development of the upper and lower reservoirs, access roads, power line towers, water supply pipeline, and surface facilities. Project-related effects on stream channel scour potential are addressed in section 3.3.2, *Water Resources*.

Eagle Crest prepared an Erosion and Sediment Control Plan as part of its application (Measure GEO-1). The plan includes best management practices (BMPs) to be implemented during the construction process to control and minimize erosion and to stabilize disturbed lands after construction. The Erosion and Sediment Control Plan conceptually describes the erosion and sediment control practices planned for implementation during construction of the proposed project. These measures would minimize the erosion of soils in construction areas and prevent the transport of sediment and storm water discharges from the construction site. The Erosion and Sediment Control Plan also includes the development of a storm water pollution and prevention plan prior to construction. The storm water pollution and prevention plan would include a monitoring and inspection plan with reporting to occur on a routine (unspecified) basis

and after substantial storm events. Eagle Mountain also proposes to revegetate all areas disturbed by construction, including the water pipeline and transmission line disturbed surfaces, with native plants.

The following BMPs are included in Eagle Crest's Erosion and Sediment Control Plan, which would be implemented during construction to prevent or minimize erosion: (1) preserve existing vegetation where required and when feasible and initiate construction immediately following vegetation clearing to minimize the exposure of scarified soil to wind and water; (2) use temporary fencing, protective barriers, or other similar methods to protect vegetation not required, or authorized to be removed; (3) slope roadways and excavations away from washes and clear loose soils and pre-existing sediments in areas where haul roads would cross surface washes; (4) install riprap at the washes; (5) build small earthen embankments within washes to slow or divert surface water; (6) install silt fences in work areas near a wash to prevent sediment from entering the wash during rain storms; (7) apply water to disturbed soil areas of the project site, under the supervision of a monitor, to ensure excessive runoff does not occur and to control wind erosion and dust; and (8) implement complementary sediment controls to intercept and filter out soil particles mobilized by surface runoff. Prior to construction, Eagle Crest would prepare a storm water pollution prevention plan detailing the BMPs that would be implemented at the site, which are subject to updating as dictated by changes in construction and construction schedules. A monitoring plan would be prepared as part of the stormwater pollution prevention plan, detailing the inspection, documentation, and corrective action procedures for the BMPs.

Our Analysis

Although the proposed project site is highly disturbed, with massive quantities of mining substrate currently exposed to erosive processes, construction of the upper and lower reservoirs, access roads, power line towers, water supply pipeline, and other constructed facilities have the potential to further disturb these materials throughout the area. Increased amounts of disturbance would increase sediment mobilized during rain events, resulting in an elevated sediment load in runoff leaving the project site and, ultimately, causing high turbidity and long-term sediment deposition in low gradient areas.

Eagle Crest's Erosion and Sediment Control Plan, including BMP implementation and preparation of a storm water pollution and prevention plan and a monitoring plan, would address this potential project-related effect by adhering to industry standards. The measures outlined in the plan would minimize the potential of soil erosion of disturbed surfaces and of sediment transport in and near the construction areas.

Effects of Project Construction and Operation on Landslides and Mass Movements

Some areas within the central and eastern mining pits have potentially unstable slopes because mining has exposed unstable fractures on the pit walls. Consequently, slope failures and/or rock falls could be expected in these slopes during project construction and operations.

Eagle Crest proposes to conduct detailed subsurface investigations to support final engineering designs and to further assess potential effects on geology and soils resources. During these site investigations, which would occur after site access is granted, Eagle Crest proposes to conduct geologic mapping to identify conditions of the overburden and bedrock exposed in the mine pits that may affect the stability of slopes during reservoir-level fluctuations. Mapping would identify the degree and orientation of jointing and fracturing, faulting, and weathering, and the dimensions of the benches excavated during past mining activities. The stability of the cut slopes and benches would also be assessed at this time.

During construction activities, Eagle Crest proposes to remove loose and unstable rock blocks from slopes lying below an elevation of 5 feet above the proposed maximum water level in the reservoirs. Eagle Crest does not propose to modify existing cut slopes above these unless there is evidence of potential slope failure that could potentially affect project facilities. Eagle Crest also proposes to minimize slope failure potential by buttressing the lowermost slopes of each reservoir using mine tailings removed from potentially unstable areas above the reservoir water surface. Eagle Crest states that no mass soil or rock movements related to site construction could occur that would affect off-site facilities (i.e., those facilities existing and/or constructed upon the valley floor).

Our Analysis

Construction-related activities and on-going project operations have the potential to trigger slope failures and/or rock falls on unstable slopes within and possibly adjacent to the proposed reservoirs, facilities, and along linear features (e.g., roads) where construction involves earth moving. Eagle Crest's proposed subsurface investigations would evaluate slope stability prior to the development of final engineering and designs, and its proposed measures to remove or grade the identified unstable slopes in the reservoirs would minimize slope failure potential.

Effects of Project Construction and Operation on Active and Inactive Mines

The proposed project would use two of the four main mining pits at the inactive Eagle Mountain mine: the eastern mining pit and the central mining pit. The two western-most of the four main pits, the north and south Black Eagle pits, are outside the proposed central project area and would not be affected by construction and operation of the proposed facility, access roads, or transmission line. Located adjacent to the central

project area, but outside of the proposed reservoir areas, are two mine adits[26] (Eagle Crest, 1994). Eagle Crest does not plan to use or otherwise disturb these features as part of the proposed construction. The adits appeared to be stable at the time of previous evaluations conducted more than 15 years ago (Eagle Crest, 1994), although natural minor collapses are possible in the future.

The California State Lands Commission holds a 100 percent reserved mineral interest in a 467-acre parcel of land in the Eagle Mountain mine area, situated near the east end of the eastern mining pit (proposed lower reservoir). Geosyntec (1992, as cited in Eagle Crest, 1994) estimated that 23.5 million tons of iron-bearing placer (alluvium) deposits remain at the east end of the eastern mining pit. This amount is about 7 percent of the about 170 million tons of recoverable iron ore reserves estimated to be remaining on the entire Eagle Mountain mine (Eagle Crest, 1994; Mine Reclamation Corporation, 1997, as cited in Eagle Crest, 2009a). Kaiser held a California State Lands Commission-issued lease covering 145 acres of the mineral interest parcel. Since the lease expired in 2002, Kaiser applied to exchange the state's reserved mineral interest on the entire 467-acre parcel for a partial interest in a nearby mineral estate owned by Kaiser. The U.S. Ninth Circuit Court of Appeals reviewed Eagle Crest' license application, and on November 10, 2009, denied the land exchange between Kaiser and BLM.[27]

Our Analysis

The project area would be situated upon two inactive mining pits used by Kaiser to extract iron ore from the underlying bedrock and alluvial deposits. Eagle Crest does not propose to evaluate the project's potential effects on the structural integrity of the two abandoned mining adits adjacent to proposed project area. However, staff concludes that the structural integrity of the two mining adits could be potentially affected by project-related activities by blasting and other activities proposed during construction. Evaluating the potential project effects on these adits, including the potential for adit collapse, as part of the Eagle Crest's proposed subsurface investigations, would help clarify this issue and provide an opportunity for Eagle Crest to propose mitigation measures, if needed.

Reclamation of existing rock and ore materials present within the proposed project area would not be possible once the project is constructed and is in operation.

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[26] A mine adit is a horizontal shaft extending into the subsurface.

[27] See *National Parks v. Kaiser Eagle Mountain*, available at http://www.ca9.uscourts.gov/datastore/opinions/2009/11/10/05-56814.pdf.

3.3.2 Water Resources

3.3.2.1 Affected Environment

Water Quantity

The proposed project is located in the Eagle Mountains and Chuckwalla Valley of the arid Sonoran desert of southeastern California. On average, about 3 to 5 inches of rainfall occurs annually. August receives the most rainfall, although rainfall is also more predominate, but generally lighter, in the winter months of December, January, and February. The region's very low precipitation, high evaporation, and permeable soils preclude the existence of perennial streams. In rare large rainfall events, substantial runoff occurs in washes, causing flash floods with a great potential for erosion.

Eagle Creek, which is normally a dry wash, flows out of the Eagle Mountains generally along the southern side of the proposed central project area. USGS operated a gage on Eagle Creek (Gage No. 10253600, Eagle Creek at Eagle Mountain) near the project area from October 1, 1960, to September 30, 1966. Records from this gage, which had a drainage area of 7.71 square miles, are summarized in table 2. Flows were recorded at this gage on only 4 days when the gage was operational. The flows at this gage, which are representative of streams in the area, indicate a very flashy flow regime as shown by the large difference between the daily mean and the peak flow data. The total volumes of the 1961 and 1965 flood events were about 40 and 15 acre-feet, respectively.

Table 2. Summary of flow data (cfs) from USGS Gage No. 10253600 (Source: USGS, 2010, as modified by staff).

Water Year	Date of Flow	Daily Mean	Peak Flow
1961	August 23	20	380
1962	None	--	--
1963	September 17	0.2	3
1964	November 1	0	2
1965	August 16	7.5	180
1966	None	--	--

Under current highly disturbed conditions from the historical mining activities near the eastern mining pit, the majority of the flow in Eagle Creek enters the eastern mining pit where it accumulates and generally evaporates quickly. Eagle Crest estimates the total drainage area of Eagle Creek at 11.89 square miles. However, under current conditions, about 1.74 square miles currently flow into the central mining pit and about 2.85 square miles flow directly to the eastern mining pit and water is retained in both

mining pits. The current drainage area of Eagle Creek at the point it flows into the eastern mining pit is about 7.3 square miles. Before mining activities altered the drainage pattern, Eagle Creek (with a drainage area of 11.89 square miles) discharged into the Chuckwalla Valley, with an abrupt change in gradient where the wash emerged from the Eagle Mountains. As the flow emerged at high velocities from the channeled wash area, the sediment bedload was deposited to braided alluvial fan where sheet flow and lower velocities occurred. The CRA is buried within the alluvial fan deposits of Eagle Creek to the east of the eastern mining pit.

Chuckwalla Valley is a closed watershed with a total drainage area of about 663 square miles, with two central sinks that form the Palen Dry Lake and Ford Dry Lake. During substantial rainfall events, runoff from areas near the project area reaches the Palen Dry Lake bed, forming a surface water feature that may persist for several weeks until lost by percolation and evaporation.

There are a few intermittent springs in the mountains within the northwest part of the Chuckwalla Valley. All of these springs appear to be hydrologically disconnected from the Chuckwalla groundwater basin since the springs are located in the mountains above the valley floors.

Water Quality

Water quality in the area is influenced by the site geology, including steep mountainous terrain; unconsolidated deposits in the valleys; the disturbed mine area; and sparse vegetation. The combined effect of these conditions and the rare, but normally intense, short-duration rain events lead to high sediment loads during runoff events. Surface water quality has not been monitored during the rare runoff events and access limitations have not permitted sampling of the water that sometimes collects at the bottom of the existing mining pits. Eagle Crest states that there likely to be a still-active wastewater treatment plant with a treatment pond on the southeastern side of the largely abandoned town of Eagle Mountain. In the Chuckwalla Valley, wastewater disposal occurs primarily though residential septic systems and treatment ponds that allow infiltration to groundwater.

Water Quality Standards

Water quality protection in the proposed project area is within the jurisdiction of the California Regional Water Quality Control Board, Region 7 (Regional Water Board). The Regional Water Board carries out these responsibilities through the Water Quality Control Plan for the Colorado River Basin within California (Basin Plan). This Basin Plan provides guidelines and regulations for activities that fall within Regional Water Board jurisdiction.

Water quality objectives are based on the water body's beneficial use classification (table 3). Under existing conditions, surface water rarely occurs and there is no current use designation. The State Water Board would assign use designations for

the proposed water within the reservoirs and would approve the water quality certification for the project. Staff anticipates that the proposed project would receive the Hydropower and Industrial use designations from the State Water Board.

Table 3. Relevant beneficial use definitions for the Colorado River Basin (Source: Regional Water Board and State Water Board, 2006).

Category	Definition
Hydropower generation	Uses of water for hydropower generation
Industrial service supply	Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, and oil well pressurization.

Several water quality objectives applied to all water bodies within the Regional Water Board's jurisdiction for the Colorado River Basin are relevant to the proposed isolated, groundwater fed pumped storage project (table 4). Parameters and the important water quality objectives of the proposed project are shown in the table 4.

Table 4. Applicable water quality objectives for waters potentially affected by the proposed project (Source: Regional Water Board and State Water Board, 2006).

Parameter	Objective
Aesthetic qualities	Free from substances attributable to wastewater of domestic or industrial origin or other discharges which adversely affect beneficial uses not limited to: settling to form objectionable deposits, floating as debris, scum, grease, oil, wax, or other matter that may cause nuisances, and producing objectionable color, odor, taste, or turbidity.
Toxicity	Free of toxic substances in concentrations which are toxic to, or which produce detrimental physiological responses in human, plant, animal, or indigenous aquatic life.
Acidity	pH 6.0-9.0

Parameter	Objective
Suspended solids and settleable solids	Discharges of wastes or wastewater shall not contain suspended solids or settleable solids which increase the turbidity of receiving waters, unless it can be demonstrated to the satisfaction of the Regional Water Board that alteration in turbidity does not adversely affect beneficial uses.
Total dissolved solids	Discharges of wastes or wastewater shall not increase the total dissolved solids content of receiving waters, unless it can be demonstrated to the satisfaction of the Regional Water Board that such an increase in total dissolved solids does not adversely affect beneficial uses of receiving waters.
Sediment	The suspended sediment load and suspended sediment discharge rate to surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.
Turbidity	Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses.

Groundwater Quality

Eagle Crest states that groundwater quality in the proposed project area is typical for desert areas of southern California. The pH ranges from about 7.4 to 8.5; total dissolved solids levels at 425–950 milligrams per liter (mg/L) are generally above the California maximum containment level of 500 mg/L (CH2M HILL, 1996); and sulfate and chloride are generally both below the maximum containment level of 250 mg/L (Kaiser Steel Resources, Inc., 1978). Boron, fluoride, and arsenic are commonly higher than recommended concentrations for drinking water. Samples from the wells in the Pinto and Chuckwalla groundwater basins had concentrations of boron at 600 and 938 micrograms per liter (μg/L) and concentrations of fluoride of 2.4 and 6.2 mg/L (Kaiser Steel Resources, Inc., 1978). While high, these concentrations seem typical for arid desert valleys in southern California. Human-induced groundwater pollution is low due to the undeveloped nature of the Chuckwalla Valley area, the limited infiltration of surface water, and the extreme depth to groundwater.

Establishment of numerical objectives for groundwater quality involves complex considerations since the quality can vary with depth of well screening, existing groundwater levels, geology, hydrology, and other factors. In general, the stated objective of the Regional Water Board is to maintain the existing groundwater quality of all non-degraded groundwater basins. Table 5 provides the general groundwater quality objectives from the Basin Plan.

Table 5. Applicable groundwater quality objectives for the Colorado River Basin (Source: Regional Water Board and State Water Board, 2006).

Parameter	Objective
Taste and odor	Groundwaters for use as domestic or municipal supply shall not contain taste or odor-producing substances in concentrations that adversely affect beneficial uses as a result of human activity.
Bacteriological community	In groundwaters designated for use as domestic or municipal supply, the concentration of coliform organisms shall not exceed the limits specified in California Code of Regulations, Title 22, Chapter 15, Article 3.
Chemical and physical quality	Groundwaters designated for use as domestic or municipal supply shall not contain concentrations of chemical constituents in excess of the limits specified in California Code of Regulations, title 22, chapter 15, article 4, section 64435, tables 2, 3, and 4 as a result of human activity.
Brines	Discharges of water softener regeneration brines, other mineralized wastes, and toxic wastes to disposal facilities which ultimately discharge in areas where such wastes can percolate to groundwaters usable for domestic and municipal purposes are prohibited.

Groundwater Resources

General Hydrogeologic Setting

The project area is located in and adjacent to the Eagle Mountains on a bedrock ridge along the northwestern margins of the Chuckwalla Watershed (see figure 5). The central portions of the watershed contain the Palen and Chuckwalla valleys, with thick accumulations of alluvial sediments that comprise the Chuckwalla groundwater basin (see figure 5). Most domestic and agricultural areas are located in the western portions of the basin near Desert Center, about 10 miles south of the project site. This area has been historically referred to as the Upper Chuckwalla Valley, while the Lower Chuckwalla Valley includes the valley area situated farther east of Desert Center and along Interstate 10.

Of the five groundwater basins surround the Chuckwalla groundwater basin (see figure 5), only the Cadiz groundwater basin is hydrologically disconnected from the Chuckwalla groundwater basin, because the Cadiz basin is enclosed by surrounding mountains.

The Chuckwalla groundwater basin receives both surface and subsurface inflow from the Orocopia groundwater basin to the west and from the Pinto groundwater basin

to the north. The groundwater entering the Chuckwalla groundwater basin from the Pinto groundwater basin passes through a gap in the bedrock about 6 miles north of the project area. A portion of the Pinto groundwater basin is within the JTNP, which is about 2 miles from the project area. The Chuckwalla groundwater basin drains east into the Palo Verde Mesa and Palo Verde groundwater basins. The Colorado River forms the eastern edge of the Palo Verde Valley groundwater basin. A few intermittent springs[28] exist in the area of the northwest Chuckwalla Valley (see figure 5). None of the springs are documented as permanent, year-round springs (SCS Engineers, 1990), and all are located in the mountains and not in the valley.

Traversing these basins and surrounding mountains is the CRA, which carries water west to highly populated areas of southern California (see figure 5).

Wells

There are more than 60 known wells in the Chuckwalla groundwater basin (Eagle Crest, 1994; CH2M HILL, 1996) (figure 7). Other agricultural or domestic wells may be present, but their locations are not known due to poor record-keeping, and some older wells dating back to the early 1900s may have been destroyed or abandoned. The depth of these existing wells range up to 2,000 feet and have pumping capacities up to 3,900 gallons per minute (gpm), with average pumping rates of 1,800 gpm. In the Desert Center area, groundwater wells range up to 900 feet deep; two of these wells are capable of producing 2,300 gpm each. In the JTNP, the Park Service owns one well in the Pinto groundwater basin (Pinto Well No. 2), and Kaiser owns two additional wells near the Park Service well in the southeastern portion of the Pinto groundwater basin. There are also a few existing wells in the footprint of the proposed project near the eastern mining pit.

Water-bearing Formations

Water-bearing geologic units in the Upper Chuckwalla groundwater basin include geologically young (<1.8 Ma) alluvium and continental deposits, which together has a maximum thickness of 1,200 and 2,000 feet in the central and eastern portions of the basin, respectively (see figure 6). However, California DWR (2003, as cited in Eagle Crest, 2009a) considers there to be only 1,200 feet of permeable sediments in the basin. These units are primarily composed of semi-consolidated coarse sand and gravel, clay, and some interbedded basalts.

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[28] A spring occurs where groundwater flows naturally from the subsurface onto the land surface due to the nature and relationship of rocks, the position of the water table, and the topography (Neuendorf et al., 2005).

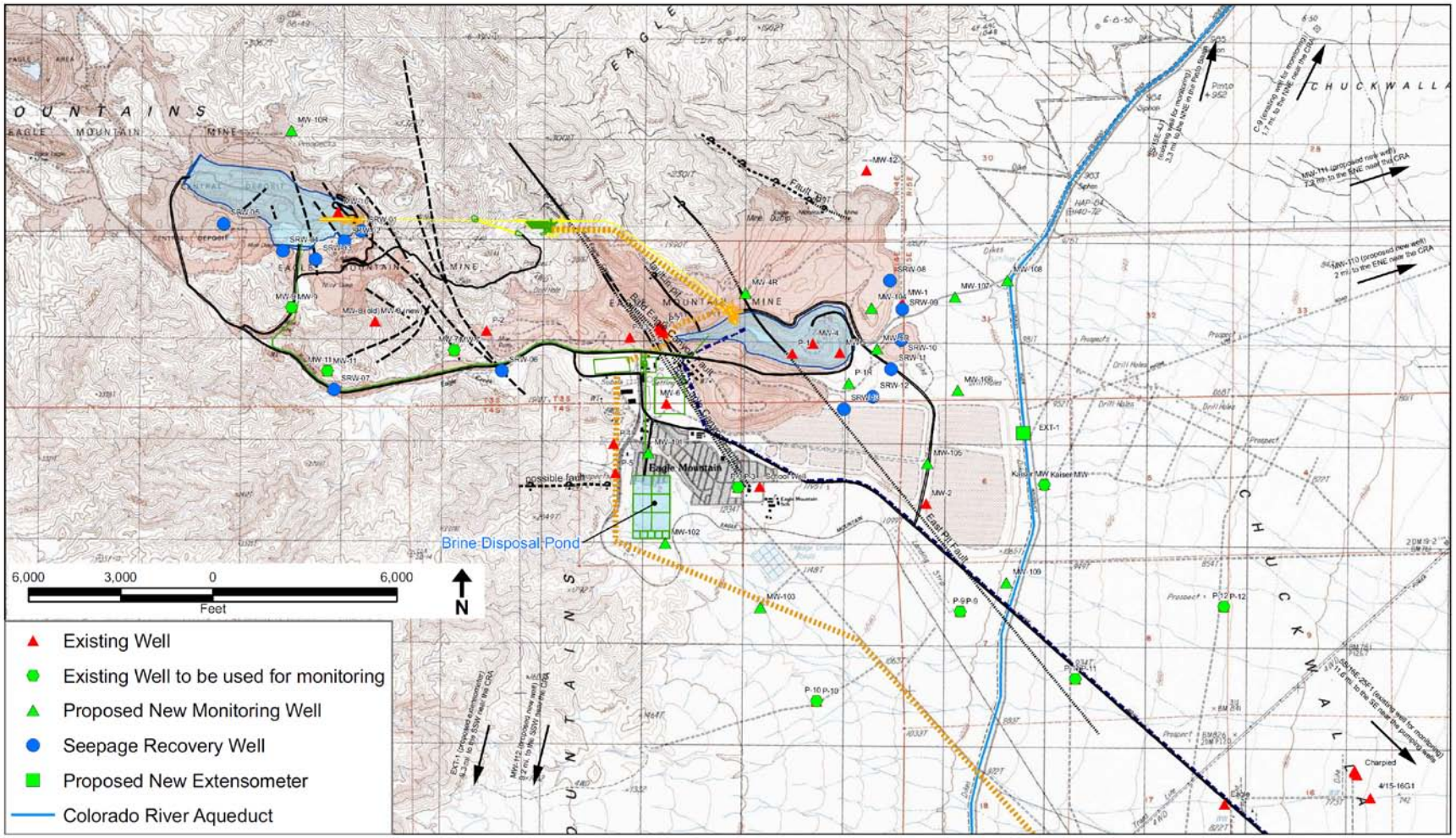

Figure 7. Existing and proposed wells for groundwater monitoring (Source: Eagle Crest, 2009a).

Well log information was used by Eagle Crest to develop geologic profiles (i.e., subsurface cross sections) of the Chuckwalla groundwater basin to show the types of sediments and their distribution. The profiles, in addition to geophysical surveys in the Upper Chuckwalla groundwater basin, suggest that the bedrock surface beneath the alluvial sediments forms a large bowl, where the southern edge of this bowl aligns with a narrow east-west trending bedrock ridge. The northern edge of the bowl is composed of a similar bedrock feature at the union of the Chuckwalla and Pinto basins.

The profiles show that coarse-grained sediments are continuous throughout the Chuckwalla groundwater basin, and because these sediment layers appear to be hydraulically connected, there is only one aquifer in most of the valley. This aquifer appears to be unconfined[29] based on the geology and measured groundwater levels. This aquifer may be semi-confined to confined[30] in the central portion of the valley near Desert Center where layers of clays have accumulated.

Hydraulic Characteristics

Limited information is available about the detailed hydraulic characteristics of the sediments in the Chuckwalla groundwater basin. The key parameters of interest when evaluating an aquifer's ability to store and transmit water are provided and defined below:

- Hydraulic conductivity—The ability of the pore spaces or fractures in rock sediment to transmit water; typical values for well-sorted sand and gravel are from 3 to 180 feet per day.
- Transmissivity—The hydraulic conductivity multiplied by the thickness of the aquifer capable of storing water.
- Porosity—The measure of void space between the sediment particles.
- Storativity—Or the storage coefficient, the volume of water an aquifer releases from or takes into storage per unit surface area or the aquifer per unit change in head. Storativity is equal to the specific yield in unconfined aquifers.
- Specific yield—The percentage of the volume of water a substrate will yield by gravity drainage to the volume of the substrate.

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[29] An unconfined aquifer contains continuous layers of permeable materials extending from the land surface to the base of the aquifer; also referred to as a water-table aquifer.

[30] A semi-confined or confined aquifer is overlain by a confining layer, and therefore, does not have direct hydraulic connectivity with the land surface or the surficial aquifer. The impermeable layer is often composed of impermeable or semi-impermeable clays.

Hydraulic conductivity measurements of the Chuckwalla groundwater basin were obtained from historical records of aquifer tests for wells in the Desert Center area, the upper portions of the basin (east of the project site), near the project area, and in the Lower Chuckwalla groundwater basin. The measurements reveal that hydraulic conductivities in the upper portions of the basin (36 to 94 feet/day) are about half of those measured near Desert Center (111 to 139 feet/day). The bedrock portion of the project area near the proposed reservoirs has a much lower hydraulic conductivity because the bedrock is essentially impermeable, limiting groundwater movement to occur within faults, joints, and fractures. California DWR estimated the average specific yield of the Chuckwalla groundwater basin to be 0.10 for the upper 220 feet of saturated sediments (California DWR, 1979, as cited in Eagle Crest, 2009a).

Groundwater Levels

Eagle Crest developed a partial trend in groundwater levels over the past 50 years by combining records from multiple wells in the Chuckwalla groundwater basin. These data represent historical water table elevations, extraction levels, and groundwater flow direction in the basin. Groundwater levels in the Desert Center area were relatively stable until 1981. Between 1981 and 1986, thousands of acres were irrigated for the first time to support short-lived agricultural activities that resulted in groundwater level declines of about 130 feet. Groundwater levels between 1986 and 2002 have recovered by over 100 feet, which is due in part to a large decrease in agricultural pumping. In addition, this recovery could be from increased groundwater inflows (from the steep gradients caused by or enhanced by the groundwater extraction) from the adjacent groundwater basins that contribute inflow. In 2007, groundwater levels were about 17 feet lower than the groundwater level in 1980.

Current trends in groundwater levels in the eastern portion of the Chuckwalla groundwater basin near the outflow to the Palo Verde Mesa groundwater basin are conflicting—one well shows a trend similar to the wells near Desert Center while another well shows the groundwater level recovering during the overdraft period of the early 1980s. This apparent conflict in groundwater trends may reflect differences in local use and the fact that the groundwater levels in the eastern portion of the groundwater basin were rising and were not affected by pumping near Desert Center. Farther east in the Palo Verde Mesa groundwater basin, water levels showed little to no effects of pumping within the Chuckwalla groundwater basin.

In the Pinto groundwater basin, water levels remained stable until about 1960 when pumping by Kaiser in the Pinto and Upper Chuckwalla valleys lowered water levels by about 15 feet between 1960 and 1981. Thereafter, groundwater levels recovered, potentially due to Kaiser's greatly reduced pumping, even though groundwater levels near Desert Center declined in the early 1980s. Recent (2007) measurements show that levels have continued to recover and are about 7 feet below the static water level measured in 1960, possibly due to withdrawals near Desert Center. These different

groundwater level trends suggest that pumping in the Desert Center area does not substantially affect groundwater levels in the Pinto groundwater basin.

Groundwater Flow Direction

Based on 1974 data (California DWR, 1979, as cited in Eagle Crest, 2009a), groundwater movement in the Chuckwalla groundwater basin is directed from the north and west toward the gap between the Mule and the McCoy mountains at the southeastern end of the basin and into the Palo Verde Mesa groundwater basin (see figure 5). More recent data near the project site reveal that groundwater movement is both north and south from the Eagle Mountains toward Eagle Creek Canyon and then to the east until it reaches the basin aquifer, where it is then directed toward the southeast (CH2M HILL, 1996).

Groundwater Storage and Outflow

The total storage capacity of the Chuckwalla groundwater basin was estimated to be between 9.1 million acre-feet and 15 million acre-feet (California DWR, 1979, as cited in Eagle Crest, 2009a). The estimated storage for just the northwestern portion of the Upper Chuckwalla near the project site is about 1 million acre-feet. This estimate is probably very conservative because only 100 feet of saturated sediments were considered in the calculation, and there are several hundred feet of saturated sediments remaining. Using geologic profiles to assess the saturated thickness and assuming a storage coefficient of 0.10, the storage capacity of the entire basin in only the coarse-grained sediment portion of the aquifer is estimated to be about 10 million acre-feet, similar to California DWR's 1979 estimate. This is probably another conservative estimate because it does not include water in the clay deposits nor does it account for additional water that may be present in the confined or partially confined areas of the central portion of Chuckwalla groundwater basin. Outflow occurs only as groundwater movement, because no surface waters leave the basin. The groundwater basin discharge of the Chuckwalla groundwater basin to the Palo Verde Mesa groundwater basin is estimated to be about 400 acre-feet per year.

Groundwater Pumping

The amount of groundwater pumped from the Chuckwalla groundwater basin has been estimated from recorded data filed with the State Water Board and by the acres and types of crops grown multiplied by the evapotranspiration rates of the plants. The recorded pumping over the years has been erratic and may be incomplete; estimates based on agricultural land usage, or water duties (evaporation plus applied water losses), were made between 1986 and 2007. The highest pumping occurred in 1986, at about 20,778 acre-feet per year, but has decreased substantially since the production of jojoba and asparagus ended shortly thereafter. Only about 25 percent of land once devoted to agriculture continues to be farmed. More recent endeavors in palm farming have slightly

increased groundwater use in the area from 1,758 acre-feet per year in 2005 to about 1,800 acre-feet per year in 2007.

Other pumping in the basin occurs for domestic and industrial use. Domestic use in the area is estimated at 50 acre-feet per year in Desert Center and 1,200 acre-feet per year at the Lake Tamarisk development. Southern California Gas Company uses wells to supply about 1 acre-foot per year to its natural gas pumping plant. Farther east in the basin are the Chuckwalla Valley and Ironwood State prisons that were opened in 1988 and 1994, respectively, and are located directly adjacent to each other about 30 miles east of Desert Center. The two prisons pumped 2,100 acre-feet per year of groundwater in 2007 and recharged about 800 acre-feet per year of treated wastewater. However, populations at the prisons are projected to be reduced by about 35 percent by 2011 to alleviate overcrowding, which would reduce their pumping to about 1,500 acre-feet per year.

Groundwater Recharge Sources

The majority of groundwater contained within the Chuckwalla groundwater basin is of ancient origin that likely derived from precipitation that was trapped with sediments as they deposited upon the valley floor over the past million years (Eagle Crest, 2009d). Therefore, the oldest water is typically found at the bottom of the aquifer and the youngest water is found closer to the ground surface.

The Chuckwalla groundwater basin is recharged by percolation of runoff from the surrounding mountains and from precipitation to the valley floor. Average annual precipitation in the basin is about 3 to 5 inches (California DWR, 2003, not seen as cited in Eagle Crest, 2009a). There are few measurements to quantify the amount of recharge from rain and some studies estimated that only 5 to 10 percent of the rain falling on the watershed contributes to the groundwater. The average recharge to the aquifer was estimated to be about 5,540 to 5,600 acre-feet per year based on an assumed 10 percent infiltration rate.

The Upper Chuckwalla groundwater basin is also recharged by groundwater inflow from the north by the Pinto groundwater basin. Inflow from the Pinto groundwater basin occurs as outflow through an alluvium-filled gap at the east end of the Pinto basin. The perennial yield of the Pinto groundwater basin is estimated at 2,500 acre-feet per year. Recent estimates using geophysical studies to define the area where groundwater leaves the Pinto basin suggest the inflow may be as much as 3,200 acre-feet per year.

Groundwater inflow to the Chuckwalla basin from the Orocopia basin is estimated to be 1,700 acre-feet per year. Because there are no groundwater withdrawals in this basin, this is considered to be all recharge to the Chuckwalla groundwater basin. Although not distinguished by groundwater basin, subsequent estimates of recharge from upgradient groundwater basins (i.e., Pinto and Orocopia) are about 6,700 acre-feet per year (CH2M HILL, 1996).

Perennial Yield

The majority of the groundwater is considered to be of "ancient" origin, estimated to have been recharged in the basin between about 2,700 and 32,300 years ago based on studies recently conducted in the nearby Joshua Tree aquifer (Nishikawa et al., 2004). The current perennial yield, or natural recharge, of the Chuckwalla groundwater basin has been estimated as between about 8,900 and 20,000 acre-feet per year. Eagle Crest, at the request of the Park Service, which proposes to use closer to 10,600 acre-feet per year in its comment letters dated August 11, 2009 and March 10, 2010, refined its perennial yield estimate to 12,700[31] acre-feet per year (mean from a range of 7,600 and 17,700 acre-feet per year) based on the percentage of precipitation falling on the mountainous areas of the basin. In its letter filed April 23, 2010, Eagle Crest also states that its estimate compares well against a re-calculation of the basin's perennial yield using a recent USGS method that was developed for the nearby Joshua Tree aquifer (Nishikawa et al., 2004).

Fishery Resources

No perennial streams are present in the project area. Intermittent surface water sources in the central project area and vicinity are Eagle Creek (a normally dry wash south of the central project area), other smaller unnamed washes, and temporary pools at the bottom of mine pits from stormwater runoff. Ephemeral springs within the vicinity of the central project area are Buzzard Spring, an unnamed spring near Buzzard Spring, and

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[31] In its comments (filed October 13, 2010) about the State Water Board draft EIR, the Park Service states that a total recharge estimate of between 3,300 and 6,000 acre-feet per year should be used for the Chuckwalla groundwater basin. The Park Service states that this value is based on results and methods presented in the USGS report (Nishiwawa et al., 2004) about recharge rates in the Joshua Tree area—located about 50 miles west of the Chuckwalla groundwater basin. The Park Service contends these recharge rates are more applicable than methods used by Eagle Crest, i.e., information from studies in the Fenner groundwater basin, located 40 miles north of the Chuckwalla groundwater basin, immediately north of the Cadiz valley. In another recent comment by the Park Service dated July 8, 2010 about the proposed nearby Genesis Solar draft staff assessment and EIS (SA/DEIS; a document prepared cooperatively by the Interior, BLM, and the California Energy Commission for NEPA and CEQA compliance), the Park Service recommended using a total annual recharge value of 10,400 acre-feet per year for the Chuckwalla groundwater basin. While the annual recharge to the Chuckwalla groundwater basin varies annually and can only be estimated, the 10,600 to 12,700 acre-feet per year range is most commonly accepted because it was developed using published data and methods developed from other studies conducted within the basin (e.g., Mann, 1986; Greystone, 1994, both as cited in State Water Board, 2010) or the general region (e.g., URS, 1999; Davisson and Rose, 2000; USGS-WRD 2000, all as cited in State Water Board, 2010; Nishikawa et al., 2004).

Eagle Tank Spring. All of these water sources are temporary and seasonal and are not capable of supporting fish.

The CRA lies at the base of the inactive Eagle Mountain mine site. South of the central project area is a forebay (part of the aqueduct system) at the Metropolitan Water District's pumping plant. The CRA diverts water from Lake Havasu on the Colorado River, and fish species that may be present in the aqueduct system are the same as those found in Lake Havasu and the Colorado River. These species consist primarily of introduced game species including largemouth bass, striped bass, catfish (whitehead, bullhead, flathead, and channel), threadfin shad, green sunfish, black crappie, warmouth, and carp. Native species that may be present in the aqueduct are razorback sucker, bonytail chub, and desert pupfish. Although the CRA may support game fish, it is not legally accessible to the public and Eagle Crest does not plan to use water from the CRA.

3.3.2.2 Environmental Effects

Water Quantity

Effects of Operation on Water Quantity in the Reservoirs

Construction of the project and operation would result in changes to the amount of flow that reaches Eagle Creek during the rare events that runoff occurs in the area. Under current conditions, both existing mining pits retain the stormwater runoff that is directed to their locations. Under operational conditions, this stormwater would be added to water in the reservoirs, creating a possible excess amount of water in the reservoirs, depending on operational conditions and the amount of inflow.

In its letters filed April 27, 2009, responding to Deficiency no. 5 and AIR no. 4, Eagle Crest's summarizes its plans to release excess water from the reservoirs during large rainfall events, such as the 100-year event and up to and including the PMF. These measures are summarized below:

- During stormwater inflow to the lower reservoir, operations would be adjusted or curtailed to account for higher than normal water in storage. The amount of available energy storage space in the lower reservoir would be reduced from 17,700 acre-feet by the volume of runoff entering the lower reservoir in order to avoid spills at the upper reservoir due to pumping. The number of hours of on-peak generation would be reduced or curtailed during large (>200 acre-feet) runoff events.
- For larger inflow volumes (>200 acre-feet), the lower reservoir spillway would be operated to release, by gravity, the extra water in storage. This would be accomplished by keeping the water level in the lower reservoir above the spillway crest level by about 3 feet (reservoir at elevation 1,098 feet) with releases of water from the upper reservoir through the turbines to the lower reservoir.

- During large inflow events, normal pumped storage operations would be interrupted until the excess water is removed from the reservoir system. Eagle Crest expects during this type of operation that one of the turbine units would be operated at its minimum flow rate (about 1,100 cubic feet per second [cfs]) for pre-arranged time periods. The attenuating effects of the reservoir would be adequate to maintain outflows close to 460 cfs on a continuous basis, with small reservoir storage level fluctuations above the spillway crest.
- These operations would cause the spillway to discharge 460 cfs. With no inflow, the reservoir would be drawn down by 1 foot in about 5.2 hours (ending with 3 feet of head on the spillway). This drawdown would allow minimum generation flow (1,100 cfs) to be released for about 2.7 hours until the spillway is discharging 460 cfs once again and then the operating cycle would repeat.

Eagle Crest states that this operational procedure after large flood events was designed based on a desire to have a relatively small amount of flow reach the alluvial fan balanced against the need to restore normal pumped storage operations in a reasonable amount of time following rare flood events.

Our Analysis

Runoff events in the project area are very rare and normally are of short duration with a limited amount of volume, as indicated by the historical gaging on Eagle Creek. Eagle Crest estimates that events producing inflows less than 200 acre-feet could be stored in the reservoirs to reduce the amount of make-up water needed. The 200 acre-feet could be stored in the lower reservoir without overtopping the proposed spillway, so normal operations could continue with inflow volumes less than 200 acre-feet. The upper reservoir could accommodate about 1,000 acre-feet without overtopping the spillway crest.

Eagle Crest estimated that a 100-year flood event would add about 2,000 acre-feet to the reservoir system. It would require about 2 days to remove this water from the two reservoirs following Eagle Crest's proposed operational procedures. With the proposed storage capacity of the upper and lower reservoirs, staff's calculations indicate that 2,000 acre-feet is about 11 percent of the excess storage that is available in the combined reservoirs. A pumped storage facility has the advantage that normally about half of the total active storage is available in one or a combination of the reservoirs at any time. Even though the estimated runoff during the 100 year event is only 2,000 acre feet, it is likely that the majority of this runoff would reach the reservoir system within a few hours, but would likely be less than the proposed total pumping or generation capacity (11,600 cfs) of the project. However, the exact timing would be a function of travel time in natural channels and the effects of attenuation by storage in the reservoirs. So it is likely that even with minor operational changes and spillways designed for larger events than the 100 year event, no major effects on the project area are likely.

Eagle Crest estimated the PMF event would add an estimated 11,520 acre-feet to the reservoir system and estimated the recurrence interval of this event as about once every 10,000 years. In the event of a PMF type event, operational changes would be needed for about 12 days to discharge the excess that would accumulate in the reservoirs.

The analyses discussed here are based on preliminary designs. The project design could change prior to construction, which would affect the parameters used in the analyses. To ensure that any design changes would not increase the environmental effects of releasing excess water from the reservoirs, the design flood determination would be included in the Supporting Design Report, which would be reviewed and commented on by the Commission staff prior to start of construction. A likely dam break analysis and analysis design of flood conditions would be included in the emergency action plan, which would be submitted at least 60 days prior to initial filling of the reservoir in accordance with Part 12, Subpart C of the Commission's regulations.

Effects of Operation on Water Quantity in Eagle Creek and the Alluvial Fan

Project construction and operation would result in changes to the amount of flow that reaches Eagle Creek and the alluvial fan during the rare flood events. Under current conditions, both existing mining pits retain the stormwater runoff, which is directed to their locations and limits the amount of flow that reaches Eagle Creek and the alluvial fan. Under proposed conditions, some of this stormwater could reach Eagle Creek, depending on operational conditions of the project. The addition of this water to Eagle Creek could create higher peak flows in Eagle Creek between the upper reservoir and the lower reservoir and downstream of the lower reservoir along the proposed overflow discharge location. Existing berms and other structures that exist along the lower reaches of Eagle Creek appear to have been constructed during the mining operations to direct flood water away from the Eagle Mountain town site and other structures.

Eagle Crest's response to Deficiency no. 6 summarizes its conceptual plans for channel modification to contain the PMF within the Eagle Creek channel. Included in these conceptual plans are berms and other modifications to direct flood water to the lower reservoir and away from other existing or proposed structures during the PMF and lesser flood events. However, based on Eagle Crest's analyses of Eagle Creek, it does not currently propose any modifications to contain the PMF within the Eagle Creek channel.

Eagle Crest has also designed the spillway and discharge channel of the lower reservoir and proposes an operational plan to limit the release from the lower reservoir to 460 cfs for a period of 13 days after a PMF event.

Our Analysis

Eagle Crest estimated that the peak PMF discharge in the Eagle Creek channel is 17,380 cfs, including 15,320 cfs of unregulated runoff from the main 7.3-square mile

portion of the watershed and 2,050 cfs from spillway operation at the upper reservoir, assuming that the upper reservoir is full to its normal pool at the onset of the flood.

This rate is based on an estimated peak PMF inflow to the upper reservoir of 4,640 cfs from its 1.7-square mile watershed, which would be attenuated to 2,050 cfs by storage above the spillway invert. Table 6 provides the estimated peak PMF flows at two locations under existing and proposed conditions.

Table 6. Peak flow (cfs) during the probable maximum flood (Source: Eagle Crest, 2009c).

	Existing Condition	**Proposed Condition**
Below the upper reservoir	0	2,050
Eagle Creek to lower reservoir	15,320	15,320
Total	15,320	17,370

Because of limited site access, Eagle Crest estimated hydraulic capacity at key locations of the Eagle Creek channel using available topographic mapping and aerial photos to provide estimated channel slopes and widths and to estimate flow depths and velocities at key locations. This analysis then used the two flow rates noted in table 6 for existing and proposed conditions in Eagle Creek. Based on the results provided by Eagle Crest from this analysis, the existing Eagle Creek channel should be adequate to convey PMF flows for existing and proposed conditions due to an increase in flow depth of about 0.4 foot and a velocity increase of about 0.9 foot per second, or about 5 percent. However, staff notes that especially in streams, such as Eagle Creek, substantial geomorphological changes are likely during large flood events, which could change the location and conveyance capacity of the channel. The flow velocities for Eagle Creek calculated by Eagle Crest indicate that during the PMF, velocities would range in the 16 to 18 feet per second range. Staff's calculations for smaller flood events indicate a flow velocity in Eagle Creek at more than 10 feet per second. Both of these ranges of flow velocities are capable of moving a large amount of sediment, gravel, and boulders and causing substantial erosion of existing and proposed structures and streambed conditions.

The average grade of the alluvial fan (which contains the buried CRA) in the vicinity of the lower reservoir spillway channel discharge point is about 2 percent. The water from the overflow spillway, at a proposed maximum rate of 460 cfs, is proposed to be conveyed through a riprap channel then discharged and spread across the alluvial fan during and after very large storm events such as the PMF. Calculations by Eagle Crest indicate that the flow velocity in the unlined alluvial fan should be about 3 feet per second during the PMF. During a PMF type event within the watershed and the Chuckwalla Valley, the possible erosion downstream of the lower reservoir as a result of a flow of 460 cfs should be insignificant.

More detailed analyses would be required during final design of the project. At that time, precise topographic mapping would be available and physical reconnaissance of the Eagle Creek and the overflow spill path from the lower reservoir could be performed. Once this information is collected and the final designs are complete, the parameters needed for channel capacity evaluation and design of channel improvements and/or armoring could be determined.

Reservoir Level Monitoring

Operation of the reservoirs would cause water levels to substantially fluctuate on a daily basis. During peak electrical demand periods, water would be released from the upper reservoir to the lower reservoir, and during low demand periods, water would be pumped to the upper reservoir. Fluctuations of the reservoir levels would affect not only terrestrial issues but would also create operational and safety issues. Safety measures would include ensuring that over-pumping or over-generation does not occur, causing spillage from the reservoir's emergency spillways. Safety and compliance associated with the water levels of the proposed project would fall under Part 12 of the Commission's Division of Dam Safety and Inspections regulations. Eagle Crest did not propose a reservoir monitoring program in its license application.

Our Analysis

Eagle Crest proposes to transfer a maximum of 17,700 acre feet of water between the two reservoirs on a daily basis with the proposed hydraulic capacity of 11,600 cfs. Under proposed operations, the upper reservoir would fluctuate between a minimum water elevation of 2,349 feet and a maximum water level of 2,485 feet. The lower reservoir would fluctuate between a minimum level of elevation 925 feet and elevation 1,092 feet. The average amount of daily fluctuation would probably be less than the total variation between the minimum and maximum water levels. The elevation of the proposed spillway at the upper reservoir is also at elevation 2,485 and the spillway at the lower reservoir is at elevation 1,095 feet, 2 feet above the maximum water surface at the lower reservoir elevation.

Environmentally, the fluctuation of the reservoirs could have an effect on possible acid production from water interaction with the rocks surrounding the proposed reservoirs and the potential for water seepage from the reservoirs as discussed later in this section. In addition, the fluctuating water levels could affect the potential for invasive species occurrence in the reservoir areas, as discussed in section 3.3.3, *Terrestrial Resources*, and the access to water for desert bighorn sheep as discussed in section 3.3.4, *Threatened and Endangered Species*.

Project operations would required a dedicated and redundant system of monitoring to ensure that over pumping and over release of water for the proposed project would not occur and would need to follow regulations set by the Commission's Division of Dam Safety and Inspections prior to operation of the project. A reservoir monitoring program

to address environmental issues would be less stringent and could include monitoring and documentation of reservoir levels at 15 to 30 minute and included in the project operation report.

Water Quality

Construction of the proposed project would increase the amount of disturbed soils available for mobilization during rain events and could affect sedimentation and turbidity. These effects are addressed in section 3.3.1, *Geologic and Soil Resources.* Operation of the proposed project could also result in increased salinity and acid levels in the reservoirs as the result of evaporation and the exposure of mining materials to water. This could potentially affect multiple water quality parameters within the proposed project area, as described in the following section.

Effects of Seepage and Evaporation from the Reservoirs and Brine Ponds on Groundwater Quality

Left untreated, the chemical components of the water lost to evaporation (dissolved minerals, nutrients, and other chemicals) would remain in the reservoirs, increasing dissolved mineral concentrations and decreasing water quality. Eagle Crest estimates evaporation losses from the reservoirs at 1,760 acre-feet per year. In addition, an estimated volume of up to 1,600 acre-feet of water per year would seep from the project reservoirs.

To maintain water quality within the reservoirs, Eagle Crest proposes to use a reverse osmosis treatment system that would remove water from the reservoir at a rate of 2,055 gpm (Measure GQ-1). This system would be designed to remove sufficient total dissolved solids to maintain the in-reservoir total dissolved solids at the average concentration of the source groundwater. The design of the reverse osmosis treatment system would comprise several pretreatment elements, including dissolved air flotation, automatic backwash screens, and a microfiltration system, to optimize treatment by the reverse osmosis process. Treated water would be returned to the lower reservoir, and the concentrated brine from the reverse osmosis process would be directed to the proposed evaporation ponds. These ponds would cover about 56 acres and Eagle Crest estimates the total brine production at about 270 acre feet per year. The proposed design for the evaporation ponds divides the total required pond area into six ponds of varying levels of salinity and five solidifying ponds. Each evaporation pond would be about 8.3 acres in size and each solidifying pond would be about 1.4 acres in size. The discharge from the reverse osmosis system would flow into one pond and be directed to another pond while the solution remaining in the first pond evaporates. Proposed pond design includes clay or membrane liners along the bottom and the 8-foot-high berms to protect against seepage. Eagle Crest proposes to use monitoring wells to help identify a potential liner failure (Measure GQ-2).

Our Analysis

Without treatment, the water quality in the reservoirs would diminish because salinity levels would increase due to evaporative losses from the reservoirs. Reverse osmosis systems are capable of desalinating water and producing mineral-free water. Eagle Crest's current proposed design would operate at a 90 percent recovery rate, the final reverse osmosis treatment step would produce 1,560 gpm of permeate to be returned to the lower reservoir, and 174 gpm of brine would be sent to the evaporation ponds.

Eagle Mountain's proposal to treat a sufficient volume of reservoir water to maintain water quality comparable to the source water should prevent degradation of water quality from salinity increases that would occur otherwise. To achieve this goal, Eagle Crest's proposal includes treating 3,315 acre-feet of reservoir water each year. According to Eagle Crest, this procedure would result in the production of about 2,500 tons of dry salt in the brine ponds each year. It is anticipated that the time required to concentrate dissolved solids in the reservoir to levels considered a degradation of water quality would take longer than any reasonable reverse osmosis system downtime scenario involving maintenance or repair. Staff also discusses potential effects of salt management in section 3.3.5, *Recreation, Land Use, and Aesthetics,* in the subsection *Land Use*. In addition to removing salts from the water, most other contaminants (e.g., microbes), nutrients, and minerals would be removed as well. Therefore, eutrophication is not expected to occur because the water quality in the reservoirs would be maintained.

The storage of brine in the surface ponds poses some risk to surface and groundwater quality. Brine pond leakage could pose a distinct threat to water quality. Failure of the pond wall or liner represent possible scenarios related to an accidental release of brine to the surrounding environment.

In the event of a pond wall failure, concentrated brine could wash out of the pond, resulting in surface flow. This type of a failure would release the brine, with high concentrations of salts and other minerals onto the soil, potentially harming vegetation. Staff estimates that the brine from a possible pond wall failure would affect a limited area and would not reach the CRA, which is buried and about 2.4 miles downgradient from the proposed ponds. The concentrated brine would percolate into the soil and eventually reach the groundwater as a plume after a largely vertical movement through the subsurface. However, the infiltration rate would be slow due to the low amount of infiltration from other sources, such as rain water. In addition, staff expects that the percolation and movement of brine through the soil would be slowed by the effects of viscosity, density, and the attachment of brine particles to soil particles. In this area of the site, groundwater is about 500 feet below the surface with about 300 feet of alluvial deposits over bedrock.

Eagle Crest has not specified the exact type of liner it is proposing, other than stating that it would be a clay or membrane liner. With a clay liner and concentrated brine, cation exchange[32] might be likely and this interaction could slowly increase the permeability of the clay liner. In the event of a pond liner failure, there would probably be a somewhat slow, continuous concentrated brine solution leak, which staff expects would move slowly to the groundwater table. Once the brine plume reaches the bedrock or the groundwater table, the plume would begin to move more horizontally downgradient where it might be intercepted by a proposed monitoring well. Eagle Mountain proposes to install monitoring wells around the brine ponds detect such a failure. However, due to the great depth to groundwater and the largely vertical expected movement of a possible brine plume, a leak would probably be observed in the monitoring well only months or years after the leak began. In addition, once a leak is detected in the monitoring wells, a large plume of brine would be moving through the unsaturated zone.

With proper construction and maintenance performed on the evaporating ponds, the risk of such scenarios would be minimized. Because the opportunity to inspect and replace the pond liners would occur in association with salt removal (proposed every 10 years), it is anticipated that the ponds would reliably hold the concentrated brine solution during this time and that the risk of a wall or liner failure is considered small. Proposed monitoring methods for the brine ponds are analyzed under *Water Quality Monitoring* below.

With Eagle Crest's proposed reverse osmosis system in place, total dissolved solids levels in the reservoirs should be nearly the same as the source groundwater. Therefore, seepage of reservoir water into the groundwater aquifer would not degrade groundwater quality. Additionally, Eagle Crest proposes a series of seepage recovery wells to recovery the vast majority of possible seepage water from the reservoirs (Measure SR-2). Therefore, water lost by seepage from the reservoirs would not contribute to an increase in chemical component concentration in the reservoirs because water quality components of the reservoirs would be similar to the groundwater. Proposed monitoring methods for the reverse osmosis system and the reservoirs are analyzed under *Water Quality Monitoring* below.

Effects of Project Operations on Acid Production and Water Quality

The interaction between water stored in the proposed reservoirs and the surrounding exposed mine pit material could affect water quality by exposing minerals to surface water and oxygen. When the common mineral iron disulfide or pyrite is exposed, it reacts with oxygen and water (oxidizes) to form sulfate and acidic conditions. Under these conditions, the acidic solution can then interact with the surrounding earthen materials and leach out

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[32] Cation exchange is the exchange of positively charged ions from the clay with the likely negatively charged brine solution.

arsenic, copper, cadmium, silver, zinc, and other heavy metals. Acid rock drainage and acid mine drainage are terms that refer to the outflow of this water.

Quantitative information to determine if acid production would occur during project operations does not exist. Eagle Mountain proposes to implement a Phase 1 Pre-Design Site Investigation Plan to address this issue prior to final project design and construction. Implementation of this plan would involve collecting field samples and conducting analyses to determine the site-specific acid production potential and the net neutralizing capacity. Once access to the site is granted, Eagle Crest (2009b) states that the plan would include the following steps:

1. Obtain samples from each pit from the different the stratigraphic zones. The thickness of each unit as exposed in the pit would be measured or estimated to determine the percentage contribution of each unit to acid production.
2. Perform analysis for pyrite, and total sulfur, and sulfate sulfur.
3. Calculate acid production potential (APP).
5. Determine the neutralization potential (NP).
6. Calculate the net neutralizing potential (NNP): NNP = NP – APP expressed as kg calcium carbonate/ton.

Our Analysis

Depending on many site-specific factors, the interaction between proposed project water and mine pit materials could result in acid production. Table 7 provides the primary, secondary, and tertiary factors that control acid production in mine environments (EPA, 1994). Currently, the lack of water is the single biggest factor limiting acid production at the project site.

Iron is the most important ore found in the mine pits and the primary minerals of this zone are magnetite and pyrite, and the secondary minerals are hematite and geothite (Dubois and Brummett, 1968, as cited in Eagle Crest, 1994). Some mineralogy data exist for the Eagle Mountain site in historical survey records; however, the quantity of pyrite and other sulfide minerals (necessary for acid production) is not well defined. About 170 million tons of iron ore reserves, considered economically recoverable at the time the mine was closed, remain at the entire Eagle Mountain mine site (Mine Reclamation Corporation, 1997, as cited in Eagle Crest, 2009a). According to Eagle Crest, iron ore reserves are magnetite mixed with pyrite, or magnetite and hematite with small amounts of pyrite. Eagle Crest (2009b) indicates that the lack of site access precluded it from sampling the central and eastern mining pits to calculate the amount of pyrite and acid rock drainage potential. Force (2001) reports that the lower ore zone of the central mining pit contains 10 to 50 percent platy pyrite, while earlier reports suggest pyrite ranges up to 10 percent, averaging 3 to 4 percent (Hadley, 1945). Because materials were removed during past mining operations, it is not clear what the composition of the remaining material is or the acid producing potential.

Table 7. Description of factors that control acid rock drainage (Source: EPA, 1994).

Factor Type	Description
Primary	Presence and type of: • sulfide minerals Presences of: • water • oxygen • ferric iron • bacteria to catalyze the oxidation reaction
Secondary	Presence and type of: • minerals that react acid produced, such as calcite and dolomite which neutralize the acid, or metals that change the character of the resulting effluent
Tertiary	• physical characteristics of the material • physical arrangement of acid producing and acid neutralizing materials • hydrologic regime

The proposed project would exhibit several of the U.S. Environmental Protection Agency (EPA) listed conditions that can lead to increased acid production (see table 7). Operation of the reservoirs would raise and lower water levels, resulting in a well-mixed and oxygenated water column. Mineral composition and the buffering capacity of the surrounding materials and the groundwater would dictate the potential for acid rock drainage.

The buffering capacity of the surrounding materials and groundwater could offset the rate and concentration of acids generated in the reservoirs. The pH of groundwater proposed to fill the reservoirs is slightly basic (pH 7.4 to 8.5), which would help to neutralize acid production. According to Eagle Crest, historical mineralogy information from the site shows no evidence of high concentrations of toxic metals in the site materials. However, specific measurements of the mineralogy and toxic metal content of the material that would come into contact with project waters have not been conducted.

Without samples to determine the amount of pyrite and other sulfides in the inactive mine pits, the extent of acid production is speculative. Implementation of Eagle Crest's proposed Phase 1 Pre-Design Site Investigation Plan would provide the data necessary to make quantitative determinations about the proposed project's effect on this aspect of water quality. Existing data suggest that acid generation could be limited due to the lack of sulfide minerals on site and buffering capacity of the site material and groundwater.

Eagle Crest states that the proposed reverse osmosis system would not be designed for treating the pH of the water; however, in the event of an observed drop in pH, the system could be retrofitted to accommodate buffering agents to treat water returning to the lower reservoir. In addition, the permeable membranes in the reverse osmosis system would filter any metals, precipitates (solids separated out of solution as a result of a chemical reaction), and the microbes involved in the chemical reaction that results in acid production.

Water Quality Monitoring

Any leakage from the reservoirs and brine ponds could adversely affect groundwater quality at the Eagle Mountain site and the Chuckwalla groundwater basin, depending on the water quality, amount of leakage, and infiltration rate. Eagle Crest proposes a number of surface and groundwater monitoring efforts throughout the proposed area to help identify and minimize any adverse effects (Measure GQ-2). It specifically identified a number of wells to monitor depth to groundwater and proposes to monitor groundwater quality near the proposed reservoirs and brine ponds. Eagle Crest proposes to develop a monitoring program using measurements from reservoirs, seepage recovery wells, monitoring wells, and brine ponds on a quarterly basis for the first 4 years of operation.

Our Analysis

Monitoring the water quality of the reservoirs and groundwater quality throughout the area is necessary to determine the effectiveness of the reverse osmosis system and seepage recovery systems. It is also needed to ensure that the brine pond liners are not leaking and to provide supporting data related to seepage estimates. Figure 7 shows the network of existing and proposed wells that Eagle Crest proposes to use for groundwater monitoring.

Monitoring the water quality of the groundwater seepage would allow for the assessment of groundwater quality effects on the aquifer surrounding the project in the event of water quality degradation in project waters. Eagle Crest proposes to monitor groundwater quality in seepage wells and in monitoring wells upgradient and downgradient of the reservoirs. Having these data would allow comparison of background water quality with any possible changes due to project operation. Quarterly monitoring of the reservoir water quality would ensure that Eagle Crest could determine the effectiveness of the reverse osmosis system. This monitoring would also alert Eagle Crest to water quality issues before similar water quality levels could be observed at the downgradient seepage recovery wells. Sampling could occur at the water supply pipe that feeds the reverse osmosis system, prior to the water undergoing any treatment, or the water could be sampled directly from the reservoirs.

It is likely that leakage from the brine ponds would not be measureable until months or years after the leakage starts due to the slow movement of the brine through

the estimated 500-foot unsaturated zone above the groundwater table. Under these conditions, substantial brine pond leakage could occur before detection by the proposed groundwater monitoring wells. Partially horizontal monitoring wells that sample transects below the brine ponds and do not extend into the groundwater table could allow for early detection of any leakage by monitoring for a change in the moisture vapor content. Under typical circumstances, the moisture content in the monitoring well would remain low, except as the result of a brine pond leak.

In addition to leakage, an inadvertent sudden release of brine pond water due to a breach in a pond wall could pose a threat to water quality. It would be useful for evaporation potential to be monitored to ensure that the release of brine into the ponds is occurring at the appropriate rates. Also, brine pond water levels could be monitored to protect the structural integrity of the pond walls and to prevent brine from overtopping the walls. Automatic brine pond-level monitoring devices could be designed to prevent the system from releasing brine into the ponds when water levels threaten or exceed the pond's design capacity.

Water quality protection could be enhanced if Eagle Crest prepared and implemented a comprehensive water quality monitoring plan for the reservoirs, seepage wells, monitoring wells, and brine ponds. The plan could be developed in consultation with the Regional and State Water Boards, and could include location, depth, monitoring frequency, methods, reporting practices, and other parameters for the proposed water quality monitoring. This plan could also include monitoring of evaporation potential and possibly dedicated brine pond monitoring wells. Parameters of interest that could be considered for measurement are salinity, total dissolved solids, pH, silica, nitrate as N, sulfate, sulfur (total), calcium, magnesium, sodium, neutralization potential, acid-base potential, aluminum, arsenic, boron, cadmium, copper, iron, lead, manganese, mercury, molybdenum, selenium, and zinc. These parameters are representative of baseline parameters of the groundwater in the area. A comprehensive water quality monitoring plan could also include steps to be taken in the event of water quality degradation in the reservoirs or groundwater. If the project had a detrimental effect on the quality of groundwater, the monitoring measures proposed by Eagle Crest, combined with the additional measures that could be included in a comprehensive water quality monitoring plan, would allow for surface and groundwater quality degradation and effects to be identified soon after they developed. Such a comprehensive plan could also identify procedures for Eagle Crest to follow to consult with agencies about additional measures that could be implemented to address any adverse effects on groundwater quality.

Groundwater Resources

This section focuses on project-related effects on groundwater quantity, primarily as they relate to the potential effects of the project pumping and existing water uses in the basin. Project-related effects to groundwater quality from the reservoirs and brine ponds are presented above under the heading *Water Quality*.

Effects of Project Operation on Groundwater Availability

Pumping groundwater in excess of annual recharge would potentially result in lowering of the water table and reduction of groundwater outflow from the Chuckwalla groundwater basin. Eagle Crest developed a groundwater balance for evaluating the proposed project's effect on groundwater supplies. Eagle Crest estimates that over the life of the project, initial pumping, in the assumed start year of 2014, would exceed recharge by about 4,600 acre-feet per year for the first 4 years, after which recharge would be exceeded by about 1,700 acre-feet per year. Total groundwater use by the project over a 50-year period is estimated at 96,600 acre-feet.

Eagle Crest proposes two measures to minimize the effects of project pumping in the basin. These include:

- Groundwater Level Monitoring (Measure WS-1)—establish a groundwater level monitoring network, consisting of both existing and new monitoring wells, to confirm that project pumping is maintained at levels that are in the range of historic pumping and assess changes in groundwater levels throughout the basins, beneath the CRA, and in the Pinto groundwater basin, and
- Neighboring Wells (Measure WS-3)—monitor existing wells on neighboring properties to determine, in consultation with the State Water Board, whether project pumping during the initial reservoir filling period is adversely affecting those wells, and if so, replace or modify those wells and/or compensate the well owner for increased pumping costs. This measure was expanded in the State Water Board's EIR (State Water Board, 2010) to additionally state that the adjacent, existing wells would be considered adversely affected if and when project pumping resulted in lowering water levels in those wells by 5 feet or more. This modified measure is herein referred to as Measure MM GW-2.

In its letter filed March 10, 2010, the Park Service recommends that Eagle Crest develop and implement a monitoring and mitigation plan to address the potential effects on groundwater resources in the upper Chuckwalla Valley and the Pinto groundwater basins.

Our Analysis

The Chuckwalla groundwater basin is estimated to contain between 9.1 and 15 million acre-feet of recoverable water. The effect of groundwater withdrawal by the project should not cause the aquifer to approach depletion because project withdrawals over 50 years of project operation would exceed recharge by only 96,600 acre-feet or about 1 percent of the recoverable water in the Chuckwalla groundwater basin. Implementation of Measure WS-1 would effectively monitor groundwater levels in the Upper Chuckwalla groundwater basin. The proposed locations of the monitoring wells would effectively surround the three proposed pumping wells that would be situated near Desert Center. The proposed monitoring wells would also monitor groundwater levels

along the boundaries of the basin to evaluate changes to the adjacent Orocopia Valley, Pinto, and Palen Valley groundwater basins.

Implementation of Measure WS-3 would allow Eagle Crest to use groundwater information from active wells on neighboring properties (thereby extending the monitoring network in the basin) and assess project-related effects on groundwater levels in those other wells.

If Eagle Crest were to continue implementation of Measure WS-3 beyond the initial reservoir filling period, it would allow Eagle Crest to ensure that any longer term effects of continuously withdrawing groundwater from the basin during operation of the project would be identified. The length of this continuation could be determined through consultation with FERC and the State Water Board and would depend on the effects observed. The continued implementation of this measure beyond the initial reservoir filling period could be managed as part of Measure WS-4, Groundwater Monitoring, which is described in more detail below under *Regional and Local Groundwater Level Effects*. The annual reports submitted to both FERC and the State Water Board under Measure WS-4 could additionally include monitoring results from the neighboring wells.

Measures WS-3 and MM GW-2 are discussed below under *Effects of Project Operations on the Regional and Local Groundwater Level and Flow Direction and Quality*. Both of these measures address the compensation of adjacent well owners who experience drawdown in their wells as a direct result of water withdrawals associated with the project.

Effects of Reservoir Seepage during Operations

The two proposed reservoirs and other water storage and conveyance features have the potential to seep water into the surrounding rock and soil substrates. Jointing and fracturing of the underlying bedrock and the general permeability of the rock and alluvial deposits could route seeped water from the reservoirs and other unlined structures downgradient to the sediments in the adjacent Upper Chuckwalla groundwater basin. The eastern side of the lower reservoir would overlie alluvial sediments that have direct connectivity with the groundwater basin.

Eagle Crest proposes to implement several measures to mitigate for seepage into the subsurface. These include:

- Seepage Recovery System from the Lower and Upper Reservoirs (Measures SR-1 and SR-2)—construct recovery wells downgradient from each reservoir and recover seeped water from the subsurface;
- Groundwater Monitoring (Measure SR-3)—develop and install a groundwater level monitoring network (different monitoring wells from those implemented under Measures WS-1 and WS-4) to confirm that seepage recovery well pumping is effectively managing groundwater levels in the project area, especially beneath the CRA and the proposed landfill;

- Groundwater Level Target (Measure SR-4)—maintain seepage from the upper reservoir below the bottom of the bottom liner of the proposed landfill and from the lower reservoir to prevent a significant rise in water levels beneath the CRA; and
- Groundwater Monitoring (Measure SR-5)—perform groundwater monitoring activities on a quarterly basis for the first 4 years of project pumping, and thereafter depending on the findings, and submit annual reports to interested parties.

In addition to the described actions under Measure SR-1, Eagle Crest proposes to install one of the seepage recovery wells prior to project construction to perform an aquifer test. Eagle Crest proposes to conduct this test during the final engineering design to confirm the seepage recovery well pumping capacity and aquifer characteristics. With information from the aquifer test, Eagle Crest proposes to re-run the seepage recovery groundwater modeling to determine the optimal locations for the remainder of the recovery wells. These wells are proposed to capture seepage water from the lower reservoir and limit possible groundwater level increases beneath the CRA. Eagle Crest's proposed alternative to Measure SR-1 (i.e., SR-1A) is evaluated below under effects on the CRA.

Our Analysis

The proposed reservoirs would occupy two open, former inactive mining pits that are underlain by bedrock and alluvium. As such, seepage from filled reservoirs is expected. Based on these hydrogeologic conditions in the project area, seepage could cause groundwater levels to locally rise, specifically beneath the nearby CRA. The rise of groundwater from seepage could potentially pose a subsidence risk from hydrocompaction in the project area and vicinity. Up to 1,600 acre-feet of water is estimated to potentially seep from the project facilities annually. Groundwater modeling results predict that groundwater levels beneath the lower reservoir would rise by about 4 to 12 feet, while levels in the vicinity of the CRA would increase by 3 to 6 feet. The proposed seepage control measures would consist of lining the reservoirs with fine tailings, lining the eastern portion (underlain with alluvium) with fine tailings and roller-compacted concrete, and installing a series of groundwater monitoring wells located downgradient from each reservoir for seepage monitoring and pump-back recovery. Monitoring groundwater levels throughout the groundwater basin area, with emphasis on the areas downgradient from the proposed reservoirs and brine disposal pond, would allow Eagle Crest to measure direct project effects on local and regional groundwater resources. In addition, this information would help to evaluate whether project effects would adversely affect groundwater levels beneath the CRA and the proposed landfill and provide information to help determine if future mitigation procedures would be needed.

The construction and mitigation measures proposed for the project are likely to be sufficient to control potential reservoir seepage effects on groundwater levels in the project area. However, some additional actions could be taken to ensure the protection of groundwater supplies. For example, the annual groundwater monitoring reports could be submitted to FERC and the State Water Board, along with findings from all groundwater monitoring activities conducted for this project (i.e., from Measures WS-1, WS-3, WS-4, SR-3, and SR-5). Additionally, data from the seepage recovery wells could be summarized and included in the annual groundwater monitoring reports. If Eagle Crest developed a groundwater hydrologic budget for the project area that includes precipitation, groundwater pumping (from the three proposed supply wells near Desert Center), reservoir filling, seepage pumping, possible reservoir surface releases, and groundwater monitoring data, this budget could be used quarterly to evaluate groundwater conditions in the project area, specifically in those areas close to the reservoirs, brine disposal pool, CRA, and landfill. Other relevant data that could be included in the groundwater monitoring reports are groundwater levels and flow directions.

Effects of Project Operations on the Regional and Local Groundwater Level and Flow Direction and Quality.

The proposed use of groundwater for initially filling the two reservoirs and maintaining water volumes during project operation has the potential to affect groundwater levels in the Chuckwalla groundwater basin. Depending on the extent of change in groundwater levels, changes could also affect the flow duration within the Chuckwalla groundwater basin and inflow and outflow from the connected areas of the adjacent groundwater basins.

Eagle Crest proposes several measures to minimize the effects of project groundwater pumping on regional and local aquifer levels in the basin. As stated above under the topics *Effects of Project Operation on Groundwater Availability* and *Effects of Reservoir Seepage during Operations,* Eagle Crest proposes to implement Measures WS-1, WS-3, SR-3, and SR-5 to monitor groundwater pumping and reservoir seepage rates and levels throughout the basin. Additionally, Eagle Crest proposes to implement Measures WS-4 and SR-4 to more specifically focus on project effects on local and regional groundwater levels and Measure LF-1 to replace four existing wells located within the proposed reservoir areas (P-1, MW-4, MW-5, and MW-10; see figure 7). These measures would involve monitoring groundwater levels on a quarterly basis for the first 4 years of project pumping, and thereafter depending on the findings, and submitting annual reports to both FERC and the State Water Board to confirm actual drawdown conditions.

Eagle Crest's Measure WS-3 involves monitoring existing wells on neighboring properties to determine whether project pumping during the initial reservoir filling period would adversely affect those wells, and if so, replace or modify those wells and/or compensate the well owner for increased pumping costs. This measure was expanded in

the State Water Board's EIR Measure MM GW-2 to set a threshold of 5 feet or more when the adjacent, existing wells would be considered adversely affected.

Our Analysis

The proposed project pumping could cause temporary overdraft of the Chuckwalla groundwater basin, causing local and regional groundwater levels to drop and flow directions to locally change. Eagle Crest's groundwater modeling indicates a predicted maximum groundwater drawdown of 50 feet near the pumping wells during the initial 4 years, but the drawdown would level off at about 14 feet thereafter. Drawdown of about 6 feet would occur at distances of 1 mile from the pumping wells. Along the CRA in the Upper Chuckwalla and Orocopia valleys, the modeled drawdown was about 3.6 to 4.3 feet. Groundwater levels could be lowered by about 3 to 4 feet at the mouth of the Pinto groundwater basin, with the amount of drawdown being less than this farther from the project area in the interior of the Pinto groundwater basin. Eagle Crest's modeling also estimated that after 50 years of project pumping, inflow from the Pinto groundwater basin would decrease by about 30 acre-feet per year compared to pre-project conditions.

Compared to maximum historical drawdown levels (over 100 feet) near Desert Center or at the mouth of the Pinto Valley, the maximum drawdown caused by the proposed project supply wells would be less than historical conditions, especially in areas more than 1 mile from the supply wells. However, the modeled drawdowns could potentially exceed maximum historic conditions beneath the CRA by 5 feet in the Upper Chuckwalla Valley and by 4 feet in the Orocopia Valley.

Eagle Crest's proposed Measure WS-3 and its additional components in the State Water Board's Measure MM GW-2 state that in the event that adjacent wells that are being monitored under Measure WS-3 experience a drawdown in their respective water levels by 5 feet or more, Eagle Crest would compensate the well owners. Based on the results of Eagle Crest's groundwater modeling, as summarized above, numerous wells identified in the Chuckwalla groundwater basin would potentially experience drawdown in excess of 5 feet, both during the initial reservoir fill period and through project operation. The number of existing wells that would be potentially adversely affected by project pumping is summarized in table 8. This information was based on a review of water well records summarized in Eagle Crest's final license application and the State Water Board's EIR (State Water Board, 2010). Of the wells listed in table 8, it is not known how many are active water production wells intended to provide water for domestic, agricultural, and/or industrial purposes. The well records summarized in Eagle Crest's final license application do indicate, however, that the majority of water production wells were installed during the brief agricultural boom period of the early 1980s in the Desert Center area when groundwater levels were substantially lower or were operational during that period. These well records also indicate that the majority of the monitoring wells were installed after the 1980s.

Table 8. Summary of water wells in the Chuckwalla groundwater basin that would potentially experience project-induced drawdown in excess of 5 feet (Source: Eagle Crest, 2009a, as modified by staff).

Project Pumping Time Period	Approximate Number of Existing Wells that would Potentially Experience Drawdown			Total Approximate Number of Wells that would Potentially Experience Drawdown >5 feet
	>20 feet	10–20 feet	5–10 feet	
Initial reservoir fill period (≤4 years)	2	24	36	62
After 50 years of project operation	0	2	43	45

Adjacent wells that were active during or have remained active since the 1980s would likely not experience adverse production, requiring well modification or replacement as a result of the proposed project pumping. Project-induced drawdown, either during the initial fill period or during the continued project operation, would not exceed historical drawdown levels. In the event that groundwater monitoring implemented under Measure WS-3 confirms Eagle Crest's modeling and shows that groundwater levels in these wells are being lowered by 5 feet or greater from present levels as a result of project pumping, Eagle Crest proposes would be to compensate the owner of the affected well(s) for additional pumping costs or provide other mitigation measures, such as lowering the well pump or replacing the well. Staff notes that the FPA, section 10(c), 16 U.S.C. 803, makes clear that a licensee of a hydropower project "shall be liable for all damages occasioned to the property of others by the construction, maintenance, or operation of the project works…."

In addition to potential project effects on groundwater levels, the pumping-induced groundwater depression could locally alter groundwater flow directions. Currently, groundwater flow is generally from the west and north and toward the south and east (California DWR, 1979, as cited in Eagle Crest, 2009a).

Modeling and detailed analyses have not been performed to investigate the possible changes in water chemistry due to the proposed pumping of supply wells for this project. However with the projected changes in groundwater levels and flow direction and the great depth to groundwater levels and limited natural infiltration, changes in the chemical or physical qualities of the groundwater are not expected due to the proposed withdrawal rates. In addition, the aquifer is unconfined and changes in the groundwater level would not cause a comingling of previously separated aquifers.

The local springs in the Eagle Mountains are not hydrologically connected to the nearby groundwater basins. As such, project pumping from the Chuckwalla groundwater basin would not affect the local, perched groundwater systems that feed these springs.

Implementing Measure WS-4, *Groundwater Monitoring*, Measure SR-4, *Groundwater Level Target*, and Measure LF-4, *Well Replacement*, would allow Eagle Crest to effectively evaluate groundwater levels and flow directions in the basin to confirm that project-induced drawdown and reservoir seepage do not adversely affect groundwater conditions in the basin. As stated in greater detail above under *Effects of Reservoir Seepage during Operations*, all groundwater monitoring data would be summarized into one annual report for submitted to FERC and the State Water Board.

Effects of Project Operations on Subsidence and Hydrocompaction

Groundwater pumping from three proposed supply wells in the Desert Center area and seepage from the proposed reservoirs have the potential to locally and regionally alter groundwater conditions in the project area and nearby groundwater basins. Subsidence could potentially occur as a result of project pumping if drawdown levels are substantial, typically greater than historical levels, causing the subsurface stratum to collapse. Subsidence could also potentially occur as a result of hydrocompaction of sediments wetted from reservoir seepage. This process has the potential to occur beneath the CRA because portions are located downgradient from the proposed reservoirs.

Eagle Crest proposes to implement Measure WS-2, Subsidence Monitoring, to measure the potential subsidence that could affect operation of the CRA. Two extensometers (measuring devices) would be installed along the CRA: one in the Upper Chuckwalla Valley (east of the proposed lower reservoir) and the other in the Orocopia Valley (southwest of the project area). Eagle Crest developed Measure WS-2 through consultation with the Metropolitan Water District, operators of the CRA (Eagle Crest, 2010b). In the event that data show inelastic subsidence in the project vicinity as a result of project pumping, Eagle Crest proposes to eliminate inelastic subsidence by: (1) redistributing pumping by constructing additional water supply pumping wells and modifying the pumping rates to reduce drawdown; (2) reducing pumping; or (3) by artificially increasing recharge in order to better match the net annual groundwater withdrawal to the net annual recharge.

Our Analysis

The proposed project would pump groundwater from the Chuckwalla groundwater basin to fill and maintain water levels in the proposed reservoirs. Eagle Crest estimates through groundwater modeling that drawdown would not exceed historical levels in most areas. Along the CRA, project-related withdrawals from the proposed supply well could potentially lower groundwater levels by up to an additional 5 feet below their historical lows. Because of water seepage from the proposed reservoirs, groundwater levels near the CRA could rise by 3 to 6 feet without the proposed seepage recovery wells.

Currently, groundwater levels below the CRA are in excess of 150 feet below ground surface.

There has been no reported evidence of subsidence in the project area (or along the CRA) to date; therefore, under proposed conditions, the potential for subsidence caused by project water supply pumping is low.

Project-induced groundwater changes should not lead to subsidence risks in the project area or vicinity. However, monitoring of the groundwater conditions and actual subsidence levels through the implementation of several measures, namely WS-1, WS-2, WS-3, WS-4, SR-1, SR-2, SR-3, SR-4, and SR-5, would help demonstrate that effects are as expected or would signal the need for corrective action. Through continued consultation with FERC and the State Water Board via the submission of final engineering designs and the annual groundwater monitoring reports, it may be determined that additional subsidence monitoring actions and/or active mitigation measures could be required to mitigate any predicted or measured subsidence risks in the project area and vicinity, especially those that could affect the CRA.

Fishery Resources

There are no existing water bodies in the project area capable of supporting fish populations. The project reservoirs would be hydraulically disconnected from any standing fish populations that could provide a potential source for fish migrating into the reservoirs. Eagle Crest proposes to use groundwater sources for the initial filling of, as well as subsequent additions to, the reservoirs, and these groundwater sources should not introduce fish or other aquatic resources into the reservoirs. It is possible that fish could be introduced through other means, including transport by birds; however, these events are expected to be extremely rare and unlikely to result in a breeding population. No measures have been proposed to ensure that the project does not affect fisheries.

Proposed project features, including the water pipeline, transmission line, and access roads, would cross several ephemeral washes. These streams are not federal jurisdictional waters under section 404 of the CWA, but do fall under the jurisdiction of California DFG. The state of California requires any person, state, or governmental agency or public utility to notify California DFG before beginning an activity that would affect fish and wildlife by (1) substantially diverting, obstructing, or changing the natural flow of the bed, bank, or channel of a river, stream, or lake, or (2) using material from or depositing material into a streambed. Such actions require a Streambed Alteration Agreement (Measure BIO-23).

California DFG can issue a Streambed Alteration Agreement only after the CEQA process is complete. Following completion of this process and once Eagle Crest has surveyed and staked all project features, Eagle Crest proposes to hold an on-site, pre-construction meeting with California DFG to determine specific locations where Streambed Alteration Agreements would be required. To minimize effects of the project on ephemeral washes, Eagle Crest proposes to avoid any disturbance within these areas to

the greatest extent possible. In areas where some disturbance is required, the Streambed Alteration Agreement would stipulate that all construction in these areas is completed while the washes are dry. During water line construction, Eagle Crest proposes to recontour wash topography using and implement erosion control measures to prevent construction materials from being deposited in the channels. Finally, during restoration/revegetation activities along the linear rights-of-way, Eagle Crest proposes to recontour and grade disturbed areas to ensure that existing drainage patterns remain unaffected.

Our Analysis

Eagle Crest's proposal to consult with California DFG following completion of the CEQA process and prior to project construction to obtain Streambed Alteration Agreements in all areas where the project would affect ephemeral washes is consistent with California DFG policies and would adequately protect these areas from potential project effects on fisheries and streambeds.

3.3.2.3 Cumulative Effects

Groundwater use in the basin for the proposed project, the proposed landfill, and the proposed and potential future solar projects would have the potential to cumulatively deplete groundwater in storage by 0.64 to 1.05 percent over the 50 years of the withdrawals for the proposed pumped storage project (Eagle Crest, 2010b). This conclusion is based on the assumption that the majority of the proposed solar developments would use dry cooling technology, which requires substantially less water compared with wet cooling technology, due to the need to maintain water efficiency standards in the state of California.

The subsidence potential remains low when considering the cumulative effects of pumping by the project, the existing groundwater users (e.g., agriculture), the proposed landfill, and the proposed and potential future solar projects in the region.

3.3.3 Terrestrial Resources

3.3.3.1 Affected Environment

Vegetation

The proposed project area lies in the California portion of the western Sonoran Desert, commonly called the "Colorado Desert." This includes the area between the Colorado River Basin and the Coast Ranges south of the Little San Bernardino Mountains and the Mojave Desert. Rainfall amounts are low, about 3 to 5 inches per year. The project area is warmer and slightly wetter than the Mojave Desert and while rainfall may occur in the winter months, monsoon rains during the summer account for the majority of the rainfall. Winter temperatures average 54 degrees Fahrenheit (°F). Ambient, daily summer temperatures are extreme, commonly reaching over 110°F for

long periods with an average of 90°F. This period of hot weather normally extends from mid-spring through the fall. As a consequence of these climatic conditions, the vegetation is highly drought-adapted, but also contains subtropical elements. In general, species richness and density are low due to the low rainfall and high temperatures, compared to more moderate environments or other regions of the Sonoran Desert.

Along the broad alluvial fan traversed by the project's proposed linear facilities, drainage is primarily characterized by scattered, well-defined washes and networks of numerous narrow runnels (sheet flow). The former are several-yards-wide, sandy to cobbly drainages that carry periodic runoff and are often a half to several yards deep, and vegetated along the banks by both shrubs and trees. By contrast, the numerous, shallow runnels are typically only a yard or less wide, one-to-few inches deep, and irregularly vegetated by locally common shrub species. Where there is greater runoff into these runnels, arboreal elements commonly seen in the larger washes are also present, but in a stunted form. Sheet flow is evident across alluvial fans where overland flows result from a combination of heavy precipitation, low permeability surface conditions, and local topography; the substrates there tend to be more gravelly than non-sheeting habitats due to the hydrologic transport of materials.

Two basic native plant communities exist in the proposed project area: Sonoran Creosote Bush Scrub and Desert Dry Wash Woodland. Creosote bush and burro bush dominate the variations of Sonoran Creosote Bush Scrub that occur in the proposed project vicinity. Other common species include brittlebush, white rhatany, several cholla species, indigo bush, and ocotillo. Desert Dry Wash Woodland occurs in broad plains of contiguous runnels (i.e., sheet flow) with intermittent, well-defined washes. For the latter, the wash banks and islands are densely vegetated with aphyllous (no leaves) or microphyllous (small leaves) trees, primarily ironwood and blue palo verde, with occasional to common smoke tree and catclaw. In the sheeting areas, the tree species are dominant elements of the landscape and appear to be homogeneous, forming a desert "woodland" (table 9). Other species commonly found in washes, including cheesebush, galleta grass, desert lavender, desert peach, chuparosa, and jojoba, grow in the arboreal drainages as well as the less distinct runnels.

The central project area (i.e., the area of the proposed reservoirs and power plant) is located in the edge of the Eagle Mountains and on the adjacent gently sloping alluvial fan. Much of this area has been disturbed by prior iron ore mining activities and the related town site. Where vegetation is present, Sonoran Creosote Bush Scrub is the dominant vegetation type.

The proposed transmission line would extend south from the central project area along the alluvial fan and over one very low mountain near the Metropolitan Water District's pumping plant. The northern 2.8 miles segment of the proposed transmission line would lie on Kaiser property, which has not been field surveyed. However, based on

Table 9. Acreage of native habitats and disturbed areas on the Eagle Mountain Project (Source: Eagle Crest, 2009a).

Project Element	Total Area	Sonoran Creosote Bush Scrub	Desert Dry Wash Woodland	Disturbed
Central project area	1,101.5	0	0	1,101.5
Transmission line (200-foot ROW)	327 (13.5 miles)	167 (6.9 miles)	136 (5.6 miles)	24 (1 mile)
Tower footprint plus construction area (3,600 square feet per tower)	4.6–5.7 (54–68 towers)	2.1–3.3 (26–40 towers)	1.8 (22 towers)	0.4 (4 towers)
Access road (200-foot ROW)	32.7	17.7	13.6	2.4
Pulling/tensioning sites	Currently unknown (intended to fall within the transmission line ROW and substation site)	Currently unknown	Currently unknown	Currently unknown
Equipment laydown sites	Currently unknown	Assume 0	Assume 0	Assume 100%
Proposed interconnection collector substation	25	25	0	0
Water pipeline (30-foot ROW)	55.6 (15.3 miles)	20.93 (8.1miles)	0 (0 miles)	34.73 (7.2 miles)
Total project acreage	≥1,219.8	≥65.7	≥15.4	≥1,139

aerial photos and surveys that were completed along the accessible portions of the transmission line ROW, about 1 mile of the ROW would be on land disturbed by mining and 6.9 miles would be in Sonoran Creosote Bush Scrub. In the south, the proposed ROW traverses 5.6 miles of Desert Dry Wash Woodland.

The proposed water pipeline would run southeast on the alluvial fan from the central project area, about 4.6 miles along the east edge of the Kaiser Road ROW through Sonoran Creosote Bush Scrub vegetation. The proposed water line then would run parallel to an existing 161-kV line ROW, initially through about 2 miles of Sonoran

Creosote Bush Scrub vegetation and then through abandoned jojoba fields to State Route 177. A dirt access road is present along this portion of the route between Kaiser Road and State Route 177. At State Route 17, the existing ROW splits, with one route running along State Route 177, mostly through agriculturally developed parcels, but also through about 0.3 mile of native Sonoran Creosote Bush Scrub. The other ROW fork runs southeast along an existing dirt road, primarily through abandoned fields, but also through about 1.2 miles of Sonoran Creosote Bush Scrub. The combined acreage of native Sonoran Creosote Bush Scrub intersected by the proposed water pipeline ROWs is 20.9 acres (see table 9).

Noxious and Invasive Species

Several non-native noxious or invasive species are known to occur in the project area. These species include three grasses—red brome, cheatgrass, and split grass—and two dicots—Tournefort's mustard and filaree. These species frequently colonize disturbed soils associated with agricultural fields and roadsides. The occurrence of tamarisk (also called salt cedar) was also reported in the eastern mining pit in the 1990s, but it is not visible on recent aerial photography of the area. Tamarisk typically colonizes wet areas associated with invaded riparian areas, including springs, rivers, and canals, outcompeting native vegetation for available resources (Eagle Crest, 2009b).

Wildlife

Common wildlife species in the proposed project area are either migratory, and/or adapted to desert environments. In the habitats intersecting the proposed project, wildlife include ungulates, small and midsized mammals, birds, reptiles, and invertebrates. Common species include black-tailed hare, desert kit fox, coyote, bobcat, antelope ground squirrel, Merriam's kangaroo rat, desert woodrat, California leaf-nosed bat, pallid bat, western pipistrelle, California myotis, black-throated sparrow, California horned lark, ash-throated flycatcher, mourning dove, cactus wren, lesser nighthawk, red-tailed hawk, and turkey vulture. Common species specifically associated with drainages include desert mule deer, verdin, black-tailed gnatcatcher, and phainopepla. Common reptiles include side-blotched lizard, desert iguana, zebra tailed lizard, western whiptail, desert horned lizard, gopher snake, and coachwhip. Amphibians are comparatively uncommon in the area due to lack of permanent water and unreliable ephemeral water. However, a few species of amphibians (red-spotted toad and Pacific treefrog) may breed in ephemeral water sources as they become available during summer or winter rains. Common invertebrates in the project area include spiders, beetles, true bugs, wasps, and ants.

Operation of the Eagle Mountain mine created specialized habitats associated with the mine pits, surrounding mine shafts, and the Eagle Mountain town site. These habitats attract additional wildlife species that do not typically occur in undisturbed desert areas, or occur at much lower densities outside areas with human activity. Species occupying these areas include common raven, house sparrow, house finch, and European starling. Several bat species, including California leaf-nosed bat, Townsend's big-eared bat, and

pallid bat, may now use the mine structures, and are generally intolerant of human activity.

Human Subsidized Predators

Increased human settlement in the arid southwestern United States is credited with an increased density of some predator species in this ecosystem, including ravens (Boarman et al., 2006; Knight et al., 1993) and coyote. Human settlement brings food and water subsidies to the desert environment and also adds new features to the landscape, like electricity and telephone line poles. These additions make the desert more habitable for wildlife species tolerant of human presence. While the increased density of these populations is dependent on human subsidies, their presence also creates increased predation rates on native wildlife including snakes, lizards, and the threatened desert tortoise.

Over the last 50 years, human activities have substantially modified the desert environment in the vicinity of the proposed project. These modifications, in addition to the Eagle Mountain mine, include construction of the Eagle Mountain town site, the CRA, and the Metropolitan Water District's pumping plant, and, to a lesser extent, development of campgrounds and other facilities within the JTNP. Landscape features associated with these developments include permanent supplies of standing water, electric and other utility lines, and potential food subsidies. These conditions are likely to subsidize resident populations of ravens and coyote. Both species are known to occur in the project area with some regularity; however, Eagle Crest has not conducted surveys for these species, and little is known about the current size of these populations other than that they are somewhat common.

Sensitive Species

Several species known to occur on or in the vicinity of the proposed project are accorded special status because of their recognized rarity or potential vulnerability to extinction. Frequently, they have an inherently limited geographic range and/or limited habitat. Some are state-listed as threatened or endangered and receive specific protection as defined in one or both of the federal ESA or California ESA. Candidate species for listing, species designated as "Species of Concern" or "Sensitive" by state or federal agencies, and plant species from Lists 1A, 1B, and 2 of the California Native Plant Society (CNPS), are protected under CEQA. These species are referred to collectively as special-status species.

While plant species from CNPS Lists 3 and 4 are watchlist species and generally not included for special-status consideration, several species from these two lists have been included by the NECO Plan as species for which surveys must be completed where a project intersects the species ranges, as mapped in the NECO Plan. Therefore, these plants are also included in the list of special-status species for the proposed project. Similarly, any wildlife species listed by the NECO Plan as special-status, even if not otherwise considered special-status, is included. Finally, two species (burro deer and

bighorn sheep) in the project area receive protection and management as game species, and burros are afforded protection by the Wild, Free-Roaming Horse and Burro Act.

Special-status, game, and protected species that may occur or have been documented to occur in the project vicinity and have potential to be affected by project activities are listed in table 10. This list includes only those species with the potential to be found in the area of project components, not all special-status species that are regionally known. The list is based on (1) records of the California Natural Diversity Data Base for special-status species that are known to occur in the project survey area; (2) CNPS records for special-status plants; (3) results from recent, relevant surveys and reviews; (4) the NECO Plan; and (5) known habitats in the area (i.e., experience of the consulting biologist).

Because of the special habitat value within the project area, high population density in the project area, or potential for the project to have concentrated effects on a population, several of the species presented in table 10 are discussed in more detail below.

These species include Nelson's bighorn sheep, burrowing owls, bats, and Couch's spadefoot toad. Two federally listed species are included in the list of special-status species with the potential to be in the project area: Coachella Valley milkvetch and desert tortoise; see section 3.3.4, *Threatened and Endangered Species*, for full discussion of these species.

Nelson's Bighorn Sheep

Nelson's bighorn sheep (also called desert bighorn sheep) are widely distributed from the White Mountains in Mono County to the Chocolate Mountains in Imperial County. They live most of the year close to the desert floor in canyons and rocky areas with ewe and ram populations generally occupying different areas and congregating during mating season. In summer, they move to better forage sites and cooler conditions in the mountains. Migration routes can occur across valleys between mountain ranges. The BLM management plan for this species identifies eight metapopulations, two of which are included in the NECO Planning Area: the Southern Mojave and Sonoran metapopulations. These metapopulations are further divided into demes, or populations. The project is located in the Southern Mojave Metapopulation, adjacent to the Eagle Mountain population and near the Coxcomb population. The central project area is located in BLM's Joshua Tree National Park Desert Bighorn Sheep Wildlife Habitat Management Area.

Table 10. Potential for special-status species (Source: Eagle Crest, 2009a).

Species	Status Federal	Status State[a]	CNPS[b]	Habitat	Likelihood of Occurrence on the Project Site
Plants					
Abrams's spurge (*Chamaesyce abramsiana*)	--	--	2	Sandy sites in Mojavean and Sonoran Desert scrubs in eastern California; 0–3,000 feet	Possible along the water pipeline; fall flowering
Arizona spurge *(Chamaesyce arizonica)*	--	--	2	Sandy flats in Sonoran Desert scrubs, below ~1,000 feet	Possible along the water pipeline; not observed
Ayenia *(Ayenia compacta)*	--	--	2	Sand and gravelly washes and canyons in desert scrubs, 450–3,600 feet	Possible around the central project area; not observed on 2008 or 2009 surveys
California ditaxis *(Ditaxis serrata* var. *californica)*	--	--	3	Sonoran Creosote Bush Scrub from 100 to 3,000 feet	Observed on both linear ROWs
Coachella Valley milkvetch (*Astragalus lentiginosus* var. *coachellae)*	E BLM Sensitive	--	1B	Loose to soft sandy soils, often in disturbed sites; 100 to 2,200 feet	Highly unlikely—little to no habitat on project lands and local reported populations appear to have been misidentified; not observed

Species	Status Federal	Status State[a]	CNPS[b]	Habitat	Likelihood of Occurrence on the Project Site
Coue's cassia (*Senna covesii)*	--	--	2	Dry washes and slopes in Sonoran Desert scrubs, 1,000 to 3,500 feet	Possible, especially on the bajadas (compound alluvial fans at the base of mountains) and on/near the central project area; species not observed in 2008, 2009 or on related surveys
Crucifixion thorn *(Castela emoryi)*	--	--	2	Mojavean and Sonoran Desert scrubs; typically associated with drainages	Observed on the water pipeline
Desert sand-parsley (*Ammoselinum giganteum*)	--	--	2	Sonoran Desert scrub; known from only one site, near Hayfield Dry Lake, at 1200 feet; last seen in 1922	Highly unlikely; not observed
Desert unicorn plant (*Proboscidea altheaefolia*)	--	--	4	Sandy areas in Sonoran Desert scrubs throughout southeastern California, below 3,300 feet	Observed near the well sites; possible throughout the valley
Dwarf germander (*Teucrium cubense depressum*)	--	--	2	Sandy soils, washes, playa edges, and fields in Sonoran Desert scrubs, below 1,300 feet	Possible on the water pipeline, in the valley; not observed

Species	Status Federal	Status State[a]	CNPS[b]	Habitat	Likelihood of Occurrence on the Project Site
Flat-seeded spurge (*Chamaesyce platysperma*)	BLM Sensitive	--	1B	Sandy flats and dunes in Sonoran Desert scrubs; below 350 feet; may be extirpated in California	Possible on the water pipeline, in the valley; not observed
Foxtail cactus (*Coryphantha alversonii*)	--	--	4	Primarily rocky substrates between 250 and 4,000 feet; Creosote Bush Scrub	Observed on both linear ROWs
Glandular ditaxis (*Ditaxis claryana*)	--	--	2	Sandy flats in Mojavean and Sonoran Creosote Bush scrubs in Imperial, San Bernardino, and Riverside counties; below 1,500 feet	Possible; not observed
Harwood's eriastrum (*Eriastrum harwoodii*)	--	--	1B	Range restricted to loose-sandy areas of eastern Riverside and San Bernardino counties	Unlikely due to lack of habitat; not observed
Harwood's milkvetch (*Astragalus insularis var. harwoodii*)	--	--	2	Dunes, windblown sands, and soft sands below 1200 feet., east and south of Desert Center	Unlikely, no apparent habitat; not observed
Jackass clover (*Wislizenia refracta var. refracta*)	--	--	2	Sandy washes, roadsides, flats; 1,900 to 2,700 feet	Unlikely due to lack of habitat; not observed

Species	Status Federal	Status State[a]	CNPS[b]	Habitat	Likelihood of Occurrence on the Project Site
Las animas colubrina (*Colubrina californica*)	--	--	2	Sonoran Creosote Bush Scrub <3,300 feet	Possible on/near the central project area; not observed in 2008, 2009 or on related surveys
Mesquite neststraw (*Stylocline sonorensis*)	--	--	1A	Open sandy drainages; known from one site near Hayfield Spring; not seen since 1930 and presumed extinct in California	Highly unlikely; not observed
Orocopia sage (*Saliva greatae)*	BLM Sensitive	--	1B	Mojavean and Sonoran Desert scrubs; gravelly/rocky bajadas, mostly near washes; below 3,000 feet; only known west of the Project	Unlikely but possible near/on the central project area; reported south of the central project area in earlier surveys but not observed in 2008 and 2009 on the linear ROWs
Sand evening primrose (*Camissonia arenaria)*	--	--	2	Sandy washes, rocky slopes, Sonoran desert scrubs; below 1,500 (3,500) feet	Possible; not observed

Species	Status Federal	Status State[a]	CNPS[b]	Habitat	Likelihood of Occurrence on the Project Site
Slender woolly-heads (*Nemacaulis denudate* var. *gracilis)*	--	--	2	Dunes in coastal and Sonoran Desert scrubs, primarily in the Coachella Valley; below 1,500 feet	No habitat; not observed
Spearleaf *(Matelea parvifolia)*	--	--	2	Rocky ledges and slopes, 1,000 to 6,000 feet, in Mojave and Sonoran Desert scrubs	Possible habitat near/on the central project area
Spiny abrojo (*Condalia globosa* var. *pubescens*)	--	--	4	Sonoran Creosote Bush Scrub; 500 to 3,300 feet	Possible on/near the central project area; not observed in 2008 or 2009 surveys
Wiggins' cholla (*Opuntia wigginsii*)	--	--	3	Eastern Riverside County, under about 3,000 feet	Observed in 2009 surveys
Invertebrates					
Cheeseweed owlfly (*Oliarces clara*)	--	--	--	Creosote bush scrub in rocky areas	Possible, especially near the central project area
Amphibians					
Couch's spadefoot (*Scaphiopus couchii*)	BLM Sensitive	SSC	--	Various arid communities in extreme southeastern California and east, south	Possible on entire project area; no artificial impoundments

Species	Status Federal	Status State[a]	Status CNPS[b]	Habitat	Likelihood of Occurrence on the Project Site
Reptiles					
Chuckwalla (*Sauromalus ater*)	--	--	--	Rock outcrops in Mojave and Sonoran Desert scrubs	Observed; also likely on/near the central project area
Desert rosy boa (*Charina trivirgata gracia*)	BLM Sensitive	--	--	Rocky uplands and canyons; often near stream courses	Possible, especially near the central project area
Mojave fringe-toed lizard (*Uma scoparia*)	BLM Sensitive	SSC	--	Restricted to aeolian sandy habitats in the Mojave and northern Sonoran deserts	Does not occur on project area due to lack of habitat
Desert tortoise (*Gopherus agassizii*)	T	T	--	Most desert habitats below about 5,000 feet in elevation	Observed on both linear ROWs in 2008 and 2009; likely on central project area
Birds					
American peregrine falcon (*Falco peregrinus anatum*)	Delisted BCC	E Fully Protected	--	Dry, open country, including arid woodlands; nests in cliffs	Possible forager onsite, may nest in adjacent mountains; not observed
Bendire's thrasher (*Toxostoma bendirei*)	BCC BLM Sensitive	SSC	ABC:WLBCC	Arid to semi-arid brushy habitats, usually with yuccas, cholla, and trees	Possible; not observed

Species	Status Federal	Status State[a]	CNPS[b]	Habitat	Likelihood of Occurrence on the Project Site
Burrowing owl (*Athene cunicularia*)	BCC BLM Sensitive	SSC	--	Open, arid habitats	Observed on linear ROWs; possible on central project area
Crissal thrasher (*Toxostoma crissale*)	BCC	SSC	--	Dense mesquite and willows along desert streams and washes	Unlikely, but possible on central project area only; no habitat on linear ROWs and not observed
Ferruginous hawk (*Buteo regalis*)	BCC BLM Sensitive	WL	--	Arid, open country	Possible winter resident only
Gila woodpecker (*Melanerpes uropygialis*)	BCC	E	--	Desert woodland habitats	Possible; not observed
Golden eagle (*Aquila chrysaetos*)	BCC BLM Sensitive	WL Fully Protected	--	Open country; nests in large trees in open areas or cliffs	Possible forager on site, may nest in adjacent mountains; observed in 2008.
Loggerhead shrike (*Lanius ludovicianus*)	BCC	SSC	--	Arid habitats with perches	Common; observed
Mountain plover (*Charadrius montanus*)	BCC BLM Sensitive	SSC	ABC:WLBCC	Dry upland habitats, plains, bare fields	Unlikely, but possible winter visitor to agricultural fields in the project area

Species	Status Federal	State[a]	CNPS[b]	Habitat	Likelihood of Occurrence on the Project Site
Northern Harrier (*Circus cyaneus*)	--	SSC	--	Open habitats; nests in shrubby pen land and marshes	Possible; not observed
Prairie Falcon (*Falco mexicanus*)	BCC	WL	--	Dry, open country, including arid woodlands; nests in cliffs	Likely forager on site, may nest in adjacent mountains; not observed
Short-eared owl (*Asio flammeus*)	--	SSC	ABC:WLBCC	Open habitats: marshes, fields; nests on ground and roosts on ground and low poles	Possible winter visitor
Sonoran yellow warbler (*Dendroica petechia sonorana*)	BCC	SSC	--	Riparian habitats, woodlands, orchards	Possible—no habitat on linear ROWs and habitat on the central project area is unknown; observed at the Eagle Mountain town site reservoir on previous survey; not observed during 2008 and 2009 surveys

Species	Federal	Status State[a]	CNPS[b]	Habitat	Likelihood of Occurrence on the Project Site
Vermilion flycatcher (*Pyrocephalus rubinus*)	--	SSC	--	Wooded and shrubby sites near water, especially with willows, mesquite and cottonwoods	Highly unlikely except as transient—no habitat on linear ROWs and unlikely to be habitat on the central project area; not observed
Yellow-breasted chat (*Icteria virens*)	--	SSC	--	Dense streamside thickets, willows; brushy hillsides and canyons	Highly unlikely except as transient—no habitat on linear ROWs and unlikely to be habitat on the central project area; transients observed in area on two previous surveys, but not observed during 2008 and 2009 surveys
Mammals					
American badger (*Taxidea taxus*)	--	SSC	--	Many habitats	Observed in 2008 and 2009
Big free-tailed bat (*Nyctinomops macrotis*)	--	SSC	WBWG:MH	Cliffs and rugged rocky habitats in arid, country, also riparian woodlands	Possible forager on site, especially near mountains

Species	Federal	Status State[a]	CNPS[b]	Habitat	Likelihood of Occurrence on the Project Site
Burro deer (*Odocoileus hemionus eremicus*)	--	Game species	--	Arboreal and densely vegetated drainages	Observed
California leaf-nosed bat (*Macrotus californicus*)	BLM Sensitive	SSC	WBWG:H	Lowland desert associate, found in caves, mines, tunnels and old buildings	Known from Eagle Mountain mine so possible near or on the central project area
Colorado valley woodrat (*Neotoma albigula venusta*)	--	--	--	Under mesquite in creosote bush scrub; southeastern California	Possible
Nelson's bighorn sheep (*Ovis canadensis nelsoni*)	BLM Sensitive	Game species (not hunted in project area)	--	In mountains and adjacent valleys in desert Scrub	Likely near the central project area; detected on previous surveys
Pallid bat (*Antrozous pallidus*)	BLM Sensitive	SSC	WBWG:H	Several desert habitats	Possible, primarily near the central project area; detected on previous surveys
Pocketed free-tailed bat (*Nyctinomops femorosaccus*)	--	SSC	WBWG:M	Variety of arid areas in pinyon-juniper woodland, desert scrubs, palm oases, drainages; always near rocky areas	Possible near the central project area

Species	Federal	Status State[a]	CNPS[b]	Habitat	Likelihood of Occurrence on the Project Site
Spotted Bat (*Euderma maculatum*)	BLM Sensitive	SSC	WBWG:H	Arid scrub and grasslands, to coniferous forests, roosts in cliffs, forages along streams and in woodlands, fields	Possible near the central project area
Townsend's big-eared bat (*Corynorhinus townsendii*)	BLM Sensitive	SSC	WBWG:H	Broad habitat associations. Roosts in caves and manmade structures; feeds in trees	Possible, primarily near the central project area and transmission line; detected on previous surveys
Western mastiff bat (*Eumops perotis californicus*)	BLM Sensitive	SSC	WBWG:H	Cliffs, trees, tunnels, buildings in desert scrub	Highly likely near/on the central project area; detected on previous surveys

[a] Source: California DFG, 2010, 2009

Applicable Status codes are as follows:

E – Endangered

T – Threatened

Federal C – Candidate species for listing

Federal SC – Species of Special Concern (species whose conservation status may be of concern to FWS, but have no official status [formerly C2 species])

Federal BCC –FWS Bird of Conservation Concern

State SSC – California DFG Species of Special Concern (species that appear to be vulnerable to extinction)

State Protected – Species that cannot be taken without a permit from California DFG

State Fully Protected – Species that cannot be taken without authorization from the Fish and Game Commission

State WL – Watchlist species: species that are not SSC, state-listed, or fully protected (Note: State WL species have not been included in this table if they have no other protection designation.)

BLM Sensitive – Species under review, rare, with limited geographic range or habitat associations, or declining. BLM policy is to provide the same level of protection as FWS candidate species

[b] CNPS: List 1A – Plants presumed extinct in California

List 1B – Plants rare and endangered in California and elsewhere

List 2 – Plants rare and endangered in California but more common elsewhere

List 3 – Plants about which CNPS needs more information

List 4 – Plants of limited distribution

(Note: CNPS lists 1 and 2 require CEQA consideration.)

ABC:WLBCC – American Bird Conservancy United States Watchlist of Birds of Conservation Concern

WBWG – Western Bat Working Group (http://wbwg.org):

H – High Priority – These species should be considered the highest priority for funding, planning, and conservation actions.

M – Medium Priority – These species warrant closer evaluation, more research, and conservation actions of both the species and the threats

L- Low Priority – Most of the existing data support stable populations of the species and that the potential for major changes in status is unlikely

A telemetry study conducted for the Eagle Mountain landfill project (Divine and Douglas, 1996) concluded that two non-interactive ewe populations inhabit the Eagle Mountains—one in the northern region of the mountains near the Eagle Mountain mine, and the other in the south near Lost Palms Oasis. The ram population generally occupies habitat between the two ewe populations. In the fall, the rams segregate themselves and migrate to the two ewe populations to breed. The study identified two primary water sources for the northern ewe population. Buzzard Spring (located south of the central project area) is ephemeral but more reliable than other springs and functions as the primary water source, and Eagle Tank (located north of the central project area) is ephemeral and dry during the summer months. Migration paths between these water sources likely traverse areas adjacent to the central project area.

Surveys conducted in 1995 for the Eagle Mountain landfill observed bighorn scat in the central project area. Eagle Crest was not given access the site to conduct current surveys, so more information about the Nelson's bighorn sheep is not available.

Burrowing Owl

The burrowing owl is a BLM sensitive species that occurs in open arid areas. The owls generally occur in colonies and build nests in burrows, which are an essential component of burrowing owl habitat: both natural and artificial burrows provide protection, shelter, and nests for the owls. The burrows are typically constructed by other burrowing animals including kit fox, badger, and ground squirrel, but the owls also use human-made structures, such as cement culverts; cement, asphalt, or wood debris piles; or openings beneath cement or asphalt pavement (California Burrowing Owl Consortium, 1993).

Eagle Crest conducted phase I habitat surveys (2008) and phase II presence/absence surveys (2009). During the phase II survey, biologists located two owl burrows—one active and one inactive. One burrow is located on the proposed water pipeline ROW, the other is on the proposed transmission line ROW near the southern terminus.

Raptors

Several special-status raptor species, including golden eagle and prairie falcon, have the potential to occur in the central project area. Golden eagles nest in large trees in open cliff areas. Prairie falcon nest on vertical cliff faces. Foraging habitat for both species includes open areas where small and mid-sized animals are present. Nesting season for golden eagles in the southern part of their range (including the project area) can begin as early as late January and last through August (California Wildlife Habitats Relationship System, 2010a). Nesting season for the prairie falcon lasts from mid-February through mid-September with peak season from April to early August (California Wildlife Habitats Relationship System, 2010b).

As part of its July 7, 2010, filing (Eagle Crest, 2010a), Eagle Crest provided results from golden eagle surveys that took place in March and April 2010. The surveys covered mountainous areas within 10 miles of the proposed project. The surveyors located a total of 34 golden eagle nest sites distributed among nine active and five inactive eagle territories in the project region. Four of the territories identified overlap the Eagle Mountain Project area. Surveyors recorded one incubating golden eagle female within the nine active territories. Other raptor species encountered during the surveys include the American kestrel, barn owl, Cooper's hawk, great horned owl, long-eared owl, northern harrier, osprey, peregrine falcon, prairie falcon, red-tailed hawk and Swainson's hawk.

Bats

Several BLM sensitive bat species are known to occur in the project area. These species include big free-tailed bat, California leaf-nosed bat, pallid bat, pocketed free-tailed bat, spotted bat, Townsend's big-eared bat, and Western mastiff bat. These species all prefer roosting areas associated with caves, cliffs, or rocky outcrop habitat, which is present in the central project area. Foraging habitat for these species exists in desert scrub and desert riparian areas within the project area.

Couch's Spadefoot Toad

Couch's spadefoot toads spend their lives in proximity to ephemeral pools in the southern California desert. During dry periods the adults live buried under the surface. It is possible for the toads to survive these dry conditions for multiple years without emerging from their burrows. Following spring and summer rains, the toads emerge to feed and breed in the inundated pools. In portions of the project area where access was permitted, Eagle Crest conducted surveys for all ephemeral impoundments with the potential to support this species. No surveys were conducted in the central project area.

3.3.3.2 Environmental Effects

In its draft EIR for the Eagle Mountain Project, the State Water Board identified its recommended substation location and transmission line as the environmentally superior interconnection alternative for the project. As depicted on figure 2, the State Water Board's recommended substation would be located immediately south of Interstate 10 and about 6 miles east of the applicant's proposed substation. The State Water Board's recommended transmission line would diverge for the applicant's proposed line after crossing the CRA. The State Water Board's recommended transmission line would then parallel the existing 160-kV SCE transmission line for about 10.5 miles going southeast to a point just north of the proposed substation, then it would travel south about 2 miles to the substation. In the discussion below, staff compares the effects of this recommendation with the applicant's proposed alternative.

Staff's discussion of environmental effects presented below is based on information provided in the final license application (Eagle Crest, 2009a), additional

information filed by Eagle Crest (Eagle Crest, 2009b, 2009c), Eagle Crest's response to comments on the final license application (Eagle Crest, 2009e) Eagle Crest's supplemental information filed on July 7, 2010 (Eagle Crest, 2010a). Staff's discussion of effects specific to construction and operation of the transmission line is based on the results of Eagle Crest's 2008, 2009, and 2010 surveys and information provided in the State Water Board's draft EIR (State Water Board, 2010).

Effects of Construction on Vegetation

Construction of the project would permanently disturb lands within the footprint of project facilities including the Eagle Mountain switchyard, desalination area, administration buildings, access roads, transmission line support structures, and reservoirs. Additional temporary disturbance would occur at lay down and staging areas, and at transmission line pull sites. These activities have the potential to remove or disturb existing vegetation and alter soil characteristics through compaction, subsidence, erosion, and changes in drainage patterns.

In response to the Commission's request for additional information, Eagle Crest filed its WEAP on October 27, 2009. The WEAP includes the training of staff biological monitors that would be onsite during construction. The monitors would have the authority to halt construction activities if they determine sensitive resources are at risk. These monitors would be responsible for clearing and designating safe work areas, flagging sensitive areas, and monitoring exclusion fencing. Construction crews would be instructed to only work in areas approved by the biological monitors. Desert animals frequently take refuge in shaded areas associated with parked vehicles. As such, the biological monitors would also be responsible for inspecting and clearing these areas prior to vehicle movement.

During construction in native habitats, Eagle Crest proposes to restrict surface disturbance to the smallest area necessary to complete the construction (Measure BIO-5). Eagle Crest would design new spur roads and improvements to existing roads in a way that would preserve existing desert wash topography and flow patterns.

In addition to the measures described above, Eagle Crest also proposes several measures specifically designed to reduce effects of project construction on local vegetation, including the revegetation of all temporarily disturbed areas. In response to the Commission's request for additional information, Eagle Crest filed its Revegetation Plan on October 27, 2009 (Measure BIO-8). The plan includes developing a quantitative description of the existing vegetation community, so revegetation success can be measured. To increase potential for successful revegetation in the desert environment, Eagle Crest would retain topsoil removed during site clearing and return the soil to the site prior to planting. Eagle Crest's plan also includes micro-site preparation and grading. This preparation would include vertical mulching and other techniques to increase germination potential and plant growth. Eagle Crest's planned restoration techniques include (1) seeding and/or planting seedlings of colonizing species and

(2) developing a soil micro-community by inoculating mycorrhizal fungi and planting species that develop a mycorrhizal net. Following planting, Eagle Crest would implement weed control and initial irrigation. Eagle Crest's Revegetation Plan also includes a schedule for the expected regrowth of native species and remedial measures to be implemented if needed.

As compared to the proposed route, the State Water Board's recommended route would increase the length of the transmission line by 2.9 miles. The State Water Board's route would cross 181 acres of Sonoran Creosote Bush Scrub; 97 acres of Desert Dry Wash Woodland; and 121 acres of developed land.

Our Analysis

Construction of the project would have unavoidable effects on local vegetation. Based on habitat mapping and current project design, construction of the proposed project would permanently remove or temporarily affect 67.7 acres of Sonoran creosote bush scrub and 15.4 acres of desert dry wash woodland. While some of these effects are temporary, such as disturbance within lay down and storage areas and pull sites, the desert environment in which they occur is very slow to regenerate. Clearing of native vegetation in lay down areas, transmission line pulling sites, transmission line support tower footprints, waste spoil and salt disposal sites, brine ponds, and water pipeline would be a necessary component of constructing project facilities.

The State Water Board's recommendation would require less new ROW development and cross a fewer acres of Dry Dessert Woodland. This alternative would cross 20 more acres of creosote bush scrub; however, unlike the proposed alternative, these lands would generally be outside the Desert Wildlife Management Area (DWMA) and desert tortoise critical habitat. Additionally, this alternative would use a greater percentage of disturbed lands. Therefore, the State Water Board's recommendation would have less effect on vegetation resources.

Implementation of Eagle Crest's proposed WEAP would ensure the potential for inadvertent effects on sensitive species is reduced. Keeping state and federal resource management agencies appraised of construction activities and implementation of mitigation measures would provide the agencies oversight of these activities and ensure effects are minimized and mitigation is effective. Careful planning and design of construction areas and access roads to reduce the extent of disturbance in native habitats and maintain existing drainage patterns is also a necessary component of limiting project effects in these areas.

Eagle Crest's proposed measures would limit effects of construction on vegetation through revegetation plantings and control of invasive species. Yet, compared to non-desert areas, the duration of these effects would be much longer, with regeneration to existing conditions likely requiring several decades. However, these effects would be highly localized within the project footprint and would have minimal effect on areas immediately adjacent to the disturbance areas. The overall area of disturbance would

also be small compared to the large extent of similar vegetation structure in the surrounding area and the project is not expected to cause any population level effects on vegetation species. This is true for all four transmission line routes analyzed.

Effects of Operation on Vegetation

Operation of the project would include the addition of water to the project reservoirs, proposed generating operations, and maintenance of project facilities. These activities could affect vegetation by providing water subsidies or disturbing new lands as required for maintenance.

To reduce potential effects of project operations on vegetation, Eagle Crest's WEAP requires that all maintenance activities potentially requiring ground disturbance occur in the presence of biological monitors. Additionally, in 2006 Eagle Crest entered into a Memorandum of Understanding (MOU) with FWS, BLM, and U.S. Department of Agriculture, Forest Service (Forest Service) that provides guidelines for vegetation maintenance along transmission line ROWs on federal lands. This MOU also includes standards for revegetation practices in these areas.

Our Analysis

Following construction, staff expects operation of the transmission line and water pipelines would have little, if any, effect on vegetation. If any leaks are present in the pipeline, desert annuals are likely to colonize the localized areas.

Specific soil conditions at the elevation of the normal high water line around both reservoirs are unknown since Eagle Crest was not given access to conduct surveys in these areas. However, past mining activities have removed any topsoil, and staff expects current materials in these areas to have high mineral content and very low nutrient availability. Such areas typically require many decades to develop "crypotobiotic crusts," which consist of microbes that convert elemental nitrogen into forms accessible to plants. Under these conditions, staff expects vegetation establishment to occur very slowly.

Operation of the project reservoirs would add water to areas currently void of vegetation. It is possible that vegetation would colonize these wetted areas, although any community development would be limited to the area near the normal high water line at each reservoir. Steep topography along the sides of the proposed reservoirs would limit the area of water availability to a narrow band around each reservoir. Other areas of the reservoir would be available for seed colonization during drawdown periods; however, these areas would then be inundated, normally on daily basis, as each reservoir is refilled during project operations. Proposed operations would involve daily water level fluctuations in both reservoirs of about 100 feet. Such frequent wetting and drying would greatly reduce the potential for any vegetation establishment below the high water lines.

Desert riparian tree species, including cottonwood and willows, are adapted to these sorts of environments. These species typically colonize bare mineral sand bars

deposited during the decline of spring flood pulses in desert streams (Stromberg, 1993). It is possible the wetted areas adjacent to the reservoir high water line would mimic these conditions. Seeds from these species are wind dispersed and have limited viability; they do not persist in the soil from one year to the next. To establish, the seeds need to land on wetted mineral soil, germinate, and develop sufficient root structure to maintain access to groundwater after water levels recede. If the water recedes too quickly, the seedlings will die (Stromberg, 1993). It is difficult to speculate how these species would respond to the daily wetting and drying along the sides of the proposed reservoirs. Over the course of the license, some limited establishment of these species should be expected.

Effects of Construction on Noxious and Invasive Species

Construction of the project would remove existing vegetation and disturb soils, creating conditions suitable for the establishment of noxious or invasive plants. Once the species establish, they compete with native species for resources, which are limited in the desert environment. Proliferation of these invasive species has the potential to alter the existing landscape structure and wildlife habitat.

To prevent the establishment of noxious and invasive species, Eagle Crest proposes to implement its Invasive Species Monitoring and Control Plan (Measure BIO-9). In response to the Commission's request for additional information, Eagle Crest filed its plan on October 27, 2009. The plan includes pre-construction surveys to determine baseline conditions, followed with construction and post-construction surveys (to continue for 2 years post-construction) to identify any new populations of invasive species. If these surveys identify increases in weed species presence and/or frequency, Eagle Crest would implement control measures. Eagle Crest's proposed control measures include manual and mechanical removal and application of EPA-certified herbicides.

Our Analysis

Construction activities would create areas suitable for establishment of invasive weeds by removing existing vegetation and disturbing soil. These effects would be increased along the State Water Board's recommended route for the transmission line because of the greater levels of soil disturbance associated with the additional length of the line. Eagle Crest's proposed plan to monitor and control invasive species is scientifically sound and would decrease the potential for weed proliferation in areas disturbed during construction. The proposed plan would be equally applicable to both transmission line routes analyzed. The Invasive Species Monitoring and Control Plan identifies baseline conditions and biological triggers, indicating the need for implementation of control measures. However, the plan does not include criteria for determining success or adaptive management. If Eagle Crest amended the proposed Invasive Species Monitoring and Control Plan to include criteria for success and an adaptive management plan to be implemented if initial efforts do not prove successful, effects of noxious and invasive weeds could be further reduced.

Effects of Operation on Noxious and Invasive Species

Operation of the project would include the addition of water to the project reservoirs, as well as operation and maintenance of project facilities. These activities could affect noxious and invasive weeds by providing water subsidies or disturbing new lands during maintenance. These conditions could create colonization potential for invasive species.

Eagle Crest's Invasive Species Monitoring and Control Plan calls for surveying for invasive species up to 2 years following project construction. No surveys are proposed for the remainder of the license.

Our Analysis

Eagle Crest's Invasive Species Monitoring and Control Plan appropriately concentrates transects in areas where soil disturbance is expected during construction; however, there is no mention of surveys near potential water subsidies associated with the project. These water subsidies could occur at well sites or in areas within and adjacent to the project reservoirs.

The addition of water to desert soils, even in small amounts associated with leaks or seepage at well sites, would create microsites with greater vegetation growth than the surrounding areas. These microsites would provide ideal conditions for colonization by invasive species. Addition of water to the project reservoirs would also provide wetted soil conditions favorable for some plants. As discussed above, staff expects low levels of available nitrogen, resulting from mining activities, to inhibit vegetation colonization around the project reservoirs. These conditions would also inhibit colonization of most invasive species known to occur in the project area. However, tamarisk has germination requirements similar to cottonwood and willow (Stromberg, 1993) and could colonize the perimeter of project reservoirs. Implementation of Eagle Crest's Invasive Species Monitoring and Control Plan would not address these issues.

In particular, the plan does not address the potential for weeds to colonize the reservoir areas where water availability would increase. Water subsidies related to project operations would occur at any seepage areas associated with the proposed reservoirs and well sites. If Eagle Crest modified its proposed Invasive Species Monitoring and Control Plan to include the identification and monitoring of these areas, the potential for increased weed proliferation would be reduced.

Additionally, the project reservoirs would continue to be a potential water source for invasive plants for the duration of the license. If soil conditions surrounding the high water line become suitable for vegetation establishment, noxious and invasive weeds are likely to be a component of the new vegetation growth. For reasons discussed above, staff expects vegetation would be slow to establish in these areas. As such annual surveys for invasive and noxious weeds are not necessary. However, If Eagle Crest amended the proposed plan to include annual surveys around the project reservoirs,

commencing once vegetation establishment is observed, the potential for weed proliferation would be further reduced.

Effects of Construction on Wildlife

Construction effects on the vegetation community and habitat have the potential to affect wildlife through changing habitat characteristics. Construction of the proposed project would also require heavy vehicle traffic during the 4-year construction period, extended human presence, increased noise levels, and increased levels of artificial lighting. These factors have the potential to disturb and disorient wildlife, thereby increasing the susceptibility to predators, reducing foraging success, or disrupting breeding behavior. The potential for direct mortality associated with vehicular collisions would also increase.

Many of Eagle Crest's proposed measures associated with construction management discussed in the vegetation section would also apply to wildlife. In addition to those measures, Eagle Crest proposes several measures specific to the protection of local wildlife. To protect migratory birds, Eagle Crest would complete surveys in all potential nesting sites for active bird nests (Measure BIO-11). Eagle Crest would conduct these surveys in vegetated habitat during all construction activities that are scheduled to occur between about February 15 and July 30 (breeding season for migratory birds in the project area). In areas without wildlife exclusion fencing or those areas that have not been cleared of tortoises, Eagle Crest would limit construction activities to take place during daylight hours (Measure BIO-20). Additionally, Eagle Crest would close, temporarily fence, or cover pipeline trenches at the end of each day (Measure BIO-21). Biological monitors would inspect open trenches to ensure animal safety. Eagle Crest would construct ramps leading out of the trenches to encourage animals to escape on their own.

Our Analysis

During construction, increased human presence and noise associated with vehicles and heavy machinery would have unavoidable effects on local wildlife. Construction activities would also create hazardous areas for wildlife, including open pits and trenches, and shade areas associated with vehicles and material stockpile locations. Additionally, clearing of vegetation and grading to prepare vegetated areas for project facilities have the potential to disturb nesting birds and disturb or destroy animal burrows. The State Water Board's recommendation would locate the transmission line outside the DWMA. Because this route would not bisect the DWMA, it would have a lesser effect on wildlife as compared with the applicant's proposed transmission line route. Additionally, due to portions of the line traversing abandoned agricultural land, the quality of wildlife habitat along the State Water Board's recommended route would be lower than that along the proposed transmission line route. Therefore, the State Water Board's recommendation is expected to have the least effect on wildlife in the project area.

Eagle Crest's proposed measures, including the WEAP (discussed above), pre construction surveys for breeding birds, and exclusionary measures to prevent animals from occupying hazardous areas would substantially reduce the construction effects. While it is not possible to completely eliminate all direct and indirect effects, the proposed measures would reduce disturbance to acceptable levels. Sufficient habitat exists in the areas immediately surrounding the project construction area such that the majority of wildlife species are expected to temporarily disperse to less disruptive locations. Construction effects would also be temporary and would not create long-lasting detrimental effects or affect wildlife species at a population level and would be equally applicable to either the proposed or State Water Board's recommended transmission line route.

Effects of Project Reservoir Operation on Wildlife

Operation of the project reservoirs would add about 254 acres of surface water to the project area. Given the arid nature of the surrounding area, it is likely the presence of this water would attract local wildlife. The steep terrain surrounding the reservoirs could pose a hazard for animals trying to reach the water edge, potentially resulting in serious injury or drowning. In addition, the water could attract predators, including ravens, gulls, coyotes, or feral dogs, increasing the density of predatory species in the project area and potentially increasing predation rates on local wildlife species.

To prevent wildlife access to the upper and lower reservoirs in these areas, Eagle Crest would construct an 8- to 10-foot-tall exclusionary fence designed to be impassable to large mammals (including Nelson's bighorn sheep, badger, fox, coyote, and deer) and desert tortoise (Measure BIO-18). In the northeast corner of the lower reservoir, a section of the fence would be structured so that it would be inundated during high water, thereby providing wildlife access to high water but not allowing animals to enter the pit. Topography in this location is less steep, providing easy access to drinking water for Nelson's bighorn sheep. Eagle Crest proposes to maintain the fence for the life of the project. Eagle Crest would inspect all fences on a monthly basis and during/following all major rainfall events. Eagle Crest also proposes to temporarily repair any damage to the fencing immediately, followed by permanent repair within one week.

To prevent effects of increased predation on wildlife, Eagle Crest developed a Raven Monitoring and Control Plan (Measure DT-5). To some extent this plan is specifically designed to reduce potential predatory effects on desert tortoise by ravens. Although predators could prey on other local wildlife in addition to sensitive species, staff discusses this plan in more detail in section 3.3.4, *Threatened and Endangered Species*.

During the NEPA scoping process, several entities commented that Eagle Crest's proposed levels of groundwater pumping could affect regional aquifers or springs, depleting water resources available to wildlife. In response to these comments, Eagle

Crest notes that the existing geologic and hydrologic conditions in the project area preclude interaction between groundwater pumping and surface water availability.

In its letter in response to the Commission's ready for environmental analysis (REA) notice, dated March 11, 2010, the National Parks Conservation Association comments that pumping groundwater to fill the project reservoirs could cause ground subsistence. Such subsidence could create depressions that could fill with water, drowning burrowing wildlife. In response to the National Parks Conservation Association's comment, Eagle Crest notes that based on the existing geologic conditions in the project area and its proposed levels of groundwater pumping, no subsidence is expected to occur and no wildlife would be affected by subsidence-related changes in the environment.

Our Analysis

The presence of the upper and lower reservoirs would provide tempting sources of water for local wildlife. Past mining activities created steep, rugged topography in areas adjacent to the proposed reservoirs. Most wildlife that use this habitat in the Eagle Mountains are adapted to traversing similar steep and rugged areas; however, attempts to access the waterline would prove hazardous and likely cause injury or mortality to some individuals. Eagle Crest's proposed construction of exclusionary fencing is a prudent measure to prevent these effects. The proposed fence design is suitable to prevent access to most species in the project area. Regular inspections and maintenance would ensure the fence is in effective operating condition and also reduce potential for animals to be trapped in small openings.

With respect to implementation of Eagle Crest's proposed Raven Monitoring and Control Plan, the primary effects are discussed in section 3.3.4, *Threatened and Endangered Species*. Using desert tortoise as an indicator species, Eagle Mountain would implement predator control measures as necessary. These measures would also benefit local wildlife species.

As discussed further in section 3.3.2, *Water Resources*, Eagle Crest's proposed rate of groundwater withdrawal is not expected to cause subsidence or affect surface water availability. As such, staff finds that such groundwater withdrawal is unlikely to affect wildlife in the project area.

Effects of Project Brine Pond Operation on Wildlife

As further discussed in section 3.3.2, *Water Resources*, the project facilities would include ponds and a reverse osmosis system used to remove salts and metals from reservoir water and maintain total dissolved solids concentrations within the reservoirs at the level of the source water. These ponds would have the potential to attract wildlife seeking water, and the high mineral content in the brine could pose health risks to wildlife. To prevent wildlife interaction with the ponds, Eagle Crest proposes to erect exclusionary fencing around this area. The fence design and maintenance would be

similar to that described above for the reservoir fencing. However, because the fences would not limit access to birds, Eagle Crest proposes additional measures (Measure BIO-12) to discourage access and use habitat modification techniques and hazing to make the ponds less attractive to birds. Eagle Crest would monitor the success of these measures and based on monitoring results, implement adaptive management as necessary to ensure that bird use of the ponds is minimized, including, if feasible, enhanced hazing or pond covering that does not impede the evaporation function.

Our Analysis

Birds are likely to view the ponds as a safe source of drinking water. However, high total dissolved solids concentrations in these proposed ponds could be harmful or fatal to birds and other wildlife. Discouraging and/or preventing access to these areas is a necessary component of reducing project effects on avian species. Eagle Crest's proposed measure to make this area less attractive to birds, monitor bird use, and if needed, implement exclusionary covering to prevent access would reduce these effects. However, Eagle Crest's description of this measure does not provide enough detail to for us to fully analyze the effects. For example, the existing description does not indicate what hazing methods would be used, or thresholds at which more extensive exclusionary devices would be implemented. If Eagle Crest developed and implemented more detailed plan to reduce bird use of the desalination pond, including proposed hazing and habitat modification techniques, methods for measuring success, and thresholds for implementing exclusionary pond covering, potential effects would be further reduced.

Sensitive Species

In general, the potential effects of the project on most sensitive species presented in table 10 are similar to the effects discussed above for general wildlife species. However, due to special habitat value within the project area, high population density in the project area, or potential for the project to have concentrated effects on a population, effects on some sensitive species are discussed in more detail below.

Effects of Construction on Special-Status Plants

Construction of the transmission line and water pipeline has the potential to affect sensitive plants species known to occupy the proposed ROW for these facilities. These species include California ditaxis, crucifixion thorn, desert unicorn plant, foxtail cactus, and Wiggins' cholla. Potential effects include direct mortality of the plants during vegetation clearing activities and reduced survivorship or reproductive success caused by changes in soil characteristics, microtopography, or water supply. Construction of the State Water Board's recommended transmission line route would increase potential for these effects due to the greater length of the route. Eagle Crest proposes several measures to minimize the potential for these effects.

Eagle Crest would use pre-construction surveys to identify special-status plant populations and species protected by the CDNPA (Measure BIO-6). Following surveys,

Eagle Crest would establish avoidance areas in construction zones for special plant resources. Where avoidance is not feasible, Eagle Crest would salvage and transplant any species that can be reasonably transplanted in an approved area. Eagle Crest also proposes to comply with the CDNPA and consult with the Riverside County Agricultural Commissioner for direction regarding disposal of protected plants (Measure BIO-7).

Our Analysis

As currently proposed, construction of the project transmission line and water pipeline would occur in areas populated with sensitive plant species. Failure to appropriately plan locations for equipment stockpiles, lay down sites, pull sites, and support tower footprints would create increased potential for direct effects on these species, likely killing numerous individuals and small populations. However, considerable flexibility exists in the specific locations of these project features. Eagle Crest's proposal to conduct pre-construction surveys and designate avoidance areas would reduce potential effects on sensitive plants. Nonetheless, it is likely some disturbance would be unavoidable. This is especially true within the water pipeline ROW, where it is less feasible to make small adjustments to the disturbance area. In locations where disturbance is unavoidable, Eagle Crest's proposal to allow salvage activities, transplant any reasonably movable species, and coordinate with the County Agricultural Commissioner for direction regarding disposal would further reduce project effects. These measures would be equally effective along both transmission routes analyzed.

Effects of Operation on Special-Status Plants

Maintenance activities that occur during project operations, including repair of transmission line support structures or the water pipeline, could require vegetation that would affect sensitive plants.

To reduce potential effects of project operations on special-status plants, Eagle Crest's WEAP requires that all maintenance activities potentially requiring ground disturbance occur in the presence of biological monitors. Additionally, in 2006 Eagle Crest entered into an MOU with FWS, BLM, and the Forest Service that provides guidelines for vegetation maintenance along transmission line ROWs on federal lands. This MOU also includes standards for protecting special-status plants.

Our Analysis

Maintenance of the project transmission line and water pipeline would occasionally require ground disturbance. Staff expects that the area of disturbance required for these activities over the life of the project would be small in relationship to the area disturbed during construction. Additionally, Eagle Crest would, to the greatest extent practical, site project features away from areas with high sensitive plant presence. Maintenance of these features is, therefore, unlikely to affect special-status plants. Eagle Crest's biological monitors would ensure that these activities do not affect special-status

plants. No further measures are needed to protect these species from effects of project operation.

Effects of Construction on Nelson's Bighorn Sheep

Under the proposed schedule, major construction activities in the central project area are expected to last 3 to 4 years. During this time extensive use of heavy machinery including earth movers, dump trucks, cement trucks, and tunnel boring equipment would increase noise levels and increase human presence in this area compared to current conditions. These activities could disturb bighorn populations that spend much of the year in the mountainous areas surrounding the central project area. Construction of project roads and desert tortoise exclusionary fencing, as well as increases in artificial lighting, also have the potential to disrupt migratory paths for Nelson's bighorn sheep moving between available water sources and to breeding and lambing grounds. The potential for vehicular collisions is also a concern. Following construction, project operations would provide an additional water source accessible to Nelson's bighorn sheep in the northeast corner of the lower reservoir. Other areas around the reservoir perimeters would be fenced to exclude Nelson's bighorn sheep to prevent attempts to access water by traversing hazardous terrain.

Eagle Crest notes that while the construction period would increase human presence and noise levels over current conditions, the central project area has been heavily mined over the past several decades. Eagle Crest does not expect disturbance levels related to project construction to be substantially greater than the noise and human presence associated with the past mining activities. Rather, Eagle Crest expects bighorn movements to continue as they had in the past. To reduce the effects of project construction on Nelson's bighorn sheep, Eagle Crest's desert tortoise exclusion fencing along project roads would be limited to 3 feet in height so as not prevent Nelson's bighorn sheep movement. These fences would be removed following construction.

Our Analysis

Construction activities in the central project area would result in increased noise and human presence that could affect Nelson's bighorn sheep populations in the area. Without more detailed information about the migratory pathways the bighorn sheep currently use to move from Eagle Tank to Buzzard Spring or to breeding and lambing areas, it is unclear how this disturbance would affect the current populations. However, staff finds it reasonable to assume that the proposed levels of disturbance would be similar to the historical mining operations. Given the topography in the mine area, it is probable that migration paths traverse the perimeter of the mine and have not changed in recent years when the mine has been mostly inactive. Under this scenario, project construction activities would not create a migratory barrier, and staff expects effects of project construction on Nelson's bighorn sheep populations would be minor and temporary.

Effects of Project Operations on Nelson's Bighorn Sheep

Operation of the project would include maintenance activities and fluctuating levels of standing water in the reservoirs. These conditions have the potential to attract Nelson's bighorn sheep into the central project area to access drinking water, increasing the risk of drowning or collisions with vehicles. Project lighting could also disturb this species, potentially affecting migration patterns.

During operations, Eagle Crest would reduce vehicle traffic to about one round trip per day. Wildlife exclusion fences would surround both reservoirs to prohibit Nelson's bighorn sheep from accessing water in unsafe locations, but fence setbacks would permit access in the northeast corner of the lower reservoir. Project facilities would be lighted as a safety and security precaution, and the lights would include shields to focus light on the project interior and prevent light pollution to surrounding areas (Measure BIO-22).

Our Analysis

Following construction, vehicle trips in the central project area are expected to occur at the rate of only one vehicle per day and would pose a very limited risk of collisions. While facility lighting and equipment noise may create limited disturbance, they are not expected to affect Nelson's bighorn sheep populations. The project would provide a new source of drinking water, which is a component of the management plan for this species. The addition of the new water source is likely to disrupt the migration of the northern ewe population to Buzzard Spring. This migration occurs outside of the breeding and lambing period and does not result in increased interaction with other ewe populations. The addition of the new water source is not expected to affect the greater Eagle Mountain bighorn sheep population. As such, operation of the project would provide some benefit to the bighorn population, counteracting any temporary negative effects associated with construction.

Effects of Construction on Burrowing Animals

Several sensitive species known to occur in the project area use burrows to escape the desert heat, hide from predators, and raise young. These species include badger, kit fox, and burrowing owl. Proposed construction activities have the potential to collapse these burrows or block their entrances, trapping animals inside. To prevent these effects, Eagle Crest proposes to continue consultation with California DFG to determine appropriate survey needs for the burrowing owl. Upon California DFG's request, Eagle Crest would conduct a Phase III survey for burrowing owl to further assess bird use of the project area and potential effects (Measure BIO-13). The Phase III survey would include a nesting season survey, followed by a winter survey if no burrows or owls are observed during the nesting season. Subsequently, Eagle Crest would conduct a pre-construction survey within 30 days of the start of project construction to assess species presence and the need for further mitigation. Because of the low observations of burrowing owls

during the Phase I surveys, Eagle Crest notes that California DFG may not require the Phase III survey and only pre-construction surveys would be needed.

If the Phase III or pre-construction surveys indicate burrowing owls are present, Eagle Crest would limit the construction period to September 1 through February 1 to avoid disruption of breeding activities (Measure BIO-14). Eagle Crest would avoid active nests by designating a minimum of a 250-foot buffer until fledging has occurred (February 1 through August 31). Following fledging, owls could be passively relocated away from construction activities.

To protect other sensitive burrowing animals, Eagle Crest would conduct pre-construction surveys for all burrows that might host a badger or kit fox (Measure BIO-16). Eagle Crest would avoid active burrows and all fox natal dens where possible. Biological monitors would mark the perimeters of all avoidance areas with wooden stakes, at least 3 feet high, and no more than 10 feet apart. Where avoidance is infeasible, biological monitors would determine occupancy of burrows and encourage occupants to leave their burrows. Biological monitors would fully excavate all burrows from which badgers or foxes have been removed and collapse these burrows to ensure that animals cannot return prior to or during construction.

Our Analysis

If left unsurveyed or accounted for, project construction activities would likely cause injury or mortality to burrowing species through burrow collapse or entrapment. Given the low number of burrowing owls observed during project surveys, pre-construction surveys would provide adequate information necessary to develop mitigation measures for this species. Eagle Crest's proposal to conduct pre-construction surveys for active burrows and either avoid such areas, or when necessary destroy unoccupied burrows, would reduce potential for injury or mortality. In general, destruction of an unoccupied burrow does not pose an undue risk to the burrow's occupant, which typically relocates to other vacant burrows in the vicinity. Destruction of unoccupied burrows is the best method of preventing injury in construction zones. However, when occupants are under additional stresses associated with nesting, birthing, or caring for young, burrow removal is not the appropriate option. Eagle Crest's proposal to avoid active burrowing owl nests and natal kit fox dens would prevent additional effects on these species. These measures would be equally effective along both transmission routes analyzed.

Effects of Operation on Burrowing Animals

Maintenance activities that occur during project operations, including repair of transmission line support structures or the water pipeline, could require ground disturbance activities in areas with animal burrows.

To reduce potential effects of project maintenance on burrowing animals, Eagle Crest's WEAP requires that all maintenance activities potentially requiring ground

disturbance occur in the presence of biological monitors. These monitors would follow the same protocols discussed above for clearing burrows and ensuring special-status burrowing species are not affected.

Our Analysis

Maintenance of the project transmission line and water pipeline would occasionally require ground disturbance. Staff expects that the area of disturbance required for these activities over the life of the project would be small in relationship to the area disturbed during construction. Eagle Crest's biological monitors would ensure these activities do not affect burrowing animals.

Effects of Project Construction on Raptors

Several sensitive raptor species, including prairie falcon and golden eagle, could suffer effects of project construction if there are active nests near activities proposed in the central project area. Loud staccato noises and vehicle noise could disrupt nesting activities or cause nest abandonment.

In the final license application, Eagle Crest proposed to conduct pre-construction surveys in the central project area to determine whether any active golden eagle or prairie falcon nests are present (Measure BIO-15). If surveys identified active nests, Eagle Crest proposed to provide protective 0.25-mile-radius buffers around the nests and stated that no construction activities would occur within these buffer areas during the nesting seasons.

In its comment letter filed on March 12, 2010, FWS recommends Eagle Crest consult with FWS to determine the need for golden eagle surveys.

In its reply to FWS, Eagle Crest notes that in response to new regulations and guidelines finalized subsequent to the filing of the final license application, Eagle Crest is engaging in consultation with FWS with regard to golden eagle surveys. Eagle Crest is conducting surveys for the 2010 nesting season and plans to submit to FERC the results of the surveys, with any appropriate mitigation measures, as soon as the information is available.

In its July 7, 2010, filing, Eagle Crest provided a report documenting raptor surveys in the project area. A summary of the results of this study is presented in section 3.3.3.1, *Terrestrial Resources, Affected Environment*.

Our Analysis

If carried out near active raptor nests, project construction activities in the central project area would disturb nesting pairs and potentially cause nest abandonment. The Eagle Crests raptor survey report presents maps showing the locations of golden eagle nests in the project vicinity. However, proposed project features are not included on these maps, and there is no discussion as to whether these nests are within 0.25 mile of proposed construction activities. Therefore, the report does not provide sufficient detail

to determine the need for protection buffers or time of year restrictions on construction activities. Eagle Crest's proposed measures include pre-construction surveys and development of protective buffer areas as needed. The results of the summer 2010 raptor surveys indicate that further analysis and implementation of this measure are warranted. These measures would be equally appropriate along both transmission routes analyzed.

Effects of Project Operation on Raptors

The project transmission line has potential to affect raptors due to in-flight collisions with conductors or electrocution. Additional perching or nesting sites associated with the transmission line could have beneficial effects on some raptor species, but could also cause increased predation on local wildlife.

In its comment letter filed on March 12, 2010, FWS recommends that Eagle Crest ensure compliance with Avian Power Line Interaction Committee (APLIC) recommendations and develop an avian protection plan that meets FWS guidelines. FWS also recommends co-locating the new line with existing lines in the project area. FWS states that this would reduce the creation of new perching and nesting sites for desert tortoise predators.

Eagle Crest filed a response to the FWS recommendations on April 23, 2010. In this response, Eagle Crest states that it would design and construct raptor-friendly transmission lines in strict accordance with the industry standard guidelines set forth in Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006 (APLIC, 2006) (Measure BIO-24). In addition, prior to the start of ground-disturbing activities, Eagle Crest would develop and file for Commission approval a transmission line design plan that would consider adequate separation of energized conductors, ground wires and other metal hardware, adequate insulation, and any other measures necessary to protect raptors from electrocution hazards.

Our Analysis

Avian injuries and fatalities associated with electrocution or collision with power lines have been reported since the late 1800s, and as power lines have proliferated across the country, bird losses have increased dramatically. A recent report estimated that fatalities in the United States range from 3.5 million to 1.05 billion birds every year (Hunting, 2002). Most electrocutions are associated with lines carrying 69 kV or less because the spacing of hardware is often not sufficient to prevent birds from spanning between conductors or between a conductor and a ground (APLIC, 2006). The project would include a 13.5-mile double-circuit 500-kV line and a 4,000-foot-long 18-kV line from the powerhouse to the collector substation.

Improper construction of project electric transmission facilities could pose increased risks to raptor injury and mortality. APLIC provides industry standards for electric transmission system design measures aimed at reducing effects on birds. These standards include spacing conductors such that they are beyond the wing span of large

birds to prevent electrocution, as well as measures to increase line visibility to reduce potential for collisions. Eagle Crest proposes to construct the transmission line in compliance with these standards and to prepare a plan, for Commission approval, to protect raptors from electrocution hazards. However, Eagle Crest's proposed measure does not address potential for avian collisions or procedures for monitoring and reporting avian injury or mortality resulting from interactions with the project transmission line. Addressing these components, in addition to implementing measures related to potential electrocution, would be necessary to meet the APLIC/FWS guidelines for an avian protection plan.

If Eagle Crest prepares an avian protection plan, in consultation with FWS, that includes design measures for reducing potential for electrocution and collision injuries, provides methods for surveying and reporting project related raptor mortality, incorporates a worker education plan pertaining to avian–power line interactions, and procedures for managing nesting on powerline structures, effects of project operation on raptors would be minimized. Such a plan would assist Eagle Crest in meeting the requirements of the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act.

Constructing new transmission support towers would increase perching and nesting structures for birds, including desert tortoise predators. However, constructing these new towers in areas where similar towers already exist would limit the spatial distribution of these resources. While the new towers would still present potential nesting and perching structures, the proximity of these structures to the existing structures could limit their suitability. Both ravens and other raptors nest in defended territories and are not likely to nest near pre-existing nests. Therefore, constructing the new line adjacent to existing lines would limit the creation of new nest sites. The State Water Board's recommended transmission route would be co-located with existing structures and removed from mountainous nesting habitat. This recommended route would address FWS concerns regarding the addition of new nesting habitat and is expected to have the lowest effect on raptors.

Effects of Construction on Bats

Based on existing information, it is probable that some sensitive bat species use the rocks, crevices, or caves in the central project area as roosting habitat. If roosting locations are occupied during the filling of project reservoirs, these areas could be inundated, causing disturbance, injury, or mortality to sensitive species. To reduce the potential for project effects on sensitive bats, Eagle Crest proposes to conduct pre-construction bat surveys, using a qualified bat biologist, to determine the existence, location, and condition of bat roosts on the project site. The survey would also identify foraging habitat in the project area. Based on the results of these surveys, Eagle Crest would prepare a mitigation plan to avoid roosting and foraging effects on resident bats, minimize that disturbance, or as an unavoidable measure, evict bats (Measure BIO-17).

Our Analysis

Based on the limited data available for the central project area, staff finds that occurrences of bat roosts in the Eagle Mountain mine site are likely. Inundating these areas without providing mitigation could affect bats, including sensitive bat species. Eagle Crest's proposal to conduct pre-construction surveys, and depending on the survey results, to develop and implement a bat protection and mitigation plan, would reduce these effects. If Eagle Crest prepares this plan in coordination with state and federal agencies, develops proposed environmental measures, methods for determining success, and adaptive management strategies, it would ensure the bat protection and mitigation plan is most effective.

Effects of Operation on Bats

Operation of the project would include lighting the central project area and fluctuating water levels in the reservoirs. The addition of lights and water would likely result in increases in insects in the area of the project reservoirs. These insects could provide a food source for bats. Fluctuation of the reservoir water levels associated with generation activities could result in suitable roosting areas being available at one time of day but then flooded later in the day. Bats using these roosts could be trapped by rising water levels.

To reduce to potential for project effects on sensitive bats, Eagle Crest proposes to prepare a mitigation plan to avoid roosting and foraging effects on resident bats, minimize that disturbance, or as an unavoidable measure, evict bats (Measure BIO-17). Preparation of this plan would occur following surveys to determine bat presence in the central project area.

Our Analysis

Inundation of roosting areas could affect bats, including sensitive bat species if these areas are left open and accessible during low water periods and then inundated during roosting periods. Adding lights to the central project area would attract insects to the areas. Bats are also likely to come to these areas to feed, resulting in an increased likelihood that the available roosting habitat in the central project area would be occupied. Eagle Crest's proposal to conduct pre-construction surveys and, based on the survey results, develop and implement a bat protection and mitigation plan would reduce these effects. If Eagle Crest were to prepare this plan in coordination with state and federal agencies and develop proposed mitigation measures, methods for determining success, and adaptive management strategies, it could ensure the bat protection and mitigation plan would be most effective.

Effects of Construction on Couch's Spadefoot Toad

The project could affect Couch's spadefoot toad if grading, construction of project roads, or construction of other project facilities alter topography or water availability to

existing ephemeral pools that contain this species. Since small populations of these toads occur in isolated depressions that generally gather small amounts of water, small changes in topography and water availability has the potential to eliminate an entire population in an affected depression.

To reduce potential for project effects on this species, Eagle Crest, in compliance with the NECO Plan, proposes to avoid effects on all ephemeral pools in the project area. Once access is permitted, Eagle Crest would conduct surveys for ephemeral pools in the central project area. If present, the pool would be avoided, if possible. If avoidance is not possible, then Eagle Crest would construct a new pool as close as is feasible to replicate and replace each lost pool. All larvae would be moved to the new pool (Measure BIO-10).

Our Analysis

Eagle Crest's surveys indicate that there are no ephemeral pools along the proposed transmission line or water pipeline ROWs. However, these surveys have not been conducted along the additional alternatives. Eagle Crest's proposed measure to survey the central project area for ephemeral pools and avoid these areas or relocated toads to other suitable habitat would eliminate potential effects in this area. If the final transmission line is constructed in areas not previously surveyed for ephemeral pools, there is potential for effects on Couch's spadefoot toad. If Eagle Crest conducted pre-construction surveys in all areas of proposed construction activity not previously surveyed in 2009, and implemented the same protection measures proposed for the central project area, then potential effects of the transmission line would be eliminated.

Effects of Operation on Couch's Spadefoot Toad

Maintenance activities that occur during project operations, including repair of transmission line support structures or the water pipeline, could require ground disturbance activities that have the potential to alter local patterns of surface runoff. There is potential for these activities to disturb Couch's spadefoot toad habitat.

To reduce potential effects of project maintenance on burrowing animals, Eagle Crest's WEAP requires that all maintenance activities potentially requiring ground disturbance occur in the presence of biological monitors. These monitors would follow the same protocols discussed above for identifying and protecting sensitive habitat, including ephemeral pools.

Our Analysis

Maintenance of the project transmission line and water pipeline would occasionally require ground disturbance. Staff expects that the area of disturbance required for these activities over the life of the project would be small in relationship to the area disturbed during construction. Eagle Crest's biological monitors would ensure these activities do not affect potential habitat for Couch's spadefoot toad.

3.3.3.3 Cumulative Effects

During project scoping several terrestrial resources were identified for which the Eagle Mountain Project, in conjunction with other reasonably foreseeable projects, could have cumulative effects. These resources include desert bighorn sheep and raven populations. To analyze potential cumulative effects on these resources, staff evaluated the combined effects of the proposed project, the proposed Eagle Mountain landfill, and solar projects proposed in the Chuckwalla Valley.

Nelson's Bighorn Sheep

Both the proposed project and the Eagle Mountain landfill (if constructed; see *Land Use* in section 3.3.5) would occupy lands in the central project area. As discussed above, desert bighorn sheep are known to occur in this area and to migrate between natural sources of drinking water located to the north and south of this area. Construction and operation of these projects could disturb bighorn sheep by increasing noise and human presence in the area. Combined, these projects are expected to occupy 6,875 acres, 47 percent of which would be associated with the pumped storage project. Construction of the two projects is not expected to occur simultaneously, so there would not be cumulative effects of construction at one time. However, construction of both projects could result in prolonged increases in noise-related stress that could affect bighorn sheep in the project area over the total construction period.

Construction activities are expected to involve about 75 trucks per month for the project and 1,500 trucks per month for the landfill (see *Land Use* in section 3.3.5). Eagle Crest does not propose to develop any new access roads or conduct any road improvements within the central project area. For the landfill, Eagle Crest would construct 6 miles of new, paved access roads, and widen an additional 6 miles of existing road. During operation, Eagle Crest expects to require 2 truck trips per day, while the landfill operations, Eagle Crest would require between 50 to 100 trucks per day depending on the age of the project. Eagle Crest's estimate of 75 trucks per month seems low for the amount of materials needed for the proposed project. However, even if this number is increased by a factor of 10, the contribution of the proposed project to total stress associated with construction noise would be small compared to that associated with construction of the landfill.

Proposed solar projects would be located on the valley floor and are not expected to affect desert bighorn sheep. Based on these predicted use levels, staff finds that construction and operation of both the proposed project and the Eagle Mountain landfill could affect desert bighorn sheep in the central project area. However, the Eagle Mountain Project would constitute a small percentage of these effects and Eagle Crest's proposed measures to reduce effects on desert bighorn sheep would mitigate for its share of any cumulative effects.

Ravens

Both the proposed project and the Eagle Mountain landfill (if constructed; see *Land Use* in section 3.3.5) would occupy lands in the central project area, and each project is expected to provide increased food availability to ravens. The proposed project would increase available drinking water associated with project reservoirs (254 acres) and nesting and perching habitat associated with the transmission line (13.5 miles). As discussed above, all of these resources are already present in the landscape surrounding the project, including power lines and CRA water. If proposed solar facilities are constructed in the Coachella Valley, additional transmission lines would be constructed, providing additional nesting and perching habitat. The Eagle Mountain landfill would increase available food sources associated with the importation of waste to about 2,164 acres of land in the project area. No similar food sources currently exist in the project vicinity. If both projects are constructed, the combined effects of increased food sources would likely create conditions suitable for expansion of the raven populations. However, the contribution of the pump storage facility would be small related to the contribution of the landfill because water subsidies and transmission lines are already present in the project vicinity and are not expected to be limiting resources for raven populations. Additionally, Eagle Crest's proposed measures to study effects of the project on ravens and implement control measures as needed would ensure the collective effects on ravens with the landfill project are not substantially greater than the effects of the proposed landfill and solar facilities alone.

Both the proposed project and the Desert Sunlight Solar Farm (BLM, 2010a) would require construction of new transmission lines to interconnect with the electric grid. As proposed, Eagle Crest would construct a new substation near Desert Center and create a new 500-kV transmission corridor along Eagle Mountain Road. The Desert Sunlight Solar Farm would construct the Red Bluff substation about 6 miles east of Desert Center along the Interstate 10 corridor and construct a new 230-kV transmission line that would parallel the existing SCE 160-kV line. The State Water Board's recommendation for the proposed Eagle Mountain Project would use the same substation and transmission corridor for both the Eagle Mountain and Desert Sunlight Solar Farm projects, consistent with the California Public Utilities Commission environmentally preferred alternative for the Desert Sunlight Solar Farm (BLM, 2010a). This recommendation would reduce disturbance to terrestrial resources by eliminating the need for a second substation and would reduce effects on ravens by minimizing the addition of new transmission structures that would create favorable nesting habitat.

3.3.4 Threatened and Endangered Species

3.3.4.1 Affected Environment

Two special-status species with the potential to occur in the proposed project area are federally listed as threatened or endangered: Coachella Valley milkvetch (*Astragalus lentiginosus* var. *coachellae*) is endangered and desert tortoise (*Gopherus agassizii*) is

threatened. In addition, the milkvetch is listed as sensitive by BLM and List 1B by CNPS and the desert tortoise is listed as threatened and protected by California DFG.

Coachella Valley Milkvetch

This subspecies occurs primarily from the Coachella Valley east to Desert Center. Off-highway vehicle (OHV) recreational use is one of the greatest threats to this species, and many populations may no longer exist.

The species is distinguished from other silky-haired milkvetch species by its strongly inflated, two-celled, papery, speckled seed pods. It is an herbaceous perennial whose aboveground portions die back during drought periods. While it is restricted to loose-sandy, including aeolian (wind-blown), soils, the substrate over the soil may be slightly gravelly. Microhabitat sites are often associated with disturbance, consistent with many legumes, and individuals are commonly found in road berms. FWS has designated several critical habitat units for this species along the Interstate 10 corridor between Indio and Palm Springs, California. No critical habitat is present in the project area.

Eagle Crest conducted surveys for this species in concert with surveys for desert tortoise in spring 2008 and 2009.[33] Surveyors did not encounter any Coachella Valley milkvetch in the project area.

Desert Tortoise

The desert tortoise inhabits the Southwest in areas north of Baja California, with a current range extending from southwestern Utah, west to the Sierra Nevada Range in California, and south through Nevada and Arizona into Sonora, Mexico.

The desert tortoise occupies arid habitats below 4,000 feet. In the Colorado and Sonoran deserts of southern California and Arizona, desert tortoises occupy somewhat lusher desert habitats, with increased bunch grasses, cacti, and trees. Because of the burrowing nature of tortoises, soil type is an important habitat component. In California, tortoises typically inhabit soft sandy loams and loamy sands, although they are also found on rocky slopes and in rimrock that provide natural cover sites in crevices. Hills with rounded, exfoliating granite boulders often host higher densities than the surrounding flats, especially in Arizona. Valleys, alluvial fans, rolling hills, and gentle mountain

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[33] In both 2008 and 2009, surveyors were not given access to Kaiser properties for surveying. The exclusion area included the proposed project water pipeline ROW west of the Metropolitan Water District CRA and the transmission line ROW north of UTM 3745200N (North American Datum 83). As a result, Eagle Crest was unable to conduct on-site surveys of the mine pits that would form the reservoirs and other central project areas.

slopes are inhabited. The only areas tortoises typically avoid are intermittent lakes and steep, talus-covered slopes.

In 1989, information on high mortality rates and the presence of an upper respiratory tract disease in populations of the desert tortoise resulted in a temporary emergency listing as endangered (FWS, 2010). The Mojave population—which inhabits California (including the project area), Nevada, Utah, and parts of Arizona north of the Colorado River—was listed in the final rule on April 2, 1990, as threatened. The 1994 Recovery Plan identified six evolutionarily significant units of the desert tortoise in the Mojave Region, based on differences in tortoise behavior, morphology and genetics, vegetation, and climate. Within those recovery units, suggested DWMAs act as reserves in which recovery actions are implemented. The NECO Plan furthers this recovery goal by prescribing conservation and management measures for DWMAs. The Chuckwalla DWMA intersects 17.7 acres of the project (table 11).

Table 11. Acreage of desert tortoise habitat in the Eagle Mountain Pumped Storage Project area (Source: Eagle Crest, 2009a).

Project Element	**DWMA**	**FWS Critical Habitat**	**BLM Category 3 Habitat**	**Total in Desert Tortoise Habitat**
Central project area	0	0	0	0
Transmission tower footprint plus construction area (3,600 square feet per tower)	2.1 (27 towers)	2.4 (29 towers)	1.6–2.7 (19–33 towers)	4.0–5.1 (48–62 towers)
Access road (20-foot ROW)	15.6	16.6	14.7	31.3
Pulling/tensioning sites	Currently unknown (intended to fall within the transmission line ROW and substation site)			
Equipment laydown sites	0	0	0	0
Proposed interconnection collector substation	0	0	25	25
Water pipeline (30-foot ROW)	0	0	22.9	22.9
Total project acreage	17.7	19	64.2–65.3	83.2–84.3

FWS designated critical habitat for desert tortoise in the Mojave Region in 1994 (50 CFR Part 17). The proposed project would cross portions of the Chuckwalla Unit, which encompasses 1,020,600 acres in Riverside and Imperial counties, California. This area provides nesting, sheltering, foraging, and dispersal habitat and contributes to species gene flow.

During March and early April of 2008 and 2009, Eagle Crest conducted surveys for the desert tortoise along the project's linear elements and at potential well sites. In 2008, the proposed project routes were preliminary, so surveys were conducted both on areas where the project could ultimately occur and areas that were later eliminated from consideration in 2009. Because of the uncertain nature of the proposed routes in 2008, the extensive survey protocol required by FWS for desert tortoises was not used. Rather, Eagle Crest used the following procedures to collect evidence of desert tortoises:

- Transmission Line ROW—Inside Wildlife Habitat Management Areas (WHMAs), surveyors walked four, 50-foot-wide, adjacent transects within the 200-foot transmission line ROW; outside WHMAs, surveyors walked two, 100-foot-wide, adjacent, meandering transects in the ROW.
- Water Pipeline ROW—Where the proposed ROW was precise, surveyors walked a 30-foot-wide transect; where the ROW was imprecise, surveyors walked two, 100-foot-wide, adjacent, meandering transects.
- Other ROWs—For ROWs through abandoned jojoba fields that had access roads, only the roadsides were surveyed.
- Potential Well Sites—Surveyors examined all known commercial wells in the project area that had the potential to supply water to the project.

In 2009, pedestrian transects were completed consistent with the FWS desert tortoise survey methodology. Per those protocols, 100 percent of the ROWs were surveyed using parallel, 30-foot-wide, pedestrian belt transects. The ROW for the proposed transmission line is 200 feet wide. Eagle Crest surveyed a 60-foot ROW associated with the proposed water pipeline to account for minor route shifts in the final 30-foot-wide ROW. In addition, Eagle Crest surveyed a 30-foot-wide zone-of-influence (ZOI) (i.e., both sides of the ROWs at 100, 300, 500, 1,200, and 2,400 feet from the outer edges of the ROWs). The exception to this occurred where the ROWs went through jojoba fields, which are not tortoise habitat, although it is recognized that a tortoise could enter these areas from adjacent native habitat, even if unlikely.

In both 2008 and 2009, all tortoise signs (e.g., individuals, dens, burrows, scat, tracks, pellets, skeletal remains) that surveyors encountered were measured, mapped and described relative to condition, size, and (where applicable) gender. Current and recent weather conditions were recorded to identify the potential for tortoise activity and the topography, drainage patterns, soils, substrates, plant cover, anthropogenic disturbances, and aspect-dominant, common, and occasional plant species were described and mapped. Surveyors used Global Positioning System (GPS) units to map sign and habitat features.

During 2008, surveyors encountered three tortoise burrows and one carcass in the project area that was surveyed. In 2009, following the FWS protocol, Eagle Crest's surveyors encountered 34 burrows, 8 carcasses, 16 scat piles, and 2 live tortoises. The majority of tortoise signs (56 out of 60 observations) were encountered on transects associated with the proposed transmission line.

3.3.4.2 Environmental Effects

Coachella Valley Milk Vetch

Effects of the project on Coachella Valley milk vetch would occur only through direct disturbance to individuals present in the project area. Eagle Crest's surveys indicate this species does not occur in the project area, so no effects are anticipated and no measures would be needed to protect this species. Staff finds the project would not affect Coachella Valley milk vetch.

Effects of Construction on Desert Tortoise

Construction of the project would involve the use of heavy machinery, road grading, vegetation removal, and heavy vehicle traffic in the project area. These activities have the potential to destroy desert tortoise burrows, increasing stress to individuals or potentially causing mortality if burrows are occupied at the time of collapse. Tortoises often seek shelter under vegetation or other structures that provide shade from the desert sun. Mechanized clearing of these structures could harm individual tortoises. Desert tortoises also seek shelter under parked vehicles and travel along road grades. Increased vehicle use in the area could create increased risk of collisions with tortoise, resulting in injury or mortality. In addition to measures already discussed, including the WEAP, Revegetation Plan, and Invasive Species Monitoring and Control Plan, which could help reduce effects on desert tortoise, Eagle Crest proposes the following measures to reduce the effects of construction on this species: pre-construction and clearance surveys; monitoring during construction; exclusion fencing; and the Desert Tortoise Removal and Translocation Plan.

The applicant's proposed transmission line would occupy about 82 acres of desert tortoise habitat. The proposed line includes 23 line support structures in the BLM DWMA, 24 structures in the Chuckwalla Unit of critical habitat, and 25 structures in other suitable habitat for desert tortoise. All of the structures within the BLM DWMA and critical habitat would be along a new transmission corridor and removed from existing transmission lines. For part of its length within the BLM DWMA and critical habitat (about 3.5 miles), the applicant's proposed transmission line would run parallel to the existing Eagle Mountain Road and therefore occupy areas that are already disturbed. The remainder of the ROW would require clearing undisturbed areas that support desert tortoise habitat. The proposed substation would be outside the DWMA and the critical habitat area.

The State Water Board's recommendation would occupy a total of about 78 acres of desert tortoise habitat, including 74.3 acres within the Chuckwalla Unit of critical habitat (74 acres for the substation and 0.3 acre for transmission line structures). One line support structure would be located within the BLM DWMA, 3 structures within critical habitat, and 47 structures in other suitable habitat for desert tortoise. The majority of these structures would be adjacent to an existing transmission line.

In FWS' March 12, 2010, letter, it recommends Eagle Crest relocate the transmission line out of desert tortoise critical habitat. FWS recommends Eagle Crest co-locate the new line with existing transmission lines near the project site to reduce the addition of new perching areas for predatory birds within the critical habitat area.

To reduce effects on desert tortoise, Eagle Crest would remove all tortoises from harm's way during the construction period (Measure DT-1) following conditions and guidelines in the Desert Tortoise Removal and Translocation Plan (discussed below). For linear facilities, Eagle Crest's biological monitors would first survey for all desert tortoises that might be within construction zones or are likely to enter construction zones, immediately prior to the start of construction. The biological monitors would identify active burrows, and insert a 3-inch stick into the floor of the runway to monitor tortoise use (as tortoises enter or exit the burrow, the stick would be displaced and point in the direction of movement). Biological monitors would map the locations of all tortoises so that those locations could be monitored for tortoise use during construction.

In the central project area, Eagle Crest would first conduct surveys to determine the presence of desert tortoise. If there is any suggestion of tortoise presence, either due to the presence of tortoise habitat and/or tortoise sign, Eagle Crest would erect exclusion fencing and complete a clearance survey to remove tortoises from within the fenced area (Measure DT-3). Biological monitors would complete a minimum of two clearance passes inside this area with each survey occurring during periods with heightened tortoise activity, from mid-March to mid-April and during October.

Eagle Crest does not propose to conduct any activities within unfenced areas on the linear facilities without biological monitors present (Measure DT-2). This includes both construction monitoring and maintenance activities that require surface disturbance. Qualified biological monitors meeting FWS and California DFG certification requirements would remove all tortoises following FWS and California DFG guidelines. Eagle Crest would avoid active burrows and special-resource burrows where possible. Where avoidance of any burrow is infeasible, biological monitors would determine occupancy through the use of fiber optics, probes, or mirrors. Monitors would then excavate the burrow with hand tools in the method prescribed by Desert Tortoise Council (1999), *Guidelines for Handling Desert Tortoises during Construction Projects.* Any tortoises found would be removed from the construction area. Along the water pipeline, Eagle Crest would close, cover, or fence trenches at the end of each day. Biological monitors would survey open trenches at first light, midday, and at the end of each day to ensure tortoise safety.

If necessary, Eagle Crest would install temporary fencing in the active work area to separate a tortoise from active construction to maximize protection. If a tortoise is injured or killed, Eagle Crest would cease all activities and contact the project biologist. Injured tortoises would be taken to a qualified veterinarian if the tortoise is expected to survive. FWS would determine if the tortoise can be returned to the wild, if it recovers. Following site clearance, Eagle Crest's project biologist would prepare a report documenting the clearance surveys, construction monitoring, the capture and release locations of all tortoises found, individual tortoise data, and other relevant data. Eagle Crest would submit this report California DFG and FWS.

Eagle Crest proposes to enclose the substation with a permanent tortoise exclusion fence to keep adjacent tortoises from entering the site. The fencing type would be 1- by 2-inch vertical mesh galvanized fence material, extending at least 2 feet above the ground and buried at least 1 foot. Where burial is impossible, the mesh would be bent at a right angle toward the outside of the fence and covered with dirt, rocks, or gravel to prevent the tortoise from digging under the fence. Eagle Crest would construct tortoise-proof gates at site entry points. All fence construction would take place in the presence of biological monitors to ensure that no tortoises are harmed. Following installation, biological monitors would inspect the fencing monthly and during all major rainfall events and conduct any necessary repairs immediately.

Any areas in the central project area that are determined through surveys to require fencing would be fenced as outlined above. Where a fence is discontinuous (between tailings piles for example), the fence ends would extend well up the slope of the piles to ensure that tortoises cannot go around the end. Alternative methods may be explored to ensure that the fences are functional at excluding tortoises.

For both the central project area and the linear facilities, any necessary relocation of individual tortoises would require movement only to suitable habitat in the immediate vicinity (Measure DT-4). In response to the Commission's request for additional information, Eagle Crest filed its Tortoise Removal and Translocation Plan on October 27, 2009. This plan includes specific measures Eagle Crest would implement when relocating tortoises. These measures include:

- Descriptions of acceptable habitat where tortoises can be placed;
- Data to be collected from each capture/relocation event;
- Procedures for protecting tortoises encountered along roadways;
- Procedures for protecting tortoises encountered during periods with extreme high temperature (>43 degrees Celsius or 109°F);
- Approved methods for carrying tortoises; and
- Procedures for post-release monitoring.

Finally, Eagle Crest proposes to offset effects on tortoise habitat with the purchase of a minimum of 160 acres of suitable tortoise habitat for conservation purposes (Measure DT-6). Eagle Crest would purchase this land in the habitat range for the same population of desert tortoises that occupy the project area. Eagle Crest would use the following criteria to identify suitable parcels for purchase:

- Lands that are part of larger block of lands that are currently protected or able to be protected;
- Lands that are not subject to intensive habitat degradation (e.g., recreational use, grazing use, agriculture);
- Lands that have inherently moderate-to-good habitat that would naturally and ultimately regenerate when current disturbances are removed;
- Lands that are bordered by native habitat suitable for tortoises; and
- Lands that represent a buffer for a block of good habitat.

Our Analysis

As currently proposed, construction of the project would occur within both FWS-designated critical habitat and BLM DWMA. Additional habitat outside of these designated areas is also known to support this species. Therefore, construction of the project would be likely to affect desert tortoise through the removal and/or disturbance to occupied and protected habitat.

The State Water Board's recommended transmission line would be located adjacent to, but outside of the DWMA, and would cross only a small section of critical habitat immediately north of the substation. Construction of the alternative substation would disturb 74 acres of critical habitat. However, these effects would be concentrated in a location with generally low habitat quality and few recorded occurrences of desert tortoise. Additionally, the transmission line would comply with the FWS' recommendation to co-locate the line with existing transmission lines. Therefore, the State Water Board's recommendation would have lesser effects on desert tortoise.

Eagle Crest proposes measures that would provide multiple layers of protection from project effects including pre-construction surveys and clearance surveys to identify tortoises in unsafe locations, development of procedures for the safe relocation of these individuals, and development of measures to prevent tortoises for entering unsafe locations after they are cleared. These measures are consistent with FWS' recommended measures for handling desert tortoise (FWS, 2009). Additionally, Eagle Crest would allow only employees who meet FWS standards to handle tortoises. Eagle Crest's proposed measures would substantially reduce the risk of project construction effects on desert tortoise. Staff finds construction of the project may affect but is not likely to adversely affect desert tortoise.

The NECO Plan states that all lands within a DWMA would be designated as Category I Desert Tortoise Habitat, with required compensation of 5 acres for every acre disturbed. All lands outside a DWMA are considered Category III habitat, with a 1:1 compensation ratio. Eagle Crest's proposed purchase of 160 acres of compensation lands is based on the proposed project disturbing 19 acres of Category I habitat and 65 acres of Category III habitat. However, construction of the State Water Board's recommendation, as staff recommends, would result in different levels of disturbance to Category I and Category III habitat. The specific acreages of disturbance would depend on whether the extent to which applicant constructs the interconnection substation or whether the substation is first constructed as a component of the Desert Sunlight Solar Farm (BLM, 2010a). If Eagle Crest were to recalculate the disturbance to Category I and Category III habitat after completing the interconnection design and recalculate appropriate acreages of compensation lands, the area of compensation would be more appropriately tied to project effects.

Effects of Operation on Desert Tortoise

Operation of the project would increase surface water availability to predatory species including ravens, gulls, and coyote. Additionally, the presence of the transmission line could provide additional perching and nesting area for predatory birds. By providing increases in these resources, the project could result in increases in the population size of these species in the vicinity of the project. Because these species are known to prey upon desert tortoise, such population increases could pose an increased risk of predation to this species and result in population reductions. Project maintenance activities would also pose a risk to the desert tortoise. These risks would depend on the specific activity required for project maintenance, but vehicle collisions would probably most likely. Finally, the project would permanently occupy or disturb 84 acres of desert tortoise habitat, reducing habitat availability for this species.

Interior, in its March 12, 2010, letter, recommends that Eagle Crest relocate the transmission line out of desert tortoise critical habitat. Interior recommends Eagle Crest co-locate the new line with existing transmission lines near the project site to reduce the addition of new perching areas for predatory birds within the critical habitat area. FWS also comments that where the new transmission line could not be co-located with existing lines, the new line would result in increased perching and nesting structure for desert tortoise predators. FWS recommends Eagle Crest avoid creating such an environment where predation rates on desert tortoise could increase.

The proposed transmission would result in the creation of a new utility corridor removed from pre-existing transmission lines. Under these conditions, the transmission line structures would likely provide suitable perching and nesting habitat for ravens, potentially increasing predation risk to desert tortoise. Conversely, the State Water Board's recommended transmission line would parallel an existing 160-kV line supported with wooden H-frame structures.

To reduce the potential for project operations to result in increased predation on desert tortoise, Eagle Crest developed a Raven Monitoring and Control Plan. In response to the Commission's request for additional information, Eagle Crest filed a completed draft of this plan on October 27, 2009. Specific components of the plan include the following:

- Identifying specific project components with potential to attract ravens;
- Conducting surveys during project construction (years 1 to 3) to determine baseline conditions of raven populations on project lands and within 1 kilometer of the project boundary;
- Conducting post-construction monitoring to detect changes in raven population size, nesting behavior, or evidence of tortoise predation (once every 5 years for the duration of the license);
- Development of a trash and food waste management program;
- Hazing measures at project reservoirs and desalination ponds;
- Procedures for removing raven nests, if determined necessary through consultation with FWS;
- Procedures for reporting study results to management agencies; and
- Thresholds for success or need for additional control measures.

Finally, during project maintenance activities where ground disturbance would occur, Eagle Crest would ensure qualified biological monitors are present. These monitors would use methods and procedures described above to protect desert tortoise.

The Park Service filed comments on the final license application on March 11, 2010. In its letter, the Park Service comments that Eagle Crest's management of desert tortoise predators should not be limited to ravens, but also include coyote, wild dogs, gulls, and other potential predators.

In response to this comment, Eagle Crest notes that the project reservoirs would not be the only water source in the area and that existing sources, including the CRA, Metropolitan Water District's pumping station reservoir, wastewater treatment ponds, and agricultural irrigation systems also subsidize predator species. Eagle Crest contends that since water is constantly available from these sources, water supply is not a limiting factor on predator species population size in the project vicinity. Eagle Crest also notes that if monitoring indicates increases in gull, coyote, or other desert tortoise predator species, the Raven Monitoring and Control Plan is designed to be expanded to address these predator species as an adaptive management measure.

Our Analysis

Operation of the project would increase available water sources for desert tortoise predators. The completed transmission line would provide additional perching and nesting locations for ravens and other predatory birds. However, since neither of these resources appear to be limiting factors (both are readily available in the project vicinity), the extent to which these additional resources would support increases in predator populations in not clearly evident. On the other hand, without successful implementation of mitigation for these effects, there is potential for adverse effects on the desert tortoise.

Eagle Crest's proposed measures include surveys to determine base line conditions for raven populations in the project area; and, a plan for follow up surveys to quantify the effects of project facilities on raven population size. Although Eagle Crest notes that these surveys would also detect increases in gull, coyote, or wild dog populations, the mechanism for such detections is not clear; the Raven Monitoring and Control Plan does not include any surveys for these species. If Eagle Crest amends the current Raven Monitoring and Control Plan to include baseline and post-construction survey methods for coyote, wild dogs, and gulls and develops mitigation measures to be implemented if increases in population levels are detected, in turn developing a desert tortoise predator control plan, as the Park Service recommends, effects on desert tortoise would be reduced.

Eagle Crest's description of the raven survey schedule includes 3 survey years during construction followed with surveys once every 5 years for the duration of the license. However, it is unclear whether the post construction surveys would commence during the year of project completion, or 4 to 5 years following project completion. If project operation supports an increase in tortoise predator species, there is potential for adverse effects if a 4- to 5-year time lapse occurs between the baseline surveys and the first post-construction survey. If Eagle Crest includes in the desert tortoise predator control plan, a survey schedule that includes initiation of post-construction surveys during the second year after project completion, followed by surveys once every 5 years, any initial increases in tortoise predator populations would be detected, and implementation measures could be implemented to reduce effects on desert tortoise.

Any reasonable efforts Eagle Crest can make to locate the line outside of desert tortoise critical habitat and co-locate with other transmission lines would be beneficial. Co-locating lines near existing lines would still add potential perching and nesting habitat, but the quality of this habitat would be lower than the habitat that would be created by adding new structures to areas where transmission lines are not already present. Minimizing the number of new structures constructed in desert tortoise critical habitat areas would reduce the creation of new perching and nesting habitat in these areas. Implementation of the revised desert tortoise predator control plan and Eagle Crest's other proposed measures, including habitat compensation and monitoring during maintenance activities, would reduce potential effects of project operation on desert tortoise.

Eagle Crest's proposed WEAP, Desert Tortoise Removal and Translocation Plan, Raven Monitoring and Control Plan, and proposed compensation for disturbance to desert tortoise habitat would reduce potential effects of construction and operation of the project on desert tortoise. Staff's recommended modifications to these measures, including the desert tortoise predator control plan and co-locating the transmission line with existing SCE line, as the State Water Board recommends, would further reduce potential effects on this species. However, surveys have shown the project area to support a population of desert tortoise, with multiple live tortoises, tortoise scat, and tortoise remains observed along proposed project features. As such, it is likely encounters between desert tortoise and construction and/or maintenance crews would occur. These encounters would likely result in the need to handle tortoises for removal to other areas and disturbance to or destruction of tortoise habitat. Such interactions, even when conducted following FWS guidelines and with the best of intentions, would increase stress and potentially result in desert tortoise mortality. Additionally, permanent effects would occur within the Chuckwalla Unit of designated critical habitat. Therefore, staff finds the proposed project, with staff-recommended modifications, may adversely affect desert tortoise and critical habitat for this species.

3.3.4.3 Cumulative Effects

The proposed project would not affect Coachella Valley milkvetch and would not contribute to any cumulative effects on this species in combination with other foreseeable actions in the vicinity.

Construction and operation of the pumped storage project, the Eagle Mountain landfill (see *Land Use* in section 3.3.5), and multiple solar projects proposed in the Coachella Valley all have the potential to affect desert tortoise. These effects include both direct disturbance and removal of suitable habitat. As discussed above, the Eagle Mountain Project would have a relatively small contribution to cumulative effects on terrestrial resources in the central project area, when combined with the Eagle Mountain landfill. Similarly, the project's contributions to cumulative effects on desert tortoise in this area are also negligible and Eagle Crest's proposed measures would mitigate for these effects.

On the Coachella Valley floor, there are currently 11 proposed solar developments, totaling about 123,600 (± 35,000) acres, under review. There is little certainty as to how many of these projects will be constructed. Similarly, it is not possible to ascertain the acreage of suitable desert tortoise habitat these projects would occupy. However, compared to the scale of these potential projects the effects of the Eagle Mountain Project on desert tortoise habitat in the Coachella Valley (about 85 acres) is negligible. Eagle Crest's proposed monitoring and mitigation measures would ensure the project does not contribute to adverse cumulative effects on the desert tortoise. Co-locating project facilities with the Desert Sunlight Solar Farm, as the State Water board recommends, would also reduce cumulative effects on desert tortoise.

3.3.5 Recreation, Land Use, and Aesthetics

3.3.5.1 Affected Environment

Regional Recreation Resources

Recreational resources in the region are primarily provided and managed by the Park Service and BLM and include some resources on lands owned by the state of California. Activities within the region include hiking, camping, backpacking, hunting, scenic/wildlife viewing, rock hounding, rock climbing, mountain biking, horseback riding, and OHV use.

Joshua Tree National Park and Wilderness Area

The JTNP is the most visited public land for recreational resources in the project vicinity. The JTNP encompasses nearly 792,000 acres of land, of which 585,000 acres have been designated wilderness under the Wilderness Protection Act of 1964 (Park Service, 2010). This 585,000-acre wilderness area surrounds the central project area on three sides (figure 8). At its closest point, the park boundary is located about 2 miles from the proposed project site within the inactive Eagle Mountain mine. The Park Service manages the JTNP, and there are trails that provide for motorized and non-motorized forms of access. No existing or proposed project features are located inside the park or wilderness area.

Access to the JTNP is from Interstate 10 to the south and from State Route 62 to the north. The JTNP offers a variety of dispersed recreational activities and camping. Due to its unique geology and rock formations, this area is internationally known as a prime rock climbing destination. Massive boulders and rock outcrops provide some of the best rock climbing in the United States. Skilled and novice technical rock climbers from around the world are attracted to the challenging climbing routes (BLM and California DFG, 2002). The JTNP continues to be a popular destination for both local and non-local residents and has increased visitation steadily over the past several years, such that it is now considered a year-round destination. The wilderness area provides an opportunity for solitude in nature and for primitive recreation such as hiking, backpacking, and horseback riding. Opportunities abound for viewing, studying, and photographing a diversity of flora and fauna.

Developed recreational facilities, including trails, camping, picnic, and day-use facilities, are more prevalent in the northwestern portion of the JTNP. In keeping with the management prescriptions of the wilderness area designation, recreational facilities in this segment of the park include a few backcountry roads and trails. Cottonwood Visitors Center greets visitors at the southern access road to the JTNP, while the northern portion is accessible from the Oasis Visitor Center near Twentynine Palms, and the West Entrance Station south of the town of Joshua Tree. All but one of the nine campgrounds within the JTNP are located in the western half of the park.

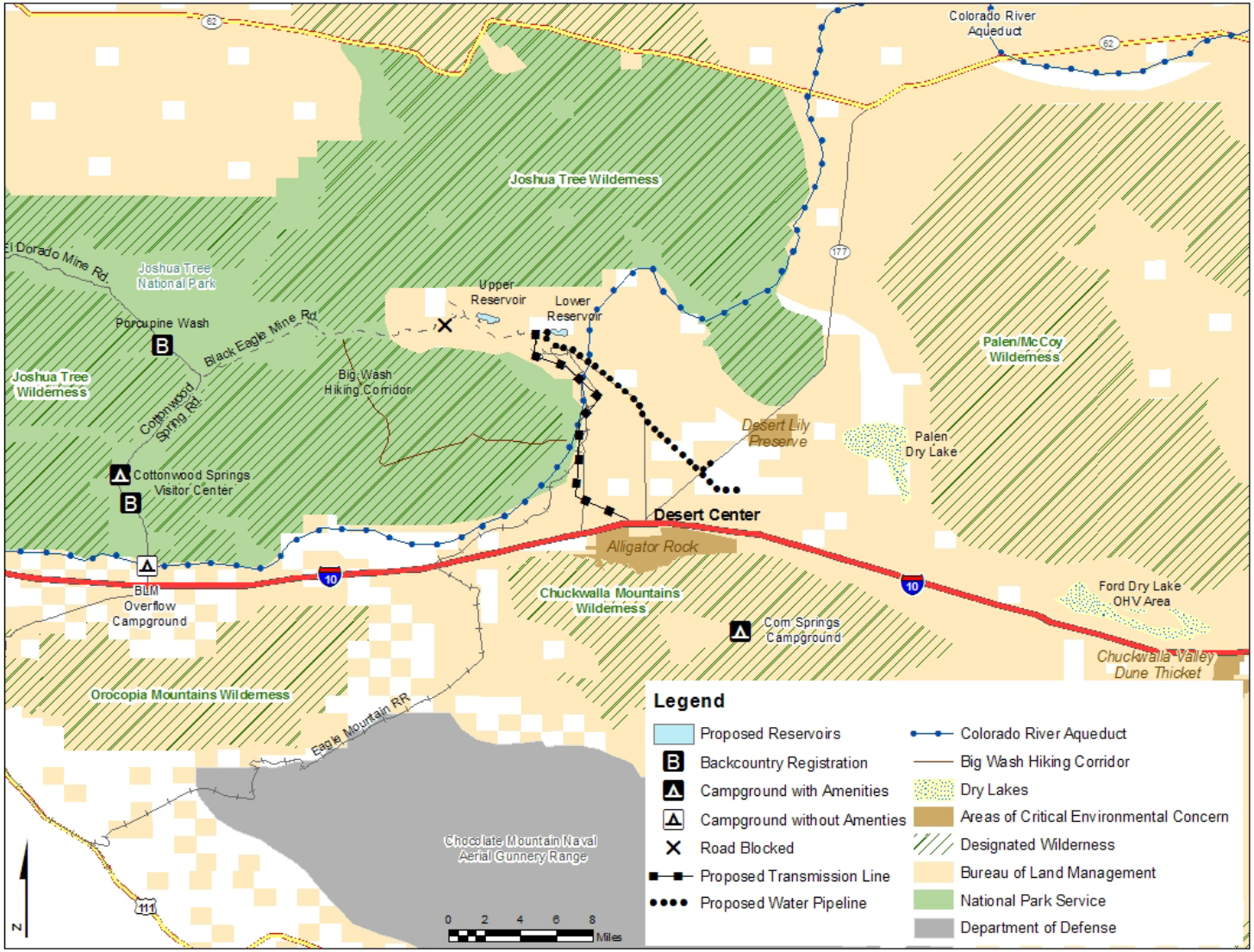

Figure 8. Recreation resources in the vicinity of the proposed project (Source: Eagle Crest, 2009a, as modified by staff).

Backcountry hiking and camping are popular in the park. Trails and facilities are more limited in the eastern half nearest the proposed project area; however, this area of the JTNP is home to more than 30 abandoned mines, an attraction to some visitors. One backcountry unpaved road, Black Eagle Mine Road, traverses canyon areas within the park and exits toward the proposed project area. The Big Wash Hiking Corridor is a Park Service trail within JTNP that follows the Big Wash arroyo from Victory Pass just south of the Metropolitan Water District's pumping plant, west into JTNP and gradually turning northwest, terminating at Black Eagle Mine Road about 2 miles west of the eastern park boundary.

The JTNP Backcountry and Wilderness Plan (Park Service, 2001) identifies an overnight restriction area (day-use only) within the wilderness area, bordering the park boundary, and about 2 miles due south of the proposed reservoirs site. There are no roads, trails, or trail corridors identified in the plan that indicate there is access to this day use only area at the present time or planned for the future.

Bureau of Land Management

The majority of recreational opportunities on BLM lands includes hiking and OHV use. BLM maintains an inventory of trails and areas open or closed to OHV activity. BLM also maintains several primitive campsites within the region.

Existing Recreation Resources in the Proposed Project Vicinity

Recreational resources in the project area are primarily dispersed opportunities on public lands; however, there are a small number of developed amenities. Public lands in the vicinity of the Interstate 10 corridor and Chuckwalla Valley include Ford Dry Lake and Palen Dry Lake, which are OHV use areas managed by BLM. Additionally, BLM manages the Chuckwalla Valley Dune Thicket and Alligator Rock, both Areas of Critical Environmental Concern (ACEC) located near Interstate 10. These areas are designated for the protection of wildlife and other resources. The Desert Lily Sanctuary is a 2,040-acre preserve adjacent to State Route 177 about 8 miles southeast of the proposed reservoir site. In addition to the JTNP and wilderness area, other designated wilderness areas in the vicinity include the BLM-managed Chuckwalla Mountains wilderness area south of Interstate 10 outside Desert Center; the Palen/McCoy wilderness area east of State Route 177; and the Orocopia Mountains wilderness area southwest of Desert Center. There are no developed facilities at any of these locations other than gravel parking and signage at the Desert Lily Sanctuary. BLM allows overnight (overflow) camping on a gravel lot north of Interstate 10 just outside the south entrance to JTNP.

Developed recreational facilities in the area include a museum, golf course, and campground. The General Patton Museum is located just off Interstate 10 at Chiraco Summit. This facility also borders a large historic area known as Camp Young, which was established as a desert warfare practice area during World War II. The small community of Lake Tamarisk, located about 5 miles southeast of the proposed project area, has a 9-hole golf course (see figure 9). BLM operates the only developed

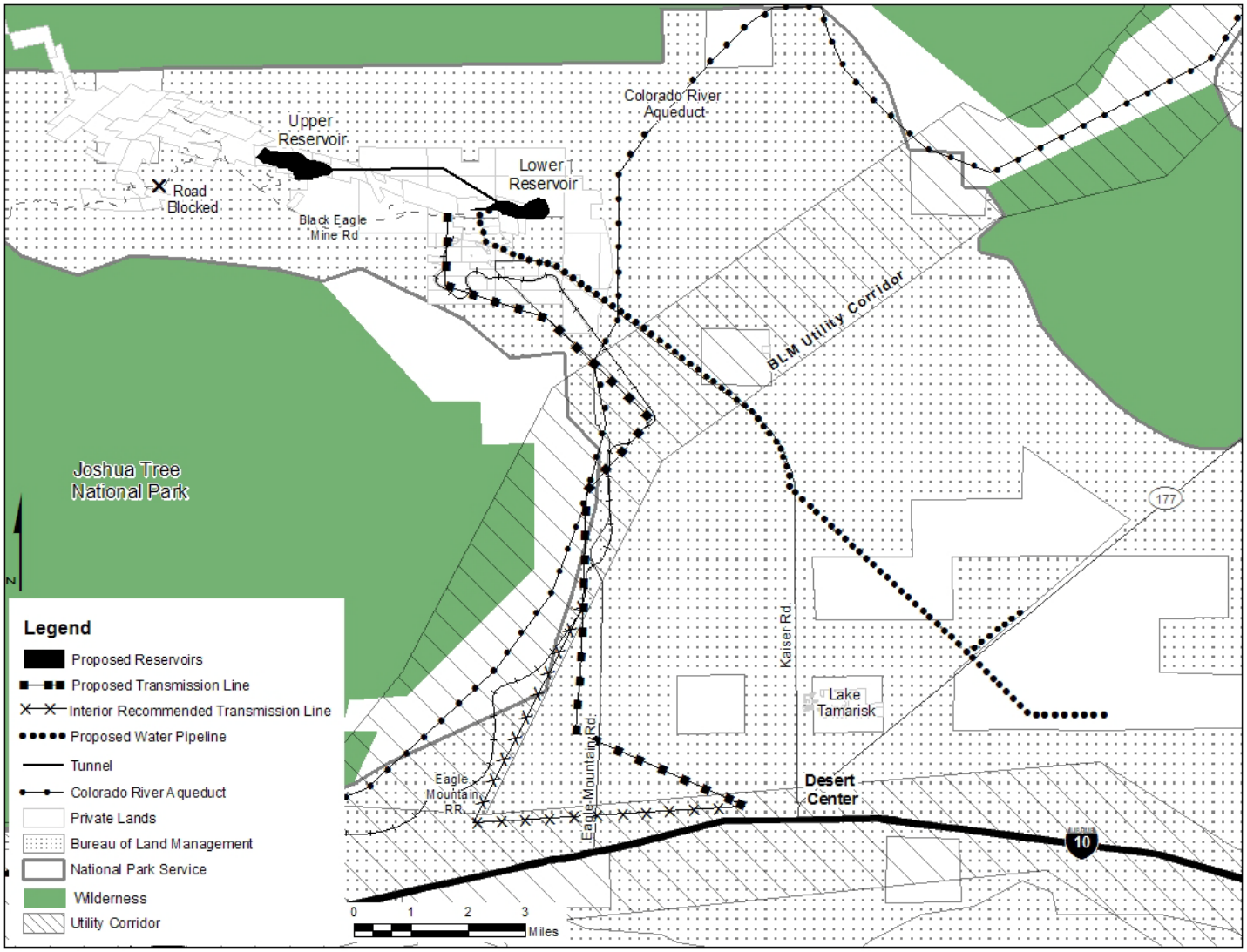

Figure 9. Land ownership in the vicinity of the proposed project (Source: Eagle Crest, 2009a, as modified by staff).

campground outside JTNP in the vicinity of the proposed project, Corn Springs in the Chuckwalla Mountains Wilderness, about 7 miles south of Desert Center. A private business has proposed to develop the Desert Center Airport off State Route 177 east of Lake Tamarisk into a large-scale motocross facility with multiple tracks, grandstands, clubhouses, and other associated facilities. According to the developer's web site, they are currently looking for investors.

Visitation

The majority of recreation activity in the region occurs within the JTNP. The park received almost 1.4 million visitors in 2008, with 3,895 recorded backcountry stays (Park Service, 2008). Most of the park's developed facilities lie to the west of the main, paved park road, with the exception of Cottonwood Springs Visitor Center and its associated facilities. Recreation facilities on the east side of the park are minimal and, as such, recreation use on the east side of the park is relatively sparse, as is information about the number of users in this portion of the park. The JTNP Management Plan notes that only about 0.5 percent of visitors to the park spend the night in the back country (Park Service, 2001). The backcountry wilderness registration board closest to the proposed project is located at Porcupine Wash on Pinto Basin Road just west of the intersection of Black Eagle Mine Road and Old Dale Road. Miscellaneous backcountry use in the southeastern portion of the park over the past 5 years has ranged from between 3,900 to 5,900 user-nights annually (Eagle Crest, 2009c). About 500 of these user-nights are estimated to be attributed to the eastern region of the Park (Eagle Crest, 2009c).

Day use of the east side JTNP lands prior to its inclusion into the park/wilderness system in 1994 relied on 4-wheel drive access to many locations (Park Service, 2001). Four-wheel drive/OHV use is prohibited within wilderness areas. Black Eagle Mine Road, an unmaintained dirt road, traverses a non-wilderness corridor in this eastern section of the park, and continues beyond the park boundary to the Eagle Mountain mine and proposed project site. The park allows only road-licensed 4-wheel drive vehicles to access this road, and it is used by both locals and tourists; however, the Park Service does not maintain vehicle counters along the road. Based on its experience, Park Service staff estimated that the road may see about 1,000 day-use visits in a season (Eagle Crest, 2009c). The Black Eagle Mine Road is barricaded with a large boulder in the middle of the road about 3 miles east of the JTNP boundary. The road block is positioned at the apex of the saddle of the Eagle Mountains running north-south, precluding vehicular access between the park and the Eagle Mountain mine site. About 5 to 10 abandoned mines are located short distances off of Black Eagle Mine Road along the route within the JTNP boundary.

Outside of JTNP, OHV use is the primary dispersed recreational activity in the area. OHV use has long been a major part of the recreation in the area, and, nationally, OHV use has increased five-fold in the last 3 years (BLM, 2010b). As noted previously, BLM maintains an inventory of trails that indicates areas open or closed to OHV activity. There are no BLM OHV areas designated as "open" within Riverside

County, where riding off designated routes is permitted. All BLM lands throughout the region are designated "limited use" for OHV purposes, meaning that all vehicles must remain on designated routes of travel. There are no estimates of the amount of recreational use these lands receive.

Similarly, BLM does not keep records of visitor use at the few camping areas in the vicinity (e.g., Corn Springs campground, JTNP dispersed camping overflow area, general dispersed camping). BLM has noted as part of the review of the NECO Plan that this area receives little recreational use (Eagle Crest, 2009a).

Land Use

Land Use in the Project Area

Much of the land surrounding the Eagle Mountain mine is public land managed primarily by the Park Service and BLM. Communities in the vicinity of the proposed project include the town of Eagle Mountain, Lake Tamarisk, and Desert Center. Kaiser developed the town of Eagle Mountain, which is located adjacent to the Eagle Mountain mine, to house mine workers. The town site consists of about 250 single-family dwellings, a store, café, two churches, a school, and a post office among other features. After the mine closed in 1986, the town became largely vacant; however, a few Kaiser employees maintain residence there. California Department of Corrections contracted with private prison operators to house low-risk inmates in renovated facilities that occupied the old town shopping center between 1986 until its closing in 2003. The correctional facility included housing units in four pods. When operated as a state facility, the rated capacity was 436 minimum security beds. Riverside County board members studied the site as a potential county correctional facility; however, the 2007 feasibility study (DMJM Design/AECOM, 2007) recommended the County should not pursue this as an option.

Lake Tamarisk and Desert Center are located about 9 and 10 miles southeast of the Eagle Mountain mine, respectively. Both towns are small communities with fewer than 100 single-family dwellings combined. Both communities as well as Eagle Mountain are accessed by Kaiser Road, which connects to Interstate 10 at Desert Center.

Land Use Within and Adjacent to the Proposed Project Boundary

Reservoir and Construction Laydown Areas—The site consists of mountainous, rocky terrain that has been extensively disturbed as a result of past mining activity. Inactive open pits, tailings piles, and remnant tailings ponds exist on site. Remnants of the structures associated with the previous mining, including railhead, haul roads, and ore processing/refining facilities, still exist, although most of the ore processing and refining facilities have been removed.

The central project area occupies only a portion of the acreage encompassing the Eagle Mountain mine area. Kaiser has proposed to develop much of the area between the two

open mine pits proposed as the upper and lower reservoirs for this project as a landfill. As part of the landfill proposal, BLM would exchange about 3,500 acres of public land within the area for offsite private lands to support the landfill project in the mine area. Figure 10 provides the phasing and layout of the proposed landfill project. If the land exchange were not to be consummated, the project boundary for the proposed project would include nearly 1,059 acres of federal land managed by BLM. If the land exchange is executed, 676 acres of the proposed project features would be on federal lands. The California State Lands Commission holds a 100 percent mineral interest on 467 acres surrounding the proposed lower reservoir site.

Water Pipeline Corridor—Water for the proposed project would originate from three wells in the Chuckwalla Valley about 11 miles from the proposed reservoirs. Water from the wells would be conveyed to the lower reservoir via pipeline extending alongside existing roads and a Metropolitan Water District transmission line corridor within a proposed 60-foot-wide pipeline ROW.

Land uses adjacent to the corridor consist primarily of undeveloped desert land. The southern third of the proposed route would cross several private parcels with inactive agricultural fields. The remainder of the route would consist of undeveloped federal land managed by BLM. As the proposed route approaches the Eagle Mountain area, it would cross the CRA before reaching the lower reservoir (figure 9).

Transmission Line Corridor—The proposed route for the project's double-circuit 500-kV transmission line would be located almost entirely on public lands managed by BLM. Exceptions include private lands within the project boundary owned by Kaiser and a small crossing of land owned by the Metropolitan Water District as the route crosses the existing district's aqueduct and transmission lines. Eagle Mountain proposes a 200-foot-wide corridor for construction, operation, and maintenance of the proposed transmission line. The proposed route would extend about 13.5 miles from the proposed project switchyard south-southeast to a proposed interconnection collector substation that would interconnect with the proposed Devers-Palo Verde No. 2 transmission line located near Desert Center.

The transmission line would exit the project switchyard and extend south to a point on the west side of the Eagle Mountain rail line. At this point, the route turns southeast to a location adjacent to existing SCE 161-kV wood pole transmission lines. Here, the line would turn to parallel the existing transmission lines and access road, crossing the Metropolitan Water District's metal tower electric transmission structures and passing to the east of the Metropolitan Water District's pumping plant. Most of this route segment from the mine to the Metropolitan Water District's pumping plant would be located on public land managed by BLM, except for a small parcel of land around the CRA and Aqueduct Road owned by Metropolitan Water District. This area of the proposed transmission line is undeveloped except for a number of unpaved access roads, the paved Aqueduct Road, and existing transmission lines.

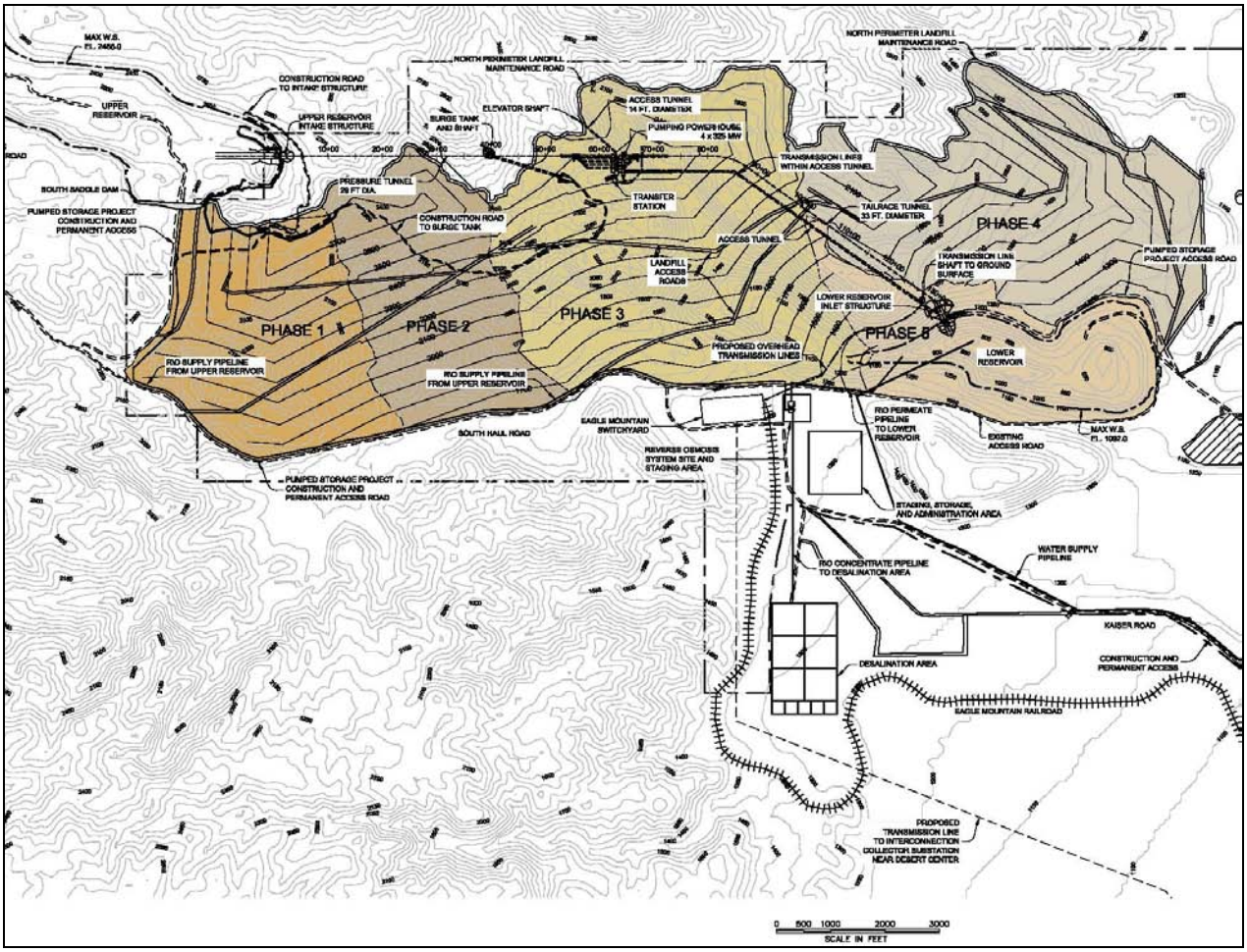

Figure 10. Proposed phasing of the land fill project (Source: Eagle Crest, 2009a, as modified by staff).

East of the Metropolitan Water District's pumping plant, the transmission line route would cross over a pass in the small hills near the Eagle Mountain railroad. At this point, the route would turn southwest for a short distance before turning south to parallel the existing Eagle Mountain Road. The route would continue to parallel Eagle Mountain Road for about 3 miles, then turn southeast and continue for another 2.5 miles to the proposed substation. Land use in the location of the proposed substation is undeveloped desert; rural open space as designated in the County's General Plan. South of the proposed substation, low density residential development exists as a part of Desert Center.

Plans

BLM is the primary land manager in the region. The entire proposed project area is located within the 25-million acre California Desert Conservation Area (CDCA), of which about 12 million acres are public lands. The California Desert Conservation Area Plan (BLM, 1980) is the BLM's land use plan for the CDCA. The general goal of the

CDCA Plan is to provide for the use and protection of the desert's natural, cultural, and aesthetic resources. This plan specifies that activities on BLM-managed public lands must conform with the approved land use.

Public lands under BLM management within the CDCA have been designated geographically into four Multiple Use Classes. The majority of the proposed project site itself is not designated because it is largely or entirely private land and therefore not directly under BLM stewardship. The plan does provide Multiple Use Class designations for portions of the proposed project site and directly adjacent public land. Public lands are assigned a Multiple Use Class according to the following allowable level of multiple uses.

- Class "C" (controlled use) designation is the most restrictive, and is assigned to wilderness areas;
- Class "L" (limited use) lands are managed to provide lower intensity, carefully controlled multiple uses while ensuring that sensitive resource values are not significantly diminished;
- Class "M" (moderate use) lands are managed to provide for a wider variety of uses such as mining, livestock grazing, recreation, utilities, and energy development, while conserving desert resources and mitigating damages that permitted uses may cause; and
- Class "I" (intensive use) provides for concentrated uses of lands and resources to meet human needs (BLM, 2002).

The proposed reservoirs and surrounding area are included within one of six concurrent CDCA Plan amendments—the NECO Plan, a plan developed for a geographic subset of the larger CDCA. Public lands west of the Kaiser lands but east of the JTNP boundary are managed as Multiple Use Class-L, and public lands east of the Eagle Mountain mine are managed according to Multiple Use Class-M guidelines.

The CDCA Plan identifies designated utility corridors targeted for transmission lines, pipelines, and related structures such as substations and compression stations and indicates that applications for utility rights-of-way will be encouraged by BLM management to use designated corridors (BLM, 1980). The plan states that sites associated with power generation or transmission not identified in the CDCA Plan will be considered through the plan amendment process (BLM, 1980).

Routes within defined corridors and on BLM-managed lands require authorization of a ROW grant from BLM. Figure 9 identifies the current BLM Multiple Use Classes relative to the project and the CDCA Plan utility corridors.

Riverside County—The project study area lies within Riverside County's Desert Center Land Use Planning Area. The vast majority of the planning area is classified as Rural Open Space and zoned as Natural Assets. Within the Desert Center Land Use Planning Area, Riverside County has established two specific policy areas. Policy areas

are specific geographic districts that contain unique characteristics that merit detailed attention and focused policies. The Eagle Mountain policy area encompasses the proposed project site and the Eagle Mountain town site. Outside this specific policy area boundary, "Rural Open Space" dominates the county land use designation, with the exception of an area of "Rural Open Space-Mineral Resources" to the north/northwest of the proposed reservoirs area. Riverside County zoning and land use plans identify the Eagle Mountain mine site as a landfill site.[34]

The Desert Center policy area encompasses currently undeveloped land located adjacent to and north of the small, unincorporated community of Desert Center. The terminus of the proposed transmission line and substation would be included within this policy area.

Joshua Tree National Park—The JTNP was established first as a national monument in 1936 and later changed to a National Park in 1994. As noted previously, the Eagle Mountain wilderness area is within the park boundary. The closest part of the JTNP is located within 2 miles of the proposed project area and is designated by the Park Service as backcountry transition or wilderness subzones. Lands within the backcountry transition subzone are managed to maintain the natural resources and processes that are unaltered by human activity except for approved developments essential for use and appreciation such as park roads, picnic areas, and backcountry parking areas. This designation applies to the Black Eagle Mine Road corridor. The remainder of the area outside the road corridor is designated as a wilderness subzone, and no development is allowed. The wilderness area designation allows only non-motorized, non-mechanized activities to occur within its boundaries, with minimal trail creation and maintenance.

Aesthetics

The proposed project is located about 10 miles north of Desert Center, California, less than 60 miles from the Colorado River. This area of California is generally referred to as the western Sonoran Desert, or more commonly called the "Colorado Desert," and includes the area between the Colorado River Basin and the Coast Ranges south of the

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[34] Specific Plan 305 was approved on September 8, 1997 (Riverside County, 1997). Specific plans are for land use for the development of large property holdings, which are otherwise eligible for development under the Riverside County General Plan. Specific Plan Zone shall be applied only to property for which a specific plan of land use has been adopted; provided, however, that the Specific Plan Zone may be adopted concurrently with a specific plan. The zone shall be applied only upon a finding that the specific plan of land use contains definitive development standards and requirements relating to land use, density, lot size and shape, siting of buildings, setbacks, circulation, drainage, landscaping, architecture, water, sewer, public facilities, grading, maintenance, open space, parking, and other elements deemed necessary for the proper development of the property.

Little San Bernardino Mountains and the Mojave Desert. The overall character of the area is a combination of arid and semi-arid landscapes alternating between basins and mountain ranges. Local elevations range from about 400 to 2,500 feet, while regionally the San Bernardino Mountains 100 miles west of the area rise up to about 11,500 feet and the Salton Sea, about 50 miles southwest of the area, is 227 feet below sea level.

The proposed project components would be located in an area that is visually characterized by broad, flat desert valleys bordered by highly eroded mountain ranges. The arid environment and low lying, sparse vegetation provide long views across the desert landscape from key view points. One of the visually striking features of this area is how abruptly the mountains rise above the valley. The proposed project would be located within an inactive iron-ore mine site within the Eagle Mountains with the transmission and water pipelines running across the Chuckwalla Valley. The valley is a mostly flat desert bordered by the Eagle Mountains to the west, the Coxcomb Mountains to the north east, and the Chuckwalla Mountains to the south. The small communities of Lake Tamarisk and Desert Center are located within this valley near Interstate 10 about 9 and 10 miles, respectively, south of the inactive mine.

BLM Visual Resource Management System

The BLM's Visual Resource Management (VRM) system is a management tool to assist BLM in carrying out its mandate to ensure that the scenic values of the public lands are considered before allowing uses that may have negative visual effects. The VRM system involves inventorying scenic values and establishing management objectives for those values through the resource management planning process, and then evaluating proposed activities to determine whether they conform with management objectives.

The visual resource inventory process provides BLM managers with a means for determining visual values. The inventory consists of a scenic quality evaluation, sensitivity level analysis, and a delineation of distance zones. Based on these three factors, BLM-administered lands are placed into one of four visual resource inventory classes. These inventory classes represent the relative value of the visual resources. Classes I and II represent the most valued resources, Class III represents a moderate value, and Class IV represents resources of least value.

VRM classes are categories assigned to public lands and serve two purposes: (1) an inventory tool that portrays the relative value of the visual resources, and (2) a management tool that portrays the visual management objectives. The VRM system evaluates the quality of existing scenery by accounting for the distance from which scenery is viewed and peoples' sensitivity to changes in the landscape. According to the VRM system, resource management classes comprise the following objectives:

- Class I—The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the

characteristic landscape should be very low and must not attract attention. Areas of Critical Environmental Concern are classified as VRM Class I.

- Class II—The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
- Class III—The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
- Class IV—The objective of this class is to provide for management activities that require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the effect of these activities through careful location, minimal disturbance, and repeating the basic elements.

BLM has not established visual resource management classes for lands within the Chuckwalla Valley or Eagle Mountain areas. Because the BLM VRM system is a well-established management tool, Eagle Crest conducted a draft VRM analysis and developed surrogate VRM Classes to help evaluate the potential effects of the project on visual resources areas part of its license application. Staff presents the applicant-devised surrogate VRM inventory classes below and shows them in figure 12:

BLM Indicator	**Reservoirs**	**Water Pipeline**	**Transmission Alignment**
Scenic Quality Class Rating	IV	III and IV	II,III and IV

Existing Site-specific Aesthetics

Reservoir Area—The mountainous landscape of the proposed reservoirs site is dominated by the disturbances associated with major hard rock mining operations. Extensive pits created when the ore was removed are bounded by benched side walls and large tailing piles. Mined areas within the project area represent highly disturbed, human-modified landscapes consisting of large open pits, tailing piles and ponds, and the remains of ore processing facilities and mining equipment. The massive amounts of

tailing piles surrounding the mine exhibit regular terraces with some eroded qualities. The Eagle Mountain mine extends into the mountain slopes and presents a distinctly different visual character from the surrounding undisturbed portions of the mountains. The area around the mine is of considerable magnitude, and the contrast generated from the exposed tailing piles and storage of the excavated materials is visible from most areas within the Chuckwalla Valley north of Interstate 10. These piles contrast in shape, texture, and color with the surrounding unmodified landscape. Adjacent to the mine, the town of Eagle Mountain is largely composed of deserted homes and vacant buildings.

Views beyond the inactive mine site include the Eagle Mountain backdrop, which precludes views into JTNP from lower elevation points. Views across the Chuckwalla Valley from the mine site are relatively unobstructed, providing long sight lines to the Coxcomb Mountains in the distance. Human-made disturbances that visibly stand out from the natural landscape include: roads, a railroad, transmission lines for the CRA, and wood distribution poles supplying electricity to the Eagle Mountain town site. High voltage transmission lines also parallel Interstate 10; however, about 11 miles away, the definition and contrast the lines provide against the natural surroundings is muted.

Transmission Line and Pipeline—Access to the Eagle Mountain mine site and the proposed transmission line and water pipeline corridors are through the Chuckwalla Valley. The valley is representative of desert basin features and consists of relatively flat to gently sloping topography that visually separates and accents the adjacent mountain ranges. The Chuckwalla Valley, like others in the region, is dominated by colors of the physical landscape: exposed rocks, sand, gravel, and sparse vegetation. After winters with above-normal precipitation, desert wildflowers provide a colorful ground cover. Overall, the visual characteristics are created by the combinations of alluvial washes, wind-blown landforms, and vegetation.

The natural features of the Chuckwalla Valley are modified by residential and commercial developments, including the Eagle Mountain town site, Lake Tamarisk, and Desert Center. Linear landscape elements within this landscape unit include roads, transmission lines, railroads, OHV tracks, the CRA, numerous stormwater draining dikes for the interstate, and the Metropolitan Water District's pumping station and related facilities. Primary transportation corridors within the unit include Interstate 10 and State Route 177. Kaiser Road is the main paved road from Desert Center to the proposed project site, Eagle Mountain Road is an alternative route, and other maintained and unmaintained dirt roads cross the valley.

The expansive scale and flat topography of the valley offers panoramic views of the surrounding mountain ranges from many locations. The relatively flat and uniform landscape character is typical of the regional landscape setting.

Key Viewpoints Associated with the Project

Many of the features associated with constructing the proposed project would be visible from public roads or lands that adjoin the proposed project site. Changes to the landscape would be most visible to people who use Kaiser Road, Eagle Mountain Road, Interstate 10, and State Route 177. Other important areas with views of the proposed project features include the small residential communities of Lake Tamarisk and Desert Center. Backcountry hikers in JTNP could also potentially see proposed project features from ridge tops at the park boundary.

Kaiser Road—Kaiser Road is the main travel route connecting Desert Center with the Eagle Mountain mine site. The road is about 9 miles long running north for two-thirds of the route before turning northwest and directly toward the mine for the final one-third of the route (figure 8). Kaiser Road is also the main travel route from Interstate 10 at Desert Center to Lake Tamarisk. The road runs primarily through the middle of the valley and views along the road are the low lying areas in all directions in the foreground with the various mountain ranges as the backdrop, depending on the direction. From Kaiser Road in Desert Center (about 10 miles away from the proposed reservoirs), the existing mining operations are visible on the Eagle Mountains as contrasting colors and lines from the exposed and stockpiled mine tailings. Similarly, from Lake Tamarisk (about 9 miles away from the proposed reservoirs), the view is similar in that the contrast of the mine tailings is visible in the distance in the middle of Eagle Mountain while the sparse desert vegetation covers the foreground and valley.

Views from Kaiser Road closer to Eagle Mountain mine show that the modified landscape surrounding the mine (e.g., flat tops or terraced tailing piles) is the most visible modification in the area. The human-modified landscape also includes visible grading for the CRA, the old mine railroad, and the transmission towers to the Metropolitan Water District's pumping plant nearby.

Eagle Mountain Road—Eagle Mountain Road is a paved, two-lane asphalt road that parallels Kaiser Road about 3 miles west of Desert Center. The road provides an alternative, and more direct, route to the Eagle Mountain mine via Interstate 10. Views from the road looking north toward the mine site from near Interstate 10 are similar to views from Kaiser Road in that the foreground is dominated by low-lying desert vegetation, framed by the Eagle Mountains on the western flank and the taller Coxcomb mountains in the far distance about 20 miles away.

Interstate 10 near Desert Center—Interstate 10 is a federal interstate highway that runs adjacent to Desert Center and receives heavy commercial and non-commercial travel use. Riverside County designated this portion of Interstate 10 as an Eligible County Scenic Highway. Similar to views from Kaiser and Eagle Mountain roads, the most visible human-made feature on the mountains is the contrast created by the Eagle Mountain mine tailing piles. The distance to the mine reduces the effect because the surrounding mountains are striking compared to the relatively flat valley floor. Because

this desert setting with interspersed mountains and valleys covers hundreds of miles, drivers on Interstate 10 may be visually saturated with the regional landscape and would likely not notice the inactive mine while traveling at high speeds along the highway. Features in the foreground include the small commercial and residential buildings that comprise Desert Center, the small road network, and various transmission and distribution towers. Desert vegetation has been cleared in more areas surrounding the developed areas, showing a greater amount of the ground surface than in other locations further from town.

State Route 177 East and West of Lake Tamarisk—SCE maintains a transmission ROW that cuts across perpendicular to State Route 177 about 3 miles northwest of Lake Tamarisk. The ROW includes a maintained dirt road between a single wood pole distribution line and a taller double wood pole transmission line that runs directly toward the Eagle Mountain mine and proposed reservoirs site. Similar to the other viewpoints within the basin, the foreground is low lying vegetation with unobstructed views to the mountains that rise from the valley floor in the distance. Historical agricultural fields are adjacent to the highway, with the existing power lines in the foreground. The majority of these fields are not currently under cultivation; however, the remnants of the row cropping technique are still evident. The wood pole electric transmission system dominates the views in this area and is clearly visible, with little in the way of either natural or human-made structures to block their view, aside from the fact that the transmission system features are of similar color to the surrounding environment.

Joshua Tree National Park—The JTNP surrounds the proposed reservoirs site on three sides, with the park boundary about 2 miles away at the closest point. The historical iron ore mining operations extended away from the pits for some considerable distance in order to stockpile the mine tailings, and evidence of the greater mine footprint (extent of operations) is visible in aerial photography and comes within 1,000 feet of the park boundary at its closest point on the north side of the mine. Generally, this eastern park edge has very few visitor amenities. The Black Eagle Mine Road, within a non-wilderness corridor, provides vehicular access to the Eagle Mountains and connects the JTNP with the Chuckwalla Valley via the Eagle Mountain mine. Complete access is currently precluded by placement of a large boulder in the middle of the road about 2 miles outside the JTNP boundary. The mine area and the proposed reservoirs would be clearly visible from the ridge tops within the JTNP because the views would be unobstructed and the proposed facilities would be in the foreground. This area of JTNP has some historical mines, which may draw hikers exploring the rugged terrain; however, the number of visitors to the entire southeastern portion of the park is low, and few people venture to the ridge tops near the proposed project site.

3.3.5.2 Environmental Effects

Recreation

Effects of Construction on Recreation Resources

Within the Chuckwalla Valley, construction activity would occur within the Eagle Mountain mine area (proposed reservoirs, intake/outlet structures, and other infrastructure necessary to operate the project); along Eagle Mountain Road (proposed transmission line); near Desert Center (proposed interconnect substation); and across the valley (water pipeline) from near the Desert Center airport to the Eagle Mountain mine area.

The proposed reservoirs and appurtenant facilities would be constructed within the existing Eagle Mountain mine, which uses private lands, precluding public access to the area. There are no existing developed recreation facilities. Public access restrictions are proposed to continue during the construction period and during operations. The proposed landfill project, discussed in more detail in *Land Use*, could potentially share other adjacent mine pits, which would also preclude public access to these areas.

According to maps developed by the applicant, about 2 miles of the water pipeline would cross BLM lands, and public access to these lands during construction activities would be precluded. The proposed route is adjacent to an existing transmission line ROW with wood pole towers under which is a maintained dirt access road. For about the last 3 miles, the pipeline would parallel Kaiser Road to the reservoir site.

Eagle Crest proposes to use the existing road network for access and construction laydown areas. Eagle Crest proposes to coordinate construction schedules with BLM and provide posted notices of construction activity and any temporary road/access closure. According to the proposed construction schedule, these activities would take place over a period of about 4 years (Measure REC-1). Eagle Crest proposes to use Eagle Mountain Road as the primary route for construction related traffic to and from the proposed reservoir site, as well as for construction of the proposed transmission line.

Our Analysis

Construction of the proposed transmission line would use Eagle Mountain Road as the main artery for all related traffic (e.g., transporting materials, workers). Although the transmission line would use the Eagle Mountain Road as access to minimize unnecessary effects on the desert ecosystem from additional spur roads, construction traffic volumes and moving machinery on site to install transmission towers could result in road closures or substantial travel delays. The road does supply access to a number of dirt roads that provide access to the existing Metropolitan Water District transmission lines just outside the JTNP boundary. Hikers wishing to use the Big Wash Hiking Corridor, which connects Black Eagle Mountain Road in JTNP with Eagle Mountain Road near Victory Pass, would be inconvenienced by the presence and activities associated with installing

the transmission line outside the park. However, Eagle Mountain Road is not a through road and the number of recreation users expected to be affected by construction activities would be low. Under the applicant's proposal, posted notices would inform visitors wanting to use this road as access into JTNP or other dispersed areas in the vicinity about construction schedules and potential closures.

The volume of motorists affected by potential road closures due to water pipeline construction along Kaiser Road would be minimal and limited to vehicles traveling to the mine site where the road terminates. In addition to restricted access to the existing road under the existing transmission line, OHV and other dispersed recreation users, both north and south of the proposed pipeline, would see and hear the construction activity associated with trenching and installing the underground pipeline.

No developed recreation facilities are located in the vicinity of the proposed interconnect substation; therefore, construction would not affect existing developed recreational facilities. The site's proximity to Desert Center suggests dispersed recreation would not exist on these lands because better options exist elsewhere in the area. Aesthetic effects of construction such as hearing noise associated with construction and seeing construction equipment and vehicles are discussed later in this section under *Aesthetics*. Any aesthetic effects associated with the construction vehicles would not continue beyond the project's 4-year construction phase.

Effects of Operation on Recreation Resources

Eagle Mountain states that the reservoirs would be fenced, and access to the reservoirs and other nearby project features would be controlled through security gates and enforced with on-site personnel. The two proposed reservoirs and appurtenant facilities would occupy the Eagle Mountain mine site, which does not have any public recreation facilities and does not allow public access.

Our Analysis

Because recreation was precluded prior to the proposed project, operations associated with the reservoirs, powerhouse, switchyard, brine pools, etc. would not affect existing developed or dispersed recreation activities within this area.

Comments received during scoping indicated concern that the proposed project may affect recreational use of nearby Chuckwalla Valley Dune Thicket ACEC (closest project feature is more than 20 miles away). No proposed project features would cross or displace lands within any ACEC within the region. This also includes the Desert Lily Preserve ACEC and Alligator Rock ACEC, which are closer to the project (closest project feature is less than 2 miles away).

No developed recreation facilities are located in the vicinity of the proposed interconnect substation; therefore, operation of the substation would not affect existing developed recreational facilities.

Effects of Construction on Recreation in Joshua Tree National Park

Construction activities would require blasting, heavy machinery, and security lighting, and would produce associated noises and air emissions during construction. The proposed reservoirs and portions of the transmission lines would be within about 2 miles of the JTNP boundary (see figure 8).

Eagle Crest proposes to implement night sky monitoring in collaboration with the Park Service during construction and a trial operational period (to measure changes from baseline conditions and adjust project lighting if needed). Eagle Crest proposes that final lighting designs would incorporate directional lighting, light hoods, and operational devices that allow to be turned on as needed for safety. Eagle Crest also identifies low pressure sodium or LED lighting as potential light source types (Measure AES-1).

Our Analysis

Although the proposed project would be located outside the park, construction activities would be noticeable from points within the park. The degree to which this would degrade the values of solitude and lack of human influence must be weighed within the overall context of the setting. Human influences, including an extensive open pit mine, already exist adjacent to the JTNP and are visible from the same locations within the park from which proposed project features would be visible. The proposed reservoir area would use the mining area on the eastern slope of the mountains, and, if viewers were to reach ridge-top vistas at the extreme eastern boundary of the park, they would also see the larger, pre-existing impacts from historic mining operations and other human modifications to the landscape throughout the Chuckwalla Valley. This would be true for all points on the eastern slope of the Eagle Mountains within the park and these areas that are not easily accessible or normally popular with JTNP visitors.

Given the challenges and limited locations of possibly viewing or hearing construction activities, points off Black Eagle Mine Road, within JTNP, would provide visitors a vantage point to see into the proposed reservoirs. Staff estimate that the annual number of park users potentially affected by daytime construction would be in the low hundreds[35]. Construction effects would begin in the first year and continue throughout the remaining period of construction, estimated by Eagle Crest to be 4 years.

Construction of the proposed transmission line would occur within less than 1 mile at its closest point to JTNP, and slightly farther under the State Water Board's recommended transmission line. Construction may cause delays or conflict with visitors wanting to access the Big Wash Hiking Corridor on the eastern slope of the mountains near Victory Pass. These construction effects would last 4 years according to the Eagle Crest's proposed construction schedule.

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[35] Based on an estimated 1,000 visitors to the entire region in a year and only a fraction of those who would climb to the peaks for a view.

Construction security lighting or possible nighttime lighted construction activity would introduce additional artificial light sources to the Chuckwalla Valley; these effects could be minimized through design specifications. Backcountry campers seeking the remote nature of the eastern portion of the JTNP may experience a decrease in nighttime dark sky conditions, and the dark sky monitoring should quantify and guide design and product selection to help offset these conditions.

Effects of Operation on Recreation in the Joshua Tree National Park

Although the proposed project would be located outside the park, project features and night lighting would be noticeable from vantage points within the park. As noted previously, Eagle Crest proposes to implement night sky monitoring with the Park Service to help guide lighting product selection and design alternatives to minimize the amount of light pollution originating from the proposed project (Measure AES-1).

Our Analysis

Implementation of design techniques to minimize light pollution from security lighting surrounding the reservoirs and switchyard would concentrate light where it would be needed, reducing the amount of light contributed to the general surroundings and potentially visible from sensitive resources or locations. Techniques such as directional lighting, light hoods, and motion sensors are common in landscape design to balance the amount of light for a specific task and the light emanating away from an area. Light pollution is a byproduct of the amount of light, typically measured in lumens or candles, rather than the type of source (e.g., low pressure sodium or LED). Energy efficient lights can be used as proposed by Eagle Crest; however, thoughtful design and product selection should provide sufficient task lighting with reduced pollution. Lighting techniques would be further refined during the project's late design and early operations phases based on information developed through dark sky monitoring to be conducted by Eagle Creek and the Park Service. This monitoring would help identify and refine lighting techniques to reduce the amount of potential lighting the proposed project would contribute to the erosion of dark night skies in the area and help to identify methods to mitigate these effects. Development of a monitoring plan prepared in consultation with the Park Service that includes specific study methodology, results, recommendations, conclusions and a plan for how lighting design or equipment changes would be implemented after the findings are posted would ensure that night sky conditions are protected. Although seeing project features and night lighting would contribute to the degradation of the values of solitude and night sky conditions, few people would be annually exposed to those conditions.

Land Use

Effects of Construction and Operation of Project Facilities

The Eagle Mountain mine site is a historical industrial use area and operation of a pumped storage project would be consistent with the historical, industrial type use of the area; however, the details of securing rights to develop on the property are complex and could be tied to the outcome of the pending land exchange appeal discussed in more detail later in this section. The proposed types of land use, intensive utility or solid waste landfill, are similar to the historical land use activities associated with mining. As proposed, the pumped storage project would operate side-by-side with the proposed landfill project (if constructed) within the existing open mine pits.

BLM's CDCA Plan identifies uses that are considered suitable for each land use zone. Utility features and structures, such as switch yards, transmission lines and towers and outbuildings, alter the setting and may conflict with the intended condition of some of the land use zones. Construction of two reservoirs within existing open mine pits could conflict with existing BLM land use plans for the areas. Further, new transmission lines can add visual elements to the landscape away from the existing open pit mines that contrast with traditional land uses.

The proposed storage area and desalinization ponds would be located adjacent to the Eagle Mountain town site in an area south of the now-closed state penitentiary. Depending on the exact location of the ponds, construction of the ponds may require demolition of some portion of the structures associated with the now-closed state penitentiary. The town site is largely vacant; however, according to the license application, a small number of residences remain occupied. The proposed project features, including the transmission line, would be sited just a few hundred feet outside the west and south sides of the Eagle Mountain town site. Eagle Crest proposes to use existing access roads surrounding the proposed reservoir sites, also indicating that construction access to/from the proposed interconnect substation site would be from the Eagle Mountain Road exit off Interstate 10 and following the Frontage Road east to the site (Measure LU-1). Two weeks prior to beginning construction, the applicant proposes to post notices locally stating the hours of operation for construction near the Desert Center community and along State Route 177 (Measure LU-2).

Eagle Crest's proposed 13.5-mile-long transmission line would parallel the existing Eagle Mountain Road for about 4.5 miles before crossing the Chuckwalla Valley in a southeasterly direction to connect to the proposed interconnection collector substation on the western edge of Desert Center. The proposed water pipeline that would supply the reservoirs with water would be buried near an existing transmission line or road rights-of-way from near the Desert Center Airport to the Eagle Mountain mine.

Interior, in response to the REA notice, recommends the proposed transmission lines be co-located with existing transmission lines near the project site.

As described in section 1.3.2.2, *California Environment Quality Act Environmental Impact Report*, and section 3.3.3.2, *Terrestrial Resources, Environmental Effects,* the State Water Board's recommended substation location, along with the proposed substation near Desert Center, is shown in figures 2 and 11. Figure 11 shows land use in the applicant's proposed and the State Water Board's recommended substations locations and the associated transmission routes.

The proposed water pipeline would cross undeveloped public (BLM) and some previously farmed privately owned lands. Proposed pipelines would be tunneled underneath State Route 177 and the Metropolitan Water District aqueduct.

Our Analysis

As with other construction effects, noise and dust would likely affect the few residents of the town site; however, these activities are not uncommon to the historic and much larger operations that occurred during construction of the penitentiary and normal operations of the mine. The heavy construction activity required to build the two reservoirs and associated facilities would be consistent with prior activities of the mine site (blasting, truck traffic, and heavy machinery use). Construction effects are estimated to be finished within 4 years.

Development of the proposed lower reservoir would present a potential conflict with certain mineral reserve interests, because the area would be inundated upon implementation of the proposed project. There are no plans to recover these reserves at this time due to the current economics associated with the remaining reserves. These mineral reserves are under the control of the California State Lands Commission. The use of the eastern mining pit as a reservoir would restrict the recovery of these mineral reserves during the life of the project.

The proposed transmission route would cross BLM lands that are managed as Multiple Use Class designations "Limited" and "Moderate" as part of the NECO Plan, including crossing about 6 miles of NECO's DWMA. After crossing the Metropolitan Water District CRA southeast of the reservoirs, 4.5 miles of the proposed route would be sited within a designated BLM utility corridor identified in the NECO Plan. The remaining 9 miles of the proposed route would be located outside the corridor. Consequently, BLM would need amendment to the CDCA Plan prior to issuing a ROW grant to construct within the corridor.

Interior's recommended transmission line route would result in siting the line almost entirely within the BLM utility corridor, a 2-mile-wide route along the existing Metropolitan Water District and Devers-Palo Verde lines in the valley. This recommended route would lengthen the transmission line by about 4 miles and also would require crossing some public lands near Interstate 10. Construction of this recommended alignment could require the development of temporary access roads; however, most of the route could be developed via the existing Hayfield Road,

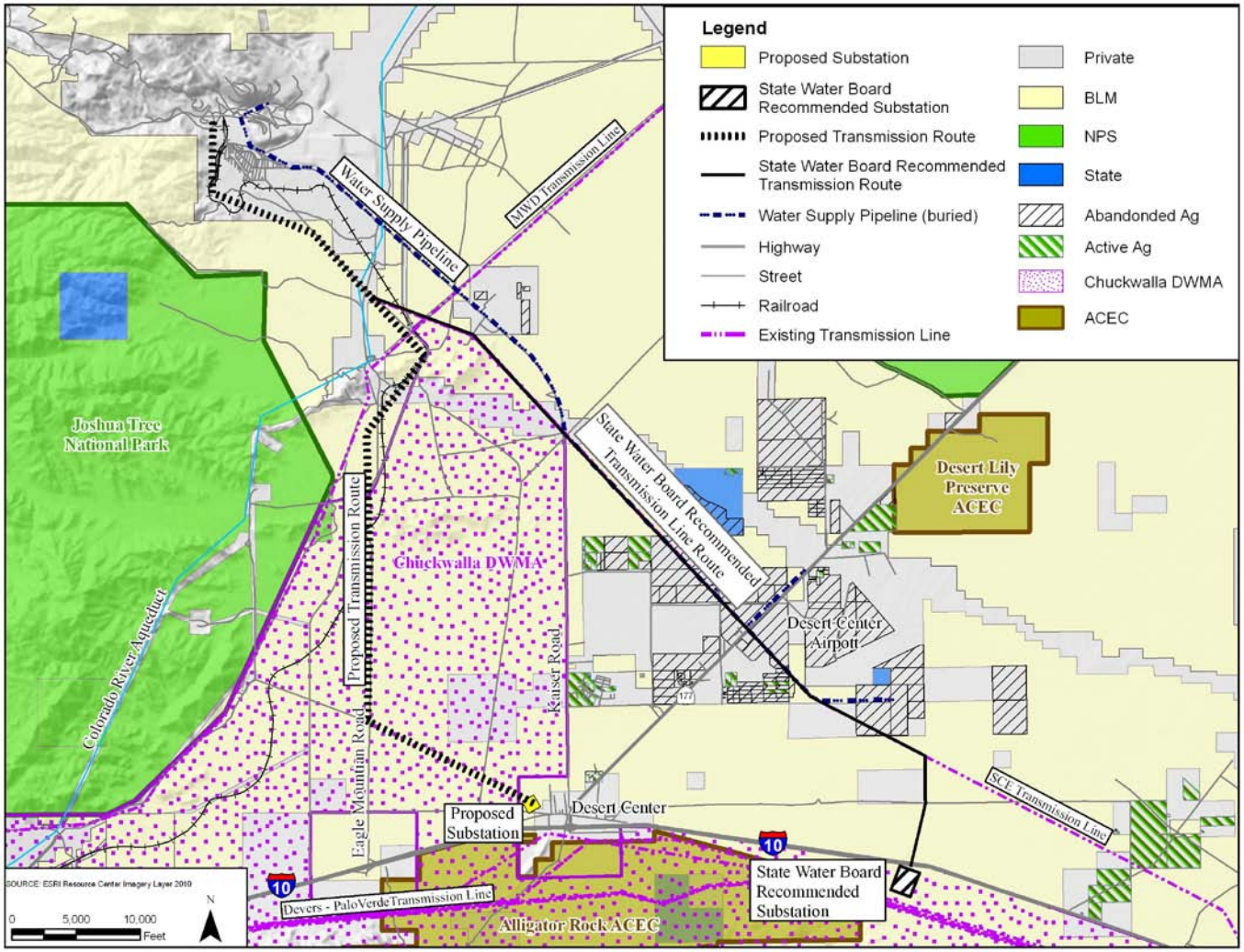

Figure 11. Land use near the applicant's proposed and State Water Board's recommended substations locations and associated transmission routes (Source: Eagle Crest, 2010a).

which parallels the Metropolitan Water District's transmission line between its pumping plant and the Interstate 10 frontage road into Desert Center. A BLM ROW access permit still would be required; however, this would likely alleviate the need to request an amendment to the NECO Plan while also consolidating utility lines together along the eastern slope of the Eagle Mountains. Effects of Interior's recommended transmission line and the other routes on wildlife are discussed in section 3.3.3, *Terrestrial Resources, Wildlife*.

Under the State Water Board's recommendation, about 86 percent of the 12.5-mile-long transmission line would be located on either side of an existing 160-kV wood H-frame transmission line owned by SCE. This recommended route would pass near several residences near the existing SCE line north of the Kaiser Road crossing. East of the Kaiser Road crossing, the remainder of the route would be, at a minimum, more than 0.5 mile from existing residences. The State Water Board's recommended transmission line would cross 4.9 miles of private land (compared with 0.4 mile for the proposed route) and would avoid, for the most part, the region's DWMA (0.1 mile compared with 5.9 miles for the proposed route). Three road crossings would be required, including Kaiser Road, State Route 177, and Interstate 10. The State Water Board's recommended transmission line route would require additional coordination and permitting with the California Department of Transportation for the crossing of Interstate 10. Under this recommendation, the line would pass within about 0.75 mile of the Desert Center Airport, a privately owned airport. Several abandoned agricultural fields would be crossed by this recommended route where it would parallel the existing H-frame ROW between Kaiser Road and several miles south of State Route 177. Overall, this recommended route would be about 3 miles longer than the applicant's proposed route.

The applicant's proposed interconnection collector substation would convert about 25 acres of currently vacant public land managed by BLM to project facilities, and the State Water Board's recommended substation would convert about 75 acres of land also managed by BLM. A planned transmission line (Devers-Palo Verde No. 2) is expected to be constructed by SCE paralleling the south side of Interstate 10 and to which the State Water Board's recommended substation would be directly connected. Construction of the applicant's proposed project transmission line and substation would have short-term effects (noise, dust, and traffic) on the nearby residences of Desert Center, but the State Water Board's recommended substation would be located in a remote area without any nearby residences. Construction activities would be consistent with the Multiple Use Class Moderate land designation and would last less than 4 years.

Operation of the applicant's proposed substation or other substation would change the current vacant nature of the site with utility uses, permanently altering the land use. The applicant's proposed substation and the State Water Board's recommended substation would also preclude the public from dispersed recreation uses on the public lands, although the sites are likely less desirable than other locations within the Chuckwalla Valley, as described elsewhere in this section under *Recreation Resources*.

Use of the Eagle Mountain Mine Road exit off Interstate 10 and Frontage Road into Desert Center as proposed by the applicant would minimize construction-related traffic in the residential community of Desert Center. The Desert Center exit off of Interstate 10 serves Desert Center, Lake Tamarisk, and motorists traveling State Route 177. Use of the proposed route (Eagle Mountain Mine Road) would minimize the amount of road damages, dust, traffic congestion and delays and other nuisances associated with construction traffic near the residential center. Publically posting the proposed construction schedule and potential closures or delays would be a courtesy to local residents and motorists passing through the area. Construction of the State Water Board's recommended transmission line and substation would result in more construction traffic in the Desert Center area as compared with the applicant's proposed transmission line and substation. Review of recent aerial photography indicates that the farmlands in which the proposed water pipeline would be sited have not recently been used for agriculture purposes. The proposed open-cut, sidecast construction method would have temporary short-term effects on any active cropland. Construction activities would not last more than 4 years, after which farming activities could resume, assuming appropriate settling of the restored surface has occurred. Coordination with the California Department of Transportation and the Metropolitan Water District to identify reinforcing requirements and other safety measures prior to proceeding would be required.

Effects of Construction on Proposed Eagle Mountain Landfill and Recycling Center

Issues surrounding the compatibility of the two proposed projects sharing the same general area and adjacent footprints are complex. The proposed pumped storage project was designed to be constructed and operated simultaneously with the approved landfill project, but the landfill project was not designed, planned, or permitted to operate simultaneously with another project. Both project concepts have moved through various stages of regulatory permitting over the last 20 years, and the anticipated start date for the landfill project is further complicated by Kaiser's most recent appeal of the 9th District Court of Appeals upholding of an earlier decision that the proposed land swap between Kaiser and BLM is illegal.

Eagle Crest suggested that the pumped storage project would be constructed first, which may cause problems for construction of the landfill as currently designed. Additionally, the pumped storage project proposes to use mine tailings in securing the mine pits and dams during reservoir construction; materials also proposed for use for landfill operations.

The proposed project would be constructed at the now non-operational Eagle Mountain mine, and certain facilities would be located on lands that also have been designated for the municipal landfill operation. The Riverside County Board of Supervisors approved the landfill project in 1992. The proposed 4,659-acre landfill would be constructed in phases over a period of many decades. Construction and operation of each phase of the landfill would progress from west to east as shown in

figure 10. Initiation of the landfill is contingent on the landfill operator owning all the fee lands included in the proposal. To achieve this prerequisite, the landfill business venture and BLM had agreed on a land exchange; however, that decision was brought to court, where the exchange was overturned. This decision was upheld by the 9th U.S. Circuit Court of Appeals on November 10, 2009 (National Parks v. Kaiser Eagle Mountain, No. 05-56908 D.C. No. CV-99-00454-RT Opinion). BLM has decided not to appeal this decision; however, Kaiser has decided to pursue an appeal, continuing the legal procedures to construct the landfill. According to Eagle Crest, the proposed pumped storage project is designed to be operationally compatible with the proposed landfill should the land exchange be consummated and both projects move forward.

Due to circumstances outside this proceeding, it is unclear if the proposed landfill project would be permitted. Although this issue is unresolved, staff discusses the potential effects of the landfill if constructed.

Our Analysis

Eagle Crest's application was developed assuming construction of the project would precede construction of the landfill and there would be no overlapping construction activities. Construction of the pumped storage project first would allow the energy infrastructure to be developed without construction congestion from two major projects. Because the approval process for both projects is out of the developer's hands at this time, calculating the timing of construction schedules is not possible. If the past is any indication of the potential timing, the landfill project is still a couple of years away from a court decision, and additional time might be needed to secure any expired permits prior to starting construction. Similarly, regulatory approval and securing financing could delay the pumped storage project and theoretically the two could start construction simultaneously. Construction of both projects simultaneously would pose challenges and necessitate strong communication between parties to ensure the projects are designed and constructed to operate in such proximity.

Although the two projects are proposed for the same general area, the proposed pumped storage project facilities would be constructed and operated either underground or away from the proposed initial landfill footprint, while the proposed landfill would operate on the land surface. Although the proposed powerhouse would be underground, the land surface above this feature would, during Phase 3 of the landfill project, receive waste material for permanent storage and burial in the landfill. The proximity of these two projects may be suitable from a land use perspective because they would both be contained within the greater footprint of the historic mine operations; however, the technical details are beyond the scope of this analysis at this time. Other proposed pumped storage project facilities such as the substation, staging, storage and administration area and the reverse osmosis system and desalination ponds would be constructed south of the proposed landfill.

Effects of Operation on Proposed Eagle Mountain Landfill and Recycling Center

During the first four phases[36] of the proposed landfill project, no overlap would occur between the landfill disposal areas and lands required for the proposed pumped storage project except for use of the primary access road into the site. The pumped storage project reservoirs would use the central and eastern mining pits, areas that are not proposed to be used during Phases 1 through 4 of the landfill. The project powerhouse and water conveyance tunnels would be constructed underground. Landfill compatibility plans submitted by Eagle Crest show that both proposed project features would be constructed to operate simultaneously with both projects within feet of each other in some places. For example, Phase I of the landfill would abut the proposed south saddle dam of the upper, (central mining pit) reservoir.

Proposed Phase 5 of the landfill is projected to begin in about year 84 of operations, and it could include overlapping uses in the vicinity of the eastern mining pit, the lower reservoir for the pumped storage project.

Our Analysis

The landfill was approved by Riverside County for a 50-year operation. However, Phase 5 is not a part of the County-approved landfill project. Solid waste management has changed dramatically since the landfill project was originally proposed (e.g., implementation and increasing participation rates of recycling programs and other existing and new landfill sites currently available) and the need to permit Phase 5 could be pushed back beyond the original 50-year estimate.

Eagle Crest states that its proposed project is designed to minimize the areas of overlap to avoid potential conflict among the two proposed projects. Such design provisions include the location of staging areas, realignment of the proposed transmission line, and use of fine tailings for components of the dam structure. Comparison of the extent of visible historical earth work and modifications throughout the Eagle Mountain mine property show that there is sufficient room to design and construct these two different projects in the same general location separated by both vertical and horizontal spacing, depending on the specific location and based on Eagle Crest's proposal; however, the landfill project has not developed a design for the technical details of such a working relationship.

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[36] The proposed landfill project would be constructed over 4 phases that would proceed over 50 years, depending on volume of waste delivered. The phases would proceed using the existing open mine pits from the west (near the proposed upper reservoir) to the east (toward the central mine pit).

Effects of Construction and Operation of Project Desalinization Ponds on Land Use

Eagle Crest proposes to initially fill the reservoirs and maintain the water level in the project reservoirs from groundwater wells in the Chuckwalla Valley. Groundwater quality in combination with evaporative losses would increase the salinity, posing a risk of accelerated wear on the project structures and possible groundwater leakage. To maintain salinity and total dissolved solids levels within the reservoirs equal to that of the groundwater, the applicant proposes to construct and use a reverse-osmosis system to treat water supply in the reservoir system. Water for treatment would be drawn from the upper reservoir while treated water would be returned to the lower reservoir and the concentrated brine from the reverse-osmosis process would be directed to about 56 acres of evaporation and solidifying ponds.

Our Analysis

Eagle Crest estimates that about 2,500 tons of salt would be removed from the reservoirs each year and that these solids produced from the evaporation and solidifying ponds would need to be removed once every 10 years. Eagle Crest does not provide information on the fate of these solids. Staff determined that the weight of salt is about 75 pounds/cubic foot or about 1 ton per yard, and each highway-approved haul truck is capable of carrying about 20 yards. Staff estimates that the removal of 1 year of salt (2,500 tons) would require about 125 truck trips. If removal were scheduled in 10-year intervals as proposed, the disposal would require about 1,250 truck trips, or substantially fewer train trips if the privately owned Eagle Mountain Railroad is used to move the salt.

Until potential uses and destinations are developed, Eagle Crest would have sufficient space within the proposed brine ponds to store this material for decades; however, it is not clear if this would significantly alter the utility of the remaining space within the ponds if they were used as storage for long periods. Eagle Crest would be responsible for the appropriate disposal of these solids, which could include transport to the proposed neighboring landfill or yet-to-be-determined, market-based opportunities (e.g., use in molten fluids for proposed concentrated solar projects throughout the region). The potential effects of brine water seeping into groundwater and surface waters are discussed in sections 3.3.*2, Water Resources*.

Aesthetics

Effects of Construction on Viewsheds

Construction and operation of the proposed project would use the existing iron ore mine, a substantially disturbed area within the Eagle Mountains, and would also introduce new visual elements in the viewsheds of BLM land throughout the Chuckwalla Valley, adjacent JTNP, and the small communities of Lake Tamarisk and Desert Center. These views would include the reservoirs, dams, power lines, water pipeline ROW, fences, brine ponds, graded and revegetated landscapes, and buildings.

Construction of the proposed reservoirs and associated facilities (e.g., powerhouse, reverse-osmosis facility, brine ponds, substation, switch yard, storage area, and surge tank) would occupy lands previously disturbed by historical Eagle Mountain mining operations.

No new roads would be developed to access the mine site because access to the site would use the existing Kaiser Road; however, additional access roads to proposed project facilities would be required. These new roads would provide access to the upper reservoir dams, inflow and outflow structures, the upper surge chamber and the access tunnel portal, and the storage/administration area. The road to the access tunnel portal and the storage/administration would be paved with asphaltic concrete; the other roads would be gravel surfaced.

Construction of the proposed 13.5-mile transmission line would occur within a 200-foot ROW, resulting in effects on a total of 327 acres required for the lines. The transmission lines would connect to a new interconnection collector substation that would be built on 25 acres near Desert Center. The buried water pipeline would run in an almost straight line from the well fields northwest to the proposed lower reservoir, a distance of about 16 miles. During construction, Eagle Crest proposes to reduce the sidecast material to minimize the contrast that the excavated material would pose to the surrounding landscape and revegetate the fill material with native vegetation after construction.

As described in section 1.3.2.2, *California Environment Quality Act Environmental Impact Report*, and section 3.3.3.2, *Terrestrial Resources, Environmental Effects*, the State Water Board has recommended a transmission line route and substation location. Figure 12 provides the applicant-prepared VRM classes in the proposed and recommended substation locations and the associated transmission routes.

Eagle Crest proposes a number of design elements and construction methods that are aimed at reducing the potential effects of construction activities of the proposed project on the aesthetic resources, including the following:

- Incorporate directional lighting, light hoods, low pressure sodium bulbs or LED lighting, and operational devices in final design to allow surface night-lighting in the central site to be turned on as needed for safety and fund night sky monitoring to be conducted in collaboration with the Park Service during the post-licensing design period, construction and a trial operational period (AES-1).
- Combine and organize staging areas and areas needed for equipment operation and material storage and assembly with construction lands to the extent feasible to minimize total footprint needed (AES-2).

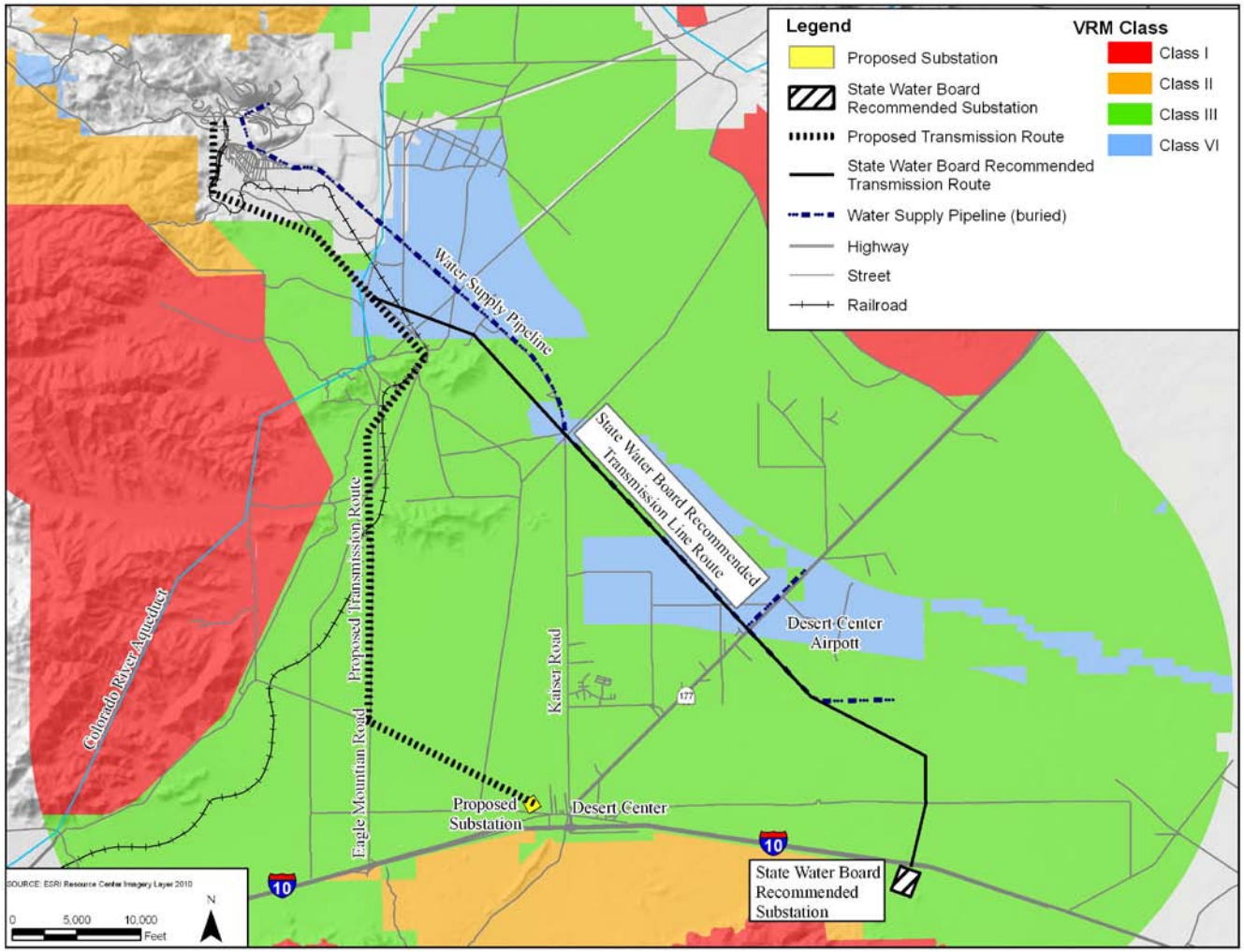

Figure 12. Visual resources in the substation and transmission line areas (Source: Eagle Crest, 2010a, as modified by staff).

- For construction of the water pipeline, reduce, to the extent possible, side cast soils to reduce color contrast with the surrounding landscape. Backfill the pipeline disturbed zone and revegetate with native vegetation immediately following completion of pipeline construction (AES-3).
- Employ visual mitigation in the design of the transmission line to minimize visual effects (AES-4).
- Use existing access roads and construction laydown areas to the extent feasible and revegetate with native vegetation immediately following construction (AES-5).

Interior, in response to the REA notice, recommends the proposed transmission lines be co-located with existing transmission lines near the project site.

Our Analysis

Construction of the proposed project would require using on- and off-road construction vehicles, machinery, and equipment to move earth; transport and place fill; grade the proposed project footprint; drill, blast, and excavate tunnel sites; store and move raw materials; and develop other infrastructure (e.g., new roadways and underground utilities). As proposed by Eagle Crest, making efficient use of construction staging areas; using existing roads, ROWs, and construction lay-down areas to the fullest extent possible; and revegetating areas that are disturbed and unnecessary for operations would help limit the introduction of visual elements to the viewshed (AES-2, AES-3 and AES-5).

The most common views of the construction activity and the resulting changes in landscape would be from public roads. To most viewers, construction within the existing footprint of the mine would be similar to past mining operations with active heavy machinery and earth moving equipment associated with developing the new hydro structures at the site.

Because of its location on the mountain side and unobstructed setting, a portion of construction activities at the mine site would be visible from parts of the Chuckwalla Valley and potentially from as far away as Interstate 10. Activities would be most visible to people traveling along the local roads in the Chuckwalla Valley; however, the overall anticipated number of viewers is expected to be small given that both Kaiser and Eagle Mountain roads are not through routes and the overall sparsely populated nature of the area results in low traffic volume on State Route 177. Motorists travelling on Interstate 10 in the vicinity of Desert Center represent the largest number of viewers potentially affected by construction, and view durations would likely be short because of the high travel speeds (posted 70 mph speed limit) through this area and because the long viewing distances would obscure any details of the activity. The State Water Board's recommended transmission line would cross Interstate 10 and result in the motorists being able to see construction activity from Interstate 10. Construction, especially of the

State Water Board's recommended transmission line route, could compromise the County's designation of this portion of Interstate 10 as an Eligible County Scenic Highway.

Construction activities would conflict with the existing aesthetics experienced by hikers venturing to the mountains surrounding the mine site from within JTNP since operations at the mine have essentially ceased; however, construction would be confined to an area previously disturbed during past mining activities. These effects would last for the duration of the construction activities (about 4 years). Proposed construction within the inactive mine area would be consistent with the applicant-prepared "Class IV" VRM scenery rating.

Transmission line construction activities would introduce heavy machinery into the area to construct the tower pads, erect the poles, and string the lines. Additionally, construction of the interconnection collector substation would require grading the site and building a series of transformers and associated electrical equipment that would be stored in a chain-link fence area. Although Eagle Crest proposes to use existing roads and access routes, additional access spurs may be required in areas where the alignment is proposed to be located away from existing road network. Constructing the additional road spurs would cause visible scars within the desert landscape. These new spurs would introduce new linear elements into the landscape.

Construction of the proposed transmission alignment across BLM land would introduce new cultural modification into the landscape, but not enough of a modification to justify lower VRM class ratings. Construction of the 54 to 68 towers, or more for the longer State Water Board-recommended transmission route, would introduce new structures, adding human development into the viewshed. The vegetation, which is generally low, brush type shrubs, would provide only marginal screening for these tall and linear features.

Views of the proposed transmission alignment within the Chuckwalla Valley, except for locations near the proposed transmission alignment, would generally be in the middle ground and foreground views to most viewers (residential centers or major roads). Segments of the proposed transmission alignment would be close to both the Eagle Mountain Road and Interstate 10, but the proposed transmission line would cross only Eagle Mountain Road. Consequently, there are numerous points where the transmission towers and corridors would be visible in the foreground, middle ground, and background. Aligning the transmission line to cross Eagle Mountain Road at an approximate 90 degree angle would slightly reduce its visual effect on road users (AES-4).

Excavation of the pipeline within the Chuckwalla Valley would be visible from motorists on most travel routes in the valley including State Route 177, Kaiser Road, and Eagle Mountain Road. Excavation of the pipeline that crosses State Route 177 and the section that parallels Kaiser Road would be clearly visible; however, the expected number of motorists on Kaiser Road in this vicinity would be minimal. Construction would introduce a visible scar across the desert valley and revegetation without assistance

(e.g., watering) may take years for the site to fully recover, during which OHV use would pose a risk to the recovery process.

Effects of Operation on Viewsheds

Eagle Crest proposes to construct two saddle dams surrounding the existing central mine pit that is proposed as the upper reservoir. At its maximum normal water level, the upper reservoir would have a surface area of 191 acres at an elevation of 2,485 feet. This proposed reservoir requires two dams, one 1,100 feet long with a height of 60 feet and the other 1,300 feet long with a height of 120 feet.

The proposed lower reservoir would occupy what is now referred to as the eastern mine pit of the Eagle Mountain mine. Other than preparation of the earthen materials within the pit, no new dam would be constructed at this location. At its normal full water level, the reservoir would have a surface area of 163 acres at an elevation of 1,092 feet.

The proposed reservoir areas would include storage buildings, a substation, reverse-osmosis facilities, brine ponds, lighting, and security fencing around the entire area. The entire proposed project area near the reservoirs would be fenced and public access would be precluded. Eagle Crest indicates that facilities would have security lighting. Eagle Crest proposes that lighting would be designed to minimize light pollution through the use of directional lighting, lower intensity lights (e.g., low pressure sodium bulbs or LEDs), and operational devices to allow surface night-lighting surrounding the proposed project facilities to be turned on as-needed (e.g., motion detection). The lighting design and product selections contribution to light to the night sky would be monitored for a trial operational period.

The presence of between 54 and 68 steel lattice towers, or more for the State Water Board's recommended transmission line, ranging in height from 175 to 235 feet with new electrical transmission wires, would introduce new, vertical human infrastructure into the Chuckwalla Valley. Towers would be spaced about 1,000 feet apart (depending on the local topography). North of the Metropolitan Water District's pumping plant, the proposed route would cross and parallel existing wood pole transmission lines and the Kaiser railroad, adding another human-made element into the landscape. South of the Metropolitan Water District's pumping plant, the proposed transmission line route would parallel the existing Eagle Mountain Road for about 4 miles before turning southeast to the interconnection collector substation site. The transmission line would introduce a new feature into the landscape and create a new vertical visual contrast that parallels the existing road. This line segment would be within the middle ground viewing distance to the greatest number of viewers (all of the lower Chuckwalla Valley, including Lake Tamarisk, Desert Center, and Interstate 10). Eagle Crest proposes to site the tower structures so that they would not be positioned on the highest topographical points along the route to minimize their effect on the desert landscape.

As described in section 1.3.2.2, *California Environment Quality Act Environmental Impact Report*, and section 3.3.3.2, *Terrestrial Resources, Environmental Effects,* the State Water Board's recommended substation would be located east of Desert Center. Figure 12 provides visual resources in the proposed and recommended substation locations and the associated transmission routes.

The proposed interconnection collector substation is proposed to have security fencing and lighting to prohibit trespass. This substation would be located less than a quarter mile west of Desert Center and would be clearly visible to residents and motorists on Interstate 10. The State Water Board's recommended substation would be located on the south side of Interstate 10 and slightly closer to Interstate 10 than the proposed substation near Desert Center.

Our Analysis

Under Eagle Crest's proposal, the reservoirs, dams, spillway, fencing, substation, reverse osmosis plant, brine ponds, and storage area would introduce new and different uses into the historical Kaiser iron ore mine. Proposed project features near the reservoirs would be visible from areas within the Chuckwalla Valley; however, the details would be difficult to ascertain because the features would be in the viewers' middle ground and within the already disturbed Eagle Mountain mine site. These structures would supplement additional lines and structures into the already heavily manipulated landscape within the mine footprint. The presence of water within the two proposed reservoirs would introduce a new visual feature absent from previous operations and completely different from the surrounding desert landscape.

Because of the site's setting in the Eagle Mountains, views of the water would be possible only from higher vantage points, which in the local area is limited to the peaks mostly within the JTNP. Recreation estimates mentioned in section 3.3.5, *Recreation, Land Use, and Aesthetics,* indicate that the mountains in the southeastern portion of the park receives very low use levels (tens of people per day). Locations within the JTNP that provide views of the proposed project features would also include views of the Chuckwalla Valley, which includes in the foreground the existing disturbed setting surrounding the mine from historic mining operations as well as existing transmission lines, the Eagle Mountain town site, and Metropolitan Water District's pumping plant.

From within Chuckwalla Valley, the reservoirs would be most visible in the foreground and middle ground distance, with diminished visibility proportional to the observer's distance. Views of the proposed facilities, most notably the flat top of the upper reservoir dam, could be visible from Kaiser Road and State Route 177; however, the flat lines would be consistent with the existing terraced look of the tailings piles, and given the distances, topographical obstructions would mask the new facilities to most viewers. Given the distance to Interstate 10 still further southeast, it is unlikely that the majority of the public would be able to discern the features associated with the reservoirs as separate or unique from the existing features related to the historical mining

operations. Operation of the proposed reservoirs would not justify any change to the BLM VRM Class C designation.

Implementation of night sky monitoring, as requested by the Park Service, would help gather the data necessary to understand the potential changes to the night sky due to proposed project security lighting. Development of a specific night sky monitoring study and plan in consultation with the Park Service, as described above, would ensure that findings from the monitoring result in design or product selection that minimizes light pollution from project sources. Incorporation of low-light emitting policies and design elements would prevent further degradation of the dark night sky in close to the JTNP, thereby preserving wilderness qualities in areas out of direct sightlines of the proposed facilities.

Visibility of transmission lines within the Chuckwalla Valley would be greatest to motorists on Eagle Mountain Road near the town site and Kaiser Road (both of which have low traffic volumes) because this section would be in the middle ground. This transmission line section would also be visible to hikers on or near the ridge tops in the JTNP designated wilderness area and lower elevations within the park within the wilderness buffer zone. From these vantage points the proposed transmission alignment would be in the foreground and middle ground viewing distances. Because there are existing wood pole transmission lines, rail lines, an abandoned air strip, the existing CRA switchyard and forebay associated with the pumping station, and a small cluster of residential buildings in the view, the proposed transmission line would be incremental to the existing visual conditions within this portion of the alignment. Towers built with dull finish and carrying conductors with qualities that reduce glare and visual contrast as proposed by Eagle Crest, would be consistent with construction trends designed to minimize visual contrast from new transmission lines.

At its closest point, the proposed transmission line route that parallels the existing Eagle Mountain Road, would be less than a mile from the JTNP boundary; however, visual contrast observed from locations within the JTNP currently includes the existing powerline to the CRA pumping station, numerous dirt roads in the area, and the railroad in the foreground. As previously discussed, the southeast area of JTNP receives a very little amount of visitor use. This segment of the line would parallel Eagle Mine Road, minimizing the amount of disturbances required in developing access spur roads to construct and maintain the towers. This section of the proposed line would not justify a lower VRM class rating (existing Class III).

Visual contrasts of the proposed access and spur roads and towers would become greater as the route leaves the Eagle Mountain Road and crosses to the proposed interconnection collector substation site 2.5 miles away. This segment would be clearly visible in middle- and foreground viewsheds from key viewpoints, notably Interstate 10, Lake Tamarisk and Desert Center. Visual contrast would be high due to increased visibility of a new utility structure and details introduced into the natural landscape. Although views from Interstate 10 are of short duration, they sweep across the proposed

route due to the bend in the interstate alignment, providing panoramic views of the Chuckwalla Valley. Visual effects of the proposed line would be greatest for this segment because it would run across most of the western portion of the lower valley and be located in the foreground of the greatest number of potential viewers, motorists on Interstate 10. Co-locating the lines within the existing utility ROW as recommended by Interior would combine new linear features with existing features (CRA transmission line and railroad) at the eastern toe of the Eagle Mountains. Continuing the route south along Eagle Mountain Road across Interstate 10 to a new western substation would introduce a new overhead element visible to all highway traffic.

Positioning the substation to the south of Interstate 10 reduces the visual contrast of the feature by minimizing its presence in the overall panoramic view; however, the substation's location would intrude on views of Alligator Rock from east-bound travelers on Interstate 10. This effect would be limited to views within a few miles of the site because the intervening topography blocks direct sightlines of the substation area until it is within the foreground view.

Operation of the new substation may result in a new source of light and glare from night lighting. Use of non-reflective materials, designs that minimize light glare (such as shielding and directional light hoods) may reduced these effects. Most of the transmission line would be within middle ground and background view zones. The visual change here would be high and would not meet VRM Class II or III objectives. The State Water Board's recommended substation would be located to the south of Interstate 10 on lands classified by the applicant as VRM Class III. This location is remote and more than 5 miles from the population center of Desert Center. The location is also on the periphery of segments along Interstate 10 that provide maximum panoramic views of the Chuckwalla Valley. The substation's size and discordant mass of equipment at varying heights would create a strong contrast to the surrounding natural features that would dominate views from Interstate 10 due to its location within foreground distance zones. The substation structures would intrude into views of Alligator Rock. Such views, however, would be brief; the substation becomes most visually apparent about 2 miles out, which at 70 mph would be visible for 2 minutes or less. Planting of desert vegetation at strategic locations and treatment of features (e.g., color, nonspecular material) would reduce visual contrast but not sufficiently within foreground view zones to avoid appearing in the skyline or to meet VRM Class III designations.

The State Water Board's recommended transmission route would connect with the applicant's proposed transmission line route north of the Metropolitan Water District pumping station, then parallel SCE's existing 160-kV wood H-frame transmission line. The State Water Board's recommended route would continue to parallel the existing line southeast for about 10 miles before turning south and leaving the existing H-frame line to cross Interstate 10 to the State Water Board's recommended substation.

More than 60 percent of the route would cross through BLM managed lands with VRM Class III designations while the remainder is Class IV. Some of these lands are

currently proposed to be used for large-scale solar projects. The State Water Board's recommended transmission line would be located adjacent to an existing transmission line ROW for 10 of its 12.5 miles). The vertical forms of the lattice towers would be visible, but difficult to discern in middle-and background view distances as a result of the scale, existing towers and variable texture of the valley landscape. The route would affect foreground views of travelers on State Route 177 but these would be in addition to the existing SCE 160-kV line along the road sides.

With the exception of the Interstate 10 crossing, the State Water Board's recommended transmission line would create an incremental increase of the visual effect caused by the existing transmission line and would not dominate the view of the casual observer. The level of change created by this alternative would be moderate and would continue to meet the spirit of VRM Class III and IV objectives.

About 2 miles from Interstate10, the State Water Board's recommended transmission line would turn south and leave the existing transmission line ROW. The vertical form and lines of the lattice towers would become more visible as the route approaches the foreground view zone of Interstate 10. The route's perpendicular alignment and crossing of Interstate10 would minimize the extent and time the line would be visible from Interstate10 travelers, but the overall change in the foreground view zone caused by the towers and the proposed east substation would be high.

Revegetation of the disturbed areas from installing the underground water pipeline and unneeded construction laydown areas and transmission line access roads is proposed, using native plants that may take decades to mature given the rate at which desert ecosystems respond. After the initial filling of the reservoirs, only a single groundwater well is proposed to be retained to provide replacement water to the reservoirs. Although Eagle Crest has not disclosed plans for the exact location or how the well site would be secured (e.g., fencing, building, etc.), the site would likely occupy a small footprint.

3.3.5.3 Cumulative Effects

Participants in scoping identified concerns about the proposed project's cumulative effects on recreation and land uses within the Chuckwalla Valley. The proposed project is one of numerous proposed projects for the Chuckwalla Valley that would contribute to past, ongoing, and future effects on future land uses, wilderness values, and dark night sky conditions. Future, planned developments within the Chuckwalla Valley, including additional transmission line projects, the potential landfill, and numerous solar projects are likely to contribute effects on these resources.

Recent legislation (California Senate Bill 107, Renewable Energy Portfolio Standard and Executive Order S-14-08) requires that 33 percent of all electricity generated in California originate from renewable sources. This in combination with the federal American Recovery and Reinvestment Act (stimulus funding) has resulted in a number of renewable energy proposals to be constructed in the California deserts. In the Desert Center area, five large-scale solar projects have been proposed, totaling more than

30,500 acres, with many more solar energy projects proposed for the greater Mojave Desert. These projects would contribute to the conversion of the rural desert landscape to one potentially filled with utility-grade solar projects and appurtenant facilities including transmission lines. Construction and operation would result in increased traffic and possibly a long-term demand for more services in the Lake Tamarisk and Desert Center areas, further contributing pressure for more land use conversions. Additional congestion and human development in the area would put additional pressure on the dispersed recreation opportunities throughout the area.

Development of the proposed project would contribute to conversion of the landscape to one filled with more human-made energy infrastructure; however, the proposed project could also have positive effects on the growing renewable energy industry due to its energy storage capabilities. For example, energy generated from other renewable sources (e.g., wind) at night could be stored and substituted for non-renewable sources when other renewable sources may not be as reliable. Eagle Crest would not be able to choose where its electricity would originate to move the water to the upper reservoir; however, there is a growing concern related to the need for large-scale energy storage systems to better balance the electrical grid.

Development and operation of the proposed project in addition to other potential projects, including the landfill and solar projects, may have an effect on the wilderness experiences of visitors to the remote eastern margins of JTNP. As described in the discussion of *Aesthetics* earlier in this section, these projects would be most noticeable to park visitors near the eastern boundaries. Development of the proposed landfill would increase rail and truck traffic in the Eagle Mountain mine area as solid waste is prepared and stored. Hauling of salt produced as part of this project would contribute additional truck traffic to local roads.

Utility-scale solar projects are another human development that has the potential to be more visible to JTNP users in the reasonably foreseeable future. Thousands of solar panels or reflection mirrors are proposed to be constructed in the Chuckwalla Valley, which could reflect the sunlight and catch the attention of JTNP users.

Construction of the transmission line would add to the cumulative effects on land use because the construction of 13.5 miles of line and dozens of towers would contribute additional energy infrastructure into the Chuckwalla Valley. Siting the line outside the existing BLM utility corridor as proposed would contribute to incremental erosion of the large open spaces the utility corridors are designed to preserve.

3.3.6 Cultural Resources

3.3.6.1 Affected Environment

Section 106 of the National Historic Preservation Act

Section 106 of the NHPA as amended requires the Commission to take into account the effects of licensing a hydropower project on any historic properties and allow the Advisory Council on Historic Preservation a reasonable opportunity to comment if any adverse effects on historic properties within the hydropower project's APE are identified. If Native American properties have been identified, section 106 also requires that the Commission consult with interested Native American tribes that might attach religious or cultural significance to such properties.

Historic properties are defined as any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. In this document, staff also uses the term "cultural resources" to include properties that have not been evaluated for eligibility for listing in the National Register. In most cases, cultural resources less than 50 years old are not considered eligible for the National Register. Cultural resources need enough internal contextual integrity to be considered historic properties. For example, dilapidated structures or heavily disturbed archaeological sites may not have enough contextual integrity to be considered eligible. TCPs are a type of historic property that are eligible for the National Register because of their association with cultural practices or beliefs of a living community that: (1) are rooted in that community's history; or (2) are important in maintaining the continuing cultural identity of the community (Parker and King, 1998).

Area of Potential Effects

Pursuant to section 106, the Commission must take into account whether any historic property could be affected by the issuance of a license within a project's APE. The APE is determined in consultation with the California SHPO and is defined as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. In this case, the APE for the Eagle Mountain Project includes lands within the proposed project boundary, plus lands outside the proposed project boundary where project operations may affect the character or use of historic properties and/or TCPs. In its AIR response filed December 22, 2009, Eagle Crest states that the APE is identical to the proposed project boundary and includes:

- the spillway from the upper reservoir, which would flow into Eagle Creek;
- Eagle Creek from the spillway to the lower reservoir;
- the spillway from the lower reservoir; and
- the access road to the West Saddle dam and to the elevator shaft.

The California SHPO stated that it did not object to how the APE was defined (letter from M.W. Donaldson, California SHPO, Office of Historic Preservation, Sacramento, CA, to Russ Kaldenberg, Principal, ASM Affiliates, Carlsbad, CA, December 22, 2009).

In appendix A of its supplemental information filed July 7, 2010 (Eagle Crest, 2010a), Eagle Crest's consultant ASM Affiliates (ASM) describes the State Water Board's recommended transmission line and substation location as included in the project APE (Schaefer, 2010).

Cultural History Overview

Prehistoric Background

The prehistory of Southern California is divided into three temporal periods: Paleo-Indian, Archaic, and Late Prehistoric. The Paleo-Indian period dating from 10,000–6,000 B.C. is typified by non-ceramic stone tool assemblages, rock features, and cleared circles in the Colorado Desert, which have been assigned to the San Dieguito pattern (10,000–6,000 B.C.). The San Dieguito pattern represented a hunter-gatherer adaptation by which small, mobile bands exploited small and large game and collected seasonally available wild plants.

The Archaic period (6,000 B.C.–A.D. 500) in southern California is typified by the Pinto and Amargosa patterns (6,000 B.C.–A.D. 500), which are considered regional specializations within the widespread hunting-gathering adaptations that characterized the Archaic period. Information suggests that the California deserts were less hospitable during the Archaic period, and that the mobile hunter-gatherers were forced to concentrate around limited locations or move to more habitable regions. The small quantity of artifacts at some sites suggests strategically stored food and seed processing equipment that was used by small mobile groups.

The Late Prehistoric period (A.D. 500–1900) is typified by the Patayan pattern and innovations such as the introduction of pottery making by the paddle-and-anvil technique, bow-and-arrow technology, and the introduction of floodplain agriculture. Agriculture and ceramics were probably introduced either from northwestern Mexico or from the Hohokam culture on the Gila River in present day Arizona.

Between A.D. 1000 and 1700, desert peoples of this region appear to have extended their focus somewhat away from the Colorado River floodplains to a more mobile, diversified resource procurement pattern, with increased travel between the river and Lake Cahuilla to the southwest). Long-range travel to special resource collecting zones and ceremonial locales, trading expeditions, and possibly warfare are reflected by the numerous trail systems seen throughout the Colorado Desert. Pot drops, trailside shrines, and other evidence of transitory activities are often associated with these trails, including within the Chuckwalla Valley and at springs and other water sources in the surrounding mountains and washes. The final recession of Lake Cahuilla by about A.D.

1700 resulted in a return to reliance on the Colorado River floodplain and increasing population growth in the Coachella Valley and San Jacinto and Santa Rosa mountains.

Ethnohistoric Background

Ethnographically (Post A.D. 1540), the project vicinity was occupied by the Colorado River People, the Desert Cahuilla, and the Chemehuevi.

The Colorado River People, known as the Halchidhoma, were a Yuman-speaking group who lived along the Palo Verde Valley of the lower Colorado River Valley, in the vicinity of modern Parker and Blythe. Although somewhat distant from the project area, they are likely to have traveled between their homeland and the Coachella Valley via the Chuckwalla Valley. Foods were procured by seasonal rounds of hunting, fishing, and gathering supplemented by small-scale agricultural practices. The primary source of dietary animal protein came from fish caught in the Colorado River. Residential bases were centered on the Colorado River but conformed to a seasonal pattern. Spring and summer houses were located near agricultural fields, but on the mesas, where they would be safe from floods, open-air ramadas were constructed on the floodplains adjacent to the fields. During the winter season, Colorado River People relocated to residential bases on Colorado River terraces and the lower mountain slopes

Likewise, while the principal residential locations of the Desert Cahuilla were in the Coachella Valley and the Santa Rosa and San Jacinto mountains, they were also known to have traveled and maintained cultural contact with Colorado River peoples. The Chuckwalla Valley would have been one of their principal travel corridors for this purpose. A dozen or more independent landholding Cahuilla clans lived within the region. In addition to each lineage's residential area and other locations within a clan territory, ownership rights to various food-collecting, hunting, and other areas were claimed by the various lineages. While villages were occupied year-round, a large number of their inhabitants would leave at specific times to exploit seasonally ripening foods in different environmental zones. Temporary camps would be established in these food-collecting areas, and surpluses would be transported back to the main village. Many animal resources were also hunted. Cahuilla clans were arranged so that each community was placed in an area near water and food resources. Throughout the area there were sacred places used primarily for rituals, inter-clan meetings, caching sacred materials, and shamans' activities. European diseases probably began to affect the Cahuilla in the early1800s and became particularly severe in the 1860s. In 1876 and 1877, the United States government set aside small reservations for all groups classified as "Mission Indians." These reservations were established in a checkerboard pattern encompassing 48 sections, spread across the eastern edge of the Santa Rosa and San Jacinto mountains and the Coachella Valley. With various additions and withdrawals over time, these lands have remained the permanent land base of the Cahuilla to the present.

The Chemehuevi occupied desert areas west of the Mohave and north of the Cahuilla probably in the period between A.D. 1200 and 1500. The Chemehuevi lived in

smaller and more mobile groups than the Cahuilla or the Yuman-speakers, in order to adapt to the sparser and more widely distributed and scarcer resources of their desert. The Chemehuevi were great travelers and regularly visited many of their neighbors and may have brought them into the general project area more often than other groups. They subsisted primarily on small game and a wide variety of seasonally available wild plants. The Chemehuevi have distinguished themselves from their Yuman neighbors by their very different mythology, worldview, religious practices, kinship system, and political organization. Between 1865 and 1871 some indigenous groups began moving south to inhabit the newly created Colorado River Reservation. Additional land was added to the Colorado River Reservation in 1874 to encourage the Chemehuevi to move there from areas near Blythe, Needles, Beaver Lake, and Chemehuevi Valley; however, not until the early 1900s did the Chemehuevi agree to move.

Historic Background

Extensive mineral exploration in the project vicinity began in the early 1860s. In 1881–1882, Jack Moore staked a claim and with his father and two other partners founded the Eagle Mountain Mining District for the exploitation of iron, gold, and silver. They failed to maintain the necessary assessment work to validate the claim and the area was abandoned for mineral development until 1895. That year L.S. Barnes began to consolidate the claims within the area. He completed his consolidation by 1912 and sold the package to Henry E. Harriman, CEO of the Southern Pacific Railroad.

World War II saw an enormous demand for steel, but shortly prior to the war in 1936, the Joshua Tree National Monument was formed, and the boundary included the Eagle Mountain claims, thus protecting the ore bodies from mining. Henry J. Kaiser then took interest in the Eagle Mountain claims. He purchased the Eagle Mountain claims from the Harriman heirs and succeeded in having the Joshua Tree Monument boundaries shifted to exclude the Eagle Mountain properties. He then began work in 1944 to survey a new railroad route between Eagle Mountain and the Southern Pacific Railroad. Construction on the railroad began in 1947 and was completed on June 23, 1948, as the Kaiser Industrial Railroad (Eagle Mountain Industrial Railroad). Ore shipment from the mine began immediately, and by 1971 the Eagle Mountain iron mine was producing 90 percent of California's total iron output.

More than 4,000 people were employed in the operation, making the Eagle Mountain mine Riverside County's largest employer. The company town of Eagle Mountain included schools, fire and police departments, civic facilities, 416 rental houses, 185 trailers, 383 dormitory rooms, and 32 apartments. As a result of establishing the Eagle Mountain mine and employing thousands, Kaiser provided his workers with a comprehensive medical plan, which later became known as Kaiser Permanente. Competition from abroad and other economic factors caused the mine to close in 1983 after 35 years in operation. Much of the housing stock was either removed, left vacant, or vandalized. By 1994, a school, a new low-security prison, and some rental properties remained at Eagle Mountain, but it is largely a ghost town today.

The town of Desert Center was founded in 1925 by Stephen Ragsdale and his wife after buying a homestead that was developed about 10 years earlier. The town remains as a waypoint on Interstate 10, which runs near the southern edge of the project area and is a major transportation artery connecting the Los Angeles area with Arizona. The route may have been used prehistorically because it represented a relatively low (but dry) corridor for travel between the lower Colorado River in Palo Verde Valley and the Coachella Valley. During the early twentieth century, as the region's highway system was gradually developed, the route was known under a succession of different designations, including Legislative Route 64 and U.S. Route 60. Interstate 10 was completed in 1968.

The CRA runs through the study area. The aqueduct was constructed between 1931 and 1941 by Metropolitan Water District as one of the major Colorado River water delivery public works projects, which also included the construction of Hoover dam and other canals supplying water to southern California. These projects are recognized as pivotal components that allowed the enormous growth of the Los Angeles area during World War II and in the following decades. In 1955 and 1994, the American Society of Civil Engineers (ASCE) recognized the CRA as one of the "Seven Engineering Wonders of American Engineering" (ASCE, 2010).

The deserts of southern California and western Arizona became the focus of important military training exercises during World War II. The project area is located near what was once the Desert Training Center, a 10- to 130-square-mile area that was opened on April 30, 1942, as the largest military training installation ever created. This facility had General George S. Patton, Jr., as its first commanding officer and served the vital purpose of training troops for desert warfare conditions and tactics in preparation for the North African Campaign. After the Allied victory in North Africa in 1943, an emphasis on desert warfare was no longer necessary. The name of the Desert Training Center was changed to the California-Arizona Maneuver Area (CAMA) on October 20, 1943, and its purpose was expanded to serve as a simulated theater of operations emphasizing large-scale logistics and not exclusively desert warfare training and tactics. The facility provided training for combat troops, service units, and staff under conditions similar to a combat theater of operations until its closure in May 1944. Divisional camps that may have deployed troops into the project area include Camp Desert Center, Camp Iron Mountain, Camp Granite, and Camp Coxcomb, all of which are located north of Desert Center. A network of railroads and roads connected all the divisional camps and depots. Many smaller camps, bivouacs, firing ranges and other facilities were constructed throughout the Desert Training Center/CAMA.

The divisional camp nearest the project area was Camp Desert Center; it was located between Camp Young and Desert Center and extended immediately east of Eagle Mountain Road and north of the old highway that preceded Interstate 10. Very little documentary information is currently known for Camp Desert Center, and its specific history and range of functions are not clearly understood. BLM did not include Camp Desert Center in its interpretive plan for the major camps of the Desert Training

Center/CAMA, although the interpretive plan includes preservation and interpretive goals for the other major sites. The 34,000-acre area included a barracks area with tent housing, an observer's camp, an ordinance camp, an evacuation hospital, a quartermaster truck site, and an extensive maneuver area.

Previous Cultural Resources Investigations

Eagle Crest conducted a search of cultural resource records housed at the Eastern Information Center of the California Historic Resources Information System at the University of California, Riverside, and at the BLM Palm Springs Field Office. This search was supplemented by a review of reports available at ASM Affiliates. This record search was augmented by additional information provided by ECORP Consulting, Inc. (ECORP), a firm that had conducted a recent survey in the project area but had not yet provided a report to the California Historic Resources Information System. The background research identified 56 previous reports within a 1-mile radius of the project APE, of which 27 included portions of the project area proper (Schaefer, 2010, 2009).

As cited by Schaefer (2010, 2009), previous studies that were found to have addressed significant portions of the project's APE include Cowan and Wallof (1977; RI-00220), Wallof and Cowan (1977; RI-00222), Carrico et al. (1982; RI-00221), Bull et al. (1991; RI-03321), Love (1994; RI-03949), Schaefer (2003), and the ECORP study (no reference provided).

During these previous studies, a total of 123 cultural resource sites were recorded within a 1-mile radius of the project area. Of these, only six sites are located at least partially within the project APE: an underground portion of the CRA (site P-33-06726), which is crossed by the proposed transmission line route and the proposed and alternative water line corridors; the Eagle Mountain mine and town site (site P-33-006913), two resources associated with the Desert Training Center 36th Evacuation Hospital (P-33-015971, P-33-017642), and two prehistoric sites (P-33-015091, P-33-015093). The Eagle Mountain town site record includes the railyard and in at least two locations, the project alignment intersects the Eagle Mountain Industrial Railroad, which is considered part of the Eagle Mountain mine and town site complex.

Identified Resources

Prehistoric and Historic Archaeological Resources

In March 2009, Eagle Crest conducted an intensive archaeological survey of the accessible portion of the project APE, encompassing 620 acres. A final report titled *A Class III Field Inventory for the Proposed Eagle Mountain Pumped Storage Project, Riverside California* (Schaefer and Iversen, 2009) was prepared that presented the results of the fieldwork. The survey area included the 200-foot-wide proposed transmission line route, as well as other routes, the 60-foot-wide proposed and alternative water line routes, two proposed collection substation locations, and four potential water supply well locations. Access to lands within the APE owned by Kaiser was not granted; these lands,

including the Eagle Mountain mine and town site and associated railroad, were not surveyed.

In section 6 of its July 2010 supplemental information filing, Eagle Crest presents the preliminary results of ASM Affiliates' recent archaeological survey of the applicant's proposed and the State Water Board's recommended transmission routes or substation locations (Eagle Crest, 2010a). A summary of the survey results were provided in a letter report titled *Results of Class I Record Search and Class III Field Inventory of Eagle Mountain Pumped Storage Project Alternative Transmission Line Corridors and Substations* (Schaefer, 2010). In this letter report, ASM Affiliates states that the report only provides the preliminary results of the survey and that an addendum to the original project survey report prepared by Schaefer and Iversen (2009) would be forthcoming. The preliminary letter report states that for the State Water Board's recommended transmission line route and substation, cultural resources data were based on the recent survey information provided by ECORP (no reference provided).

Based on the records search, the information provided by ECORP, as cited by ASM Affiliates (2010), and the subsequent archaeological survey, a total of forty-seven archaeological sites were identified within the surveyed portion of the APE. Including the Eagle Mountain mine and town site, eight resources are known to be present within the APE as previously approved by the California SHPO. An additional 39 sites were identified during recent surveys of the applicant's proposed and the State Water Board's recommended transmission routes and substation locations.

Table 12 provides a summary of all archaeological sites identified within the project APE to date.

Although it has not been formally evaluated, Eagle Crest assumes that the CRA (P-33-006726) is eligible for listing on the National Register. In the area of the proposed crossings, the aqueduct occurs as a deeply buried, massive, underground pipeline where the transmission line and waterlines would cross the aqueduct route. It is virtually invisible on the surface except for a road and earthen berm. The California SHPO agreed that assuming eligibility of this structure was acceptable (letter from M.F. Donaldson, California SHPO, Office of Historic Preservation Sacramento, CA, to R. Kaldenberg, ASM Affiliates, Carlsbad, CA, December 22, 2009).

Both the Eagle Mountain mine and the town site are recorded as P-33-006913. This property also includes features associated with the Eagle Mountain Railroad. In a previous consultation, BLM and the California SHPO concurred that this property was not eligible for the National Register (letter from C. Widell, California SHPO, Sacramento, CA, to H.R. Bisson, District Manager, BLM, California Desert District, Riverside, CA, December 12, 1996). However, at the time of the original 1996 determination and SHPO consultation, the property did not meet the 50-year age requirement for listing on the National Register. Because it now meets that requirement,

Table 12. Archaeological and historic resources within the Eagle Mountain Project APE (Source: Schaefer, 2010, 2009, as modified by staff).

Primary Number/ Temporary Designation	Description	Date	National Register Eligibility
P-33-001811	Prehistoric lithic scatter	Unknown	Recommended not eligible
P-33-0626	Colorado River Aqueduct	1931–present	Unevaluated; assumed eligible
P-33-006913	Eagle Mountain mine and town site (including railroad)	1947–1983	Previously determined not eligible (1996); pending re-evaluation
P-33-013987	Historic telegraph/ telephone line	Unknown	Recommended not eligible
P-33-015091	Prehistoric lithic scatter/rock ring	Unknown	Recommended not eligible
P-33-015093	Prehistoric lithic scatter	Unknown	Recommended not eligible
P-33-015971	Desert Training Center (rock alignment possibly associated with 36th Evacuation Hospital)	Circa 1943	Recommended potentially eligible
P-33-017642	Desert Training Center (possibly associated with 36th Evacuation Hospital)	Circa 1943	Recommended potentially eligible
P-33017643	Trash Dump	1940s–1950s	Not eligible
P-33017644	Trash Dump	1940s–1950s	Not eligible
P-33017645	Trash Dump	1940s–1950s	Not eligible
P-33017646	Trash Dump	1940s–1950s	Not eligible
P-33017647	Trash Dump	1940s–1950s	Not eligible
P-33017648	Isolate highway marker	1914–1934	Not eligible
DS-115	Historic Refuse	Unknown	Recommended not eligible

Primary Number/ Temporary Designation	Description	Date	National Register Eligibility
DS-120	Historic Refuse (Desert Center Dump)	Unknown	Recommended Not Eligible
DS-123	Historic Refuse	Unknown	Recommended not eligible
DS-124	Historic Mining	Unknown	Recommended not eligible
DS-125	Historic Refuse	Unknown	Recommended not eligible
DS-132	Historic Refuse	Unknown	Recommended not eligible
DS-137	Historic Mining	Unknown	Recommended not eligible
DS-178	Historic Refuse	Unknown	Recommended not eligible
DS-179	Historic Refuse	Unknown	Recommended not eligible
DS-195	Historic Refuse	Unknown	Recommended not eligible
DS-203	Historic Road	Unknown	Recommended not eligible
DS-227	Historic/Modern Fire Ring	Unknown	Recommended not eligible
DS-228	Prehistoric Lithic Scatter	Unknown	Recommended not eligible
DS-231	Prehistoric Lithic Scatter	Unknown	Recommended not eligible
DS-232	Historic Refuse	Unknown	Recommended not eligible
DS-239	Historic Refuse	Unknown	Recommended not eligible
DS-240	Prehistoric Habitation	Unknown	Recommended potentially eligible
DS-245	Prehistoric Lithic Scatter	Unknown	Recommended not eligible
DS-313	Historic Refuse	Unknown	Recommended not eligible
DS-314	Historic Refuse	Unknown	Recommended not eligible
DS-315	Prehistoric Lithic Scatter	Unknown	Recommended not eligible
DS-316	Historic Refuse	Unknown	Recommended not eligible
DS-326	Historic Rock	Unknown	Recommended not eligible

Primary Number/ Temporary Designation	Description	Date	National Register Eligibility
	Features		
DS-327	Historic Post	Unknown	Recommended not eligible
DS-330	Historic Rock Feature	Unknown	Recommended not eligible
DS-485	Historic Mining	Unknown	Recommended not eligible
DS-486	Historic Mining	Unknown	Recommended not eligible
DS-487	Historic Mining	Unknown	Recommended not eligible
DS-494	Historic Refuse	Unknown	Recommended not eligible
DS-495	Historic Refuse	Unknown	Recommended not eligible
DS-703	Historic Refuse	Unknown	Recommended not eligible
DS-705	Historic Mining	Unknown	Recommended not eligible
EM-1	Historic Refuse	Unknown	Recommended not eligible

the California SHPO subsequently requested re-evaluation of the resource (letter from M.F. Donaldson, California SHPO, Office of Historic Preservation Sacramento, CA, to R. Kaldenberg and J. Schafer, ASM Affiliates, Carlsbad, CA, October 26, 2009).

Five historic can and trash scatters were also recorded within the APE (P-33-17643 through P-17647). These appear to represent the disposal of household refuse along a dirt road during the late 1940s or 1950s, most likely from the community of Desert Center via Ragsdale Road. Because of their spatial dislocation from specific Desert Center households or enterprises proper, these sites are not associated with known persons or specific activities or periods with historic significance. Additionally, a concrete highway marker (P-33-17648) was recorded as an "isolate" but could also be interpreted as an "object." Such monuments were used between 1914 and 1934. The California SHPO concurred that the five dump sites and the single isolate are not eligible for listing on the National Register (letter from M.F. Donaldson, California SHPO, Office of Historic Preservation, Sacramento, CA, to R. Kaldenberg and J. Schafer, ASM Affiliates, Carlsbad, CA, October 26, 2009).

The Agua Caliente Band of Cahuilla Indians expressed concern with regard to prehistoric trails that may pass through the area (letter from S. Milanovic, Tribal Historic Preservation Office [THPO] Intern, Department of Historic Preservation, Agua Caliente Band of Cahuilla Indians, Palm Springs, CA, to G. Gillin, Project Manager, GEI Consultants, Rancho Cordova, CA, August 26, 2008). Such trails may be archaeological

in nature and may also be considered TCPs. Eagle Crest responded that it was aware of previously recorded trail segments and associated sites that would have served as alternate travel routes to the Cocomaricopa Trail connecting the Colorado River to the Coachella Valley (letter from R. Kaldenberg, Principal, ASM Affiliates, Carlsbad, CA, to Sean Milanovich, THPO Intern, Agua Caliente Band of Cahuilla Indians, Palm Springs, CA, September 10, 2009). However, Eagle Crest stated that no evidence of prehistoric or ethnohistoric trails was found within the project APE and that existing records indicated that the trail system was located elsewhere.

None of the 39 resources located in the applicant's proposed and the State Water Board's recommended transmission routes or substation locations have been formally evaluated for listing on the National Register. However, the ASM Affiliates letter report recommends that site DS-240, consisting of a prehistoric habitation site, containing lithic artifacts, ceramics, and fire-affected rock, could contain information relevant to prehistoric use of the Chuckwalla Valley (Schaefer, 2010). Two additional sites (P-33-017642 and P-33-015971) are potentially associated with the 36th Evaluation Hospital at the Desert Training Center. The inventory report states that both of these sites are also potentially eligible for the National Register (Schaefer, 2010). In its supplemental information filing, Eagle Crest (2010a) states that additional cultural materials extend north of these sites for several miles and that the potential exists for a National Register district or a multiple property submission exists. The remaining 36 sites have been recommended as ineligible.

Traditional Cultural Properties and Sacred Sites

Contact with Native Americans that have traditional ties to the Eagle Mountain Project vicinity began in September 2007. On April 16, 2008, Eagle Crest's consultant requested a records search of the California Native American Heritage Commission's (NAHC's) Sacred Lands File. A response was received on April 30, 2009, stating that no sacred lands were known within the proposed project area.

Since September 2007, Eagle Crest and/or the Commission have requested input on the proposed project from the following Native American tribes:

- Agua Caliente Band of Cahuilla Indians,
- Barona Band of Mission Indians,
- Cabazon Band of Mission Indians,
- Cahuilla Band of Mission Indians,
- Chemehuevi Indian Reservation,
- Colorado River Indian Reservation,
- Fort Mojave Indian Tribe,
- Morongo Band of Mission Indians,

- Torres-Martinez Desert Cahuilla Indians, and
- Twenty-Nine Palms Band of Mission Indians.

The Agua Caliente Band of Cahuilla Indians requested a meeting to discuss the proposed project. The Morongo Band of Mission Indians also expressed an interest in the proposed project area. However, to date, no potential TCPs have been identified within the project APE.

3.3.6.2 Environmental Effects

Effects of Project Operations on Cultural Resources

Cultural resources can be disturbed by any action (natural, animal, or human) that disturbs soils or ground surfaces on which they occur. Archaeological and historic-era sites are particularly susceptible to damage as a result of construction activity.

Eagle Crest has identified 47 cultural resource properties that are located within the project APE, including the APE encompassing the applicant's proposed and the State Water Board's recommended transmission routes and substations (see table 12). The California SHPO determined that six of these resources are not eligible for the National Register (letter from M.F. Donaldson, California SHPO, Office of Historic Preservation Sacramento, CA, to R. Kaldenberg and J. Schafer, ASM Affiliates, Carlsbad, CA, October 26, 2009).

The CRA has not been evaluated for the National Register, but will be treated as eligible. In its application, Eagle Crest states that because the CRA is buried where it would be crossed by proposed project transmission and water pipelines, construction activities are unlikely to affect the qualities of the property that could make it eligible for the National Register.

In its application, Eagle Crest cites the SHPO's 1996 letter concurring that the Eagle Mountain town site and mine are not eligible for the National Register. Further, the last sentence in section 1, *Overview and Executive Summary*, of the HPMP also implies that this resource is not a historic property. However, in section 2.4 of the HPMP, Eagle Crest correctly acknowledges that the site and its associated railroad may now meet National Register eligibility criteria and that project construction and subsequent operation and maintenance activities have the potential to affect this resource.

Because the project also could potentially affect previously unidentified cultural resources and human remains, the Aqua Caliente Band of Cahuilla Indians (letter from S. Milanovic, THPO Intern, Department of Historic Preservation, Agua Caliente Band of Cahuilla Indians, Palm Springs, CA, to G. Gillin, Project Manager, GEI Consultants, Rancho Cordova, CA, August 26, 2008) and the Cabazon Band of Mission Indians (Eagle Crest, 2009c) both recommend the presence of cultural resources monitors during construction activities.

Eagle Crest (2010a) states that site DS-240 is discrete in size and can be avoided during through project design to mitigate potential effects, but that construction of the transmission alternative through sites P-33-017642 and P-33-015971 has the potential to cause direct and indirect effects on the physical remains of the 36th Evacuation Hospital site and other associated remains form the World War II era Desert Training Center/CAMA.

Our Analysis

Construction and operation activities of the proposed Eagle Mountain Project would have the potential to affect known cultural resource properties, including the CRA, which remains unevaluated but is considered to be eligible for the National Register; the Eagle Mountain mine and town site (P-33-006913) and its associated railroad; and the 39 unevaluated sites identified in the applicant's proposed and the State Water Board's recommended transmission routes and substation locations. Project construction and operation activities also could potentially affect potential TCPs, unanticipated discoveries, and human remains that may be identified in the future.

In its June 2009 final license application and subsequent December 2009 HPMP, Eagle Crest proposes measures to address sites potentially subject to adverse project effects. Staff analyzes and discusses these proposed measures in *Management of Historic Properties* below.

Management of Historic Properties

In its June 2009 final license application, Eagle Crest proposed several measures to address potential project effects to cultural resources. These are:

- CLT-1—Evaluate cultural sites for their National Register eligibility;
- CLT-2—Monitor sensitive areas during construction; and
- CLT-3—In the event that historic properties or human remains are identified during construction of the project, develop an HPMP in consultation with BLM, the California SHPO, and Native American tribes.

These measures would apply only to lands within the APE outside of the Kaiser property. In December 2009, Eagle Crest filed an HPMP (referred to herein as CLT-4) that contains measures for the entire Eagle Mountain APE, including measures for potential project effects on cultural resources located on Kaiser lands. The HPMP contains and replaces Measures CLT-1 through CLT-3 referred to in the final license application.

The HPMP was developed in consultation with the California SHPO, BLM, Agua Caliente Band of Cahuilla Indians, Cabazon Band of Mission Indians, Chemehuevi Indian Reservation, Colorado River Reservation, Fort Mojave Indian Tribe, Morongo Band of Mission Indians, Torres-Martinez Desert Cahuilla Indians, and the Twenty-Nine Palms Band of Mission Indians (Eagle Crest, 2009e). The HPMP would be used by

Eagle Crest staff to ensure that the management goals for the preservation or appropriate treatment of historic resources are achieved. The HPMP was prepared in consideration of a document prepared in consultation with the Commission titled, *Guidelines for the Development of Historic Properties Management Plans for FERC Hydroelectric Projects* (ACHP, 2002). It its HPMP, Eagle Crest Energy proposes to undertake a variety of general measures for implementing the HPMP and managing cultural resources, including:

- Appointment of a historic properties management coordinator, who would be responsible for overseeing implementation of the HPMP.
- Preparation of an implementation report every 2 years during project construction and every 6 years during operation and maintenance. These reports would be provided to agencies and tribes and describe all activities associated with the HPMP that were undertaken during that reporting period.
- Preparation of a plan to review the effectiveness of the HPMP every 6 years in consultation with the California SHPO, BLM, Riverside County, interested tribes, the Commission, and other consulting parties.
- Pre-action review of planned actions involving ground disturbance conducted by the historic properties management coordinator in consultation with the California SHPO, interested tribes, and appropriate land management agencies, as specified in the HPMP.
- Implementation of protocols for future cultural resources field investigations (i.e., field survey, archaeological testing, data recovery or other alternative mitigation measures), which include consultation with the California SHPO, agencies, and interested tribes.
- Implementation of a plan and procedures to address the inadvertent discovery of previously unknown cultural resources or human remains. This plan would provide for the development of an as-needed monitoring program for sensitive areas.
- Development of a cultural resources element for a project WEAP that would ensure that Eagle Crest employees are familiar with cultural resource laws and regulations, instructions on HPMP protocols and requirements, and other information regarding historic properties.
- Development of interpretive signage that would be placed outside the main gate of the proposed facility and would provide the public with information about the prehistory and history of the project area, the Native Americans who inhabited the area, and background information on the functioning of the Eagle Mountain Project.

The HPMP also includes measures specific to potential historic properties identified within the APE that was approved by the SHPO in 2009. Eagle Crest proposes

to design project transmission lines and water pipes to avoid direct or indirect effects on buried portions of the CRA. Inspections would be undertaken every 2 years to determine whether conditions are stable or if any disturbances or deterioration has occurred. Further, Eagle Crest proposes to prepare a work plan to document the Eagle Mountain mine and town site and associated railroad, including the potential for a historic district, upon gaining legal access to the lands. Upon completion of documentation of the site and any other cultural resources within the Kaiser property in the APE, Eagle Crest would consult with the California SHPO, BLM, and the Commission to evaluate National Register eligibility. If any resources are determined to be eligible, the HPMP calls for avoidance or mitigation measures to be developed, and consultation with the California SHPO with regard to potential project effects. Finally, in the event that interested tribes identify potential TCPs within the project APE, Eagle Crest's proposed HPMP includes a plan to document and evaluate such properties and to resolve project adverse effects on TCPs that are eligible for the National Register.

In its draft EIR, the State Water Board (2010) commented that the construction would have potentially significant effects on the CRA (P-33-06726), resources located in the central project area (e.g., the Eagle Mountain mine and town site and associated railroad, P-33-006913), and unknown or buried cultural resources. However, the State Water Board concluded that these effects would be reduced to less than significant, if the measures proposed within the HPMP are implemented.

Our Analysis

Eagle Crest's proposal to appoint a historic properties management coordinator would ensure that the requirements of the HPMP are followed. Additionally, regular reporting to agencies and affected tribes on the status of overall cultural resources management would provide a forum for parties to discuss the HPMP and provide recommendations about management of cultural resources. However, annual reporting during construction (rather than reporting every 2 years) and annual reporting during subsequent operation and maintenance (rather than reporting every 6 years) is standard for hydroelectric projects. Annual reporting would ensure that consulting parties are regularly informed of project activities and any cultural resources issues that may arise over the license term. The frequency of reporting could be decreased in the future if the Commission and other consulting parties agree that annual reporting is no longer warranted.

Eagle Crest proposes to review the HPMP every 6 years. Affording appropriate federal land-management agencies the opportunity to comment, along with the California SHPO and tribes, on proposed revisions to the HPMP would ensure that those with an interest in the management of cultural resources would be able to contribute their views. Such a review process is typically undertaken every 5 years under FERC hydroelectric project licenses. However, Eagle Crest's plan to review the HPMP every 6 years concurrent with the Licensed Hydropower Recreation Report (FERC Form 80) would

likely provide comparable protection to cultural resources. If consulting parties wish to request an earlier review based on the results of the annual HPMP implementation report, Eagle Crest could include a clause in the HPMP to allow for an earlier review.

As specified in the HPMP, Eagle Crest's implementation of review procedures prior to ground-disturbing activities and protocols for future cultural resources field investigations would ensure that cultural resources are considered during project planning and that appropriate studies are undertaken. Further, the HPMP, Appendix A, contains protocols to be followed if previously unknown cultural resources or human remains are identified during project activities. Implementation of these measures would ensure that new discoveries are treated appropriately. However, the HPMP does not discuss the curation of archaeological materials that may be recovered during pre-construction fieldwork or fieldwork that may be undertaken in the future. Including in the HPMP a plan to address curation of the materials, which would be in accordance with federal and state requirements, would ensure that such materials are properly conserved and accessible, under properly controlled conditions, to those with appropriate research or cultural interests.

The HPMP also discusses the need for archaeological monitoring during construction activities and states that if archaeological monitoring is required, it would be conducted by a qualified cultural resources specialist and by a designated Native American monitor. However, the HPMP does not describe the circumstances under which a monitor would be needed and who would make that decision. It also does not specify a process for determining which of the interested tribes would provide the Native American monitor. Inclusion of specific parameters within the HPMP for monitoring, both during construction and during subsequent project operation and maintenance activities requiring ground disturbance, and a process for consultation with interested tribes to appoint a Native American monitor, would ensure that monitoring is undertaken appropriately.

Eagle Crest's proposal to include a cultural resources element to its WEAP program would ensure that staff is regularly informed about issues, procedures, and protocols regarding cultural resource management in the project area. Additionally, Eagle Crest's proposal to install interpretive signage regarding cultural resources would enable the public to become aware of the cultural importance of the project area. The inclusion on the signs of information pertaining to site protection and applicable laws would provide an effective vehicle for educating the public about vandalism, its effects, and its potential legal consequences. Consultation with interested Native American tribes during the development of the training sessions and providing them with an opportunity to provide input on the interpretive signs would contribute toward staff and public understanding of Native American perspectives on cultural resources.

Implementation of the measures for the identification, management, and treatment of resources associated with the CRA and the Eagle Mountain town site, mine, and associated railroad that are contained within Eagle Crest's proposed HPMP would ensure

that the potential effects of the project upon these resources are properly addressed in accordance with section 106. However, revision of the HPMP's *Overview and Executive Summary* to correctly identify the Eagle Mountain mine and town site and railroad as a potential historic property help clarify that issue.

Additionally, the HPMP does not discuss the additional APE that includes the State Water Board's recommended transmission route and substation location. Revision of the HPMP to include (1) a detailed discussion of the expanded APE alternatives, including revised APE maps; (2) a description of the sites documented by Schaefer (2010) and located within the expanded APE; and (3) inclusion of a detailed plan and schedule for National Register evaluations, assessment of effects, and identification of measures to resolve adverse effects of project construction, operation, and maintenance on any of sites identified within the specific Commission staff's recommended transmission line corridor and substation location, including the documentation of appropriate consultation with the participating tribes, BLM, and California SHPO would ensure that these properties are appropriately considered in accordance with section 106. Section 4.2 of the December HPMP currently contains procedures to evaluate the effects of project activities to cultural resources both within and outside of the APE as previously approved by the California SHPO; these procedures would ultimately apply to the specific Commission staff's recommended transmission line corridor and substation location. However, because revisions to the HPMP are recommended to address other issues, it would be reasonable to address the expanded APE and the new alternatives in the revised HPMP at this time as well.

Finally, staff finds that it is appropriate for Eagle Crest to include the handling of newly discovered paleontological resources on federal land either in the final HPMP, or as an appendix to it, due to the recent paleontological law enacted by Congress in March of 2009 that requires all federal land managers to manage and protect paleontological resources discovered on their lands.[37] Although staff recognizes that section 106 has no provisions for protecting paleontological resources, such resources should be protected in any case, and it is appropriate to use an HPMP to reference the protection of such resources because they are similar in nature to archeological resources.

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[37] See Omnibus Public Land Management Act (OPLMA) of 2009, Public Law 111-011. P.L. 111-011, Title VI, Subtitle D on Paleontological Resources Preservation (OPLMA-PRP) (123 Stat. 1172; 16 U.S.C. 470aaa). This statute requires the Secretaries of the Interior and Agriculture to manage and protect paleontological resources on federal land using scientific principles and expertise. The OPLMA-PRP includes specific provisions addressing management of these resources by BLM, the Park Service, the Reclamation, FWS, and the Forest Service.

3.3.7 Socioeconomics

3.3.7.1 Affected Environment

Riverside County is located in southern California and stretches from the Colorado River and Arizona border in the east to Orange County and within 14 miles of the Pacific Ocean to the west. The county encompasses about 7,200 square miles. The socioeconomic study area is defined as the unincorporated areas of eastern Riverside County (Eagle Mountain, Lake Tamarisk, and Desert Center) and cities within about 60 miles of the project (Blythe, Coachella, Indio, Palm Desert, Cathedral City, and Palm Springs). This description of the socioeconomic environment relies upon statistics at the county level, with local details provided where data are available.

Population

The population of Riverside County grew 35 percent from the 2000 census of 1,545,387 to an estimated 2,088,322 in 2008 (California Department of Finance, 2008, as cited by Eagle Crest, 2009a). The county's population ranks fourth of California's 58 counties and is more than the population of 15 states in the United States. The City of Riverside, which is the county seat and is located about 100 miles west of the project site, had an estimated 2008 population of 296,842, equaling 14 percent of the county's residents.

Population trends for the study area towns are shown in table 13. Most have grown more rapidly than the county as a whole, although some of that growth was in the population of inmates in the Chuckwalla Valley State Prison and Ironwood State Prison. The inmates are counted in the City of Blythe's population for state tax purposes.

Table 13. Population (Source: Riverside County Economic Development Agency, 2004, as cited by Eagle Crest, 2009a).

Area	1980	1990	2000	2007
Blythe	6,805	8,428	20,465	22,625
Cathedral City	[a]	30,085	42,647	52,115
Coachella	9,129	16,896	22,724	38,486
Indio	21,611	36,793	49,116	77,146
Palm Desert	11,081	23,252	41,155	49,752
Palm Springs	32,359	40,181	42,805	46,858
Riverside County	663,166	1,170,413	1,545,387	2,031,625

[a] Incorporated in 1981.

Eagle Mountain is located in an 802-square mile Census block group that had a population of 738 people in 1990 and 977 people in 2000, giving it a population density of 1.2 people per square mile. The project site is located about in the center of the Census block group.

The Eagle Mountain town site population peaked at 3,700 residents (CH2M HILL, 1996, as cited by Eagle Crest, 2009a), and was listed as having 2,453 people in 1970 and 1,890 people in 1980 (U.S. Bureau of the Census, 2008, as cited by Eagle Crest, 2009a). The closing of the mine in 1983 also led to the closing of the private town of Eagle Mountain, and also slowed or stopped growth in nearby communities such as Desert Center and Lake Tamarisk.

Riverside County is expected to double its population between 2000 and 2020, reaching an estimated population of 2.9 million people in 2020 (Riverside County, 2003, as cited by Eagle Crest, 2009a). The county grew in total population by 31.5 percent between 2000 and 2007, while the state of California grew by only 7.6 percent during the same time period.

The county has an average of 214.4 people per square mile in 2006 but much higher in the urbanized west and much lower (1.2 people per square mile) in the project region and similar low densities in surrounding open spaces of the central and east portions of the county.

Employment and Income

The Riverside County Economic Development Agency (2009, as cited by Eagle Crest, 2009a) states that the unemployment rate within Riverside County from 1990 to 2006 has been above the state and national averages. The agency's data show a civilian labor force of 910,400 residents with 845,700 employed and an unemployment rate of 7.1 percent in February 2008. The County experienced an unemployment rate of between 5.1 percent and 6.7 percent from 1998 to 2007. Riverside County employment by sector for 2006 is depicted in table 14.

The United States Census states that the median household income in 2006 was $53,508 for Riverside County, which was below the state median of $56,645. The California Department of Finance shows that in 2005 the per capita income for Riverside County was $27,167, which was 73.6 percent of the California average. The United States Census shows that 12.2 percent of people were below the poverty level in 2006, down from 14.2 percent in 2000 and up from 10.8 percent in 1990 (U.S. Bureau of the Census, 2008, as cited by Eagle Crest, 2009a).

The Riverside County Economic Development Agency (2006, as cited by Eagle Crest, 2009a) shows the taxable sales within the County were $29,816,237 in 2006, up from the 2001 total of $18,231,555. The tax rate for Riverside County including state, local, and district tax is 7.75 percent.

Table 14. Riverside County employment by sector, 2006 (Source: U.S. Bureau of the Census, 2008, as cited by Eagle Crest, 2009a).

Industry	Individuals	Percentage
Agriculture, forestry, fishing and hunting, and mining	13,824	1.6%
Construction	112,297	12.7%
Manufacturing	90,885	10.3%
Wholesale trade	32,279	3.7%
Retail trade	119,795	13.6%
Transportation and warehousing, and utilities	40,334	4.6%
Information	16,973	1.9%
Finance, insurance, real estate, and rental and leasing	58,680	6.7%
Professional, scientific, management, administrative	80,500	9.1%
Educational, health and social services	147,594	16.7%
Arts, entertainment, recreation and food services	90,159	10.2%
Public Administration	35,430	4.0%
Other Services	42,553	4.8%
Total	881,303	

Infrastructure and Accommodations

Housing

The California Department of Finance's (2008, as cited by Eagle Crest, 2009a) data indicate that there were about 773,331 housing units in the county in 2008, compared to 584,674 units in 2000. The figures for 2008 include 559,169 units of single family housing and 127,740 multiple family units. The median home price for the County stood at $234,105 in January 2009. Housing accommodations for towns in the project region are depicted in table 15.

Table 15. Housing accommodations and characteristics (Source: Riverside County Economic Development Agency, 2008, as cited by Eagle Crest, 2009a).

	Median Home Price		Median Rental Price	Total Units		Vacancy Rate		Owner Occupied
	2000	**2008**	**2000**	**2000**	**2008**	**2000**	**2008**	**2000**
Blythe	$90,800	$187,000	$501	4,851	5,444	16.2%	16.1%	57%
Cathedral City	$125,500	$226,500	$695	17,813	21,561	21.7%	21.1%	65%
Coachella	$83,700	$215,500	$470	4,807	8,814	4.4%	4.4%	61%
Indio	$99,000	$272,500	$579	16,899	26,464	18.0%	18.0%	56%
Palm Desert	$189,100	$382,500	$744	28,071	34,120	31.5%	31.0%	67%
Palm Springs	$157,000	$295,000	$631	30,979	33,479	33.3%	33.4%	61%
Riverside County	$146,500	$275,000	$660	584,674	773,331	13.4%	13.0%	69%

In 2008, the vacancy rate for all housing units (single family, multiple family, and mobile homes) within the County was 13 percent. Within the project region, Palm Springs accounted for the highest vacancy rate at 33.4 percent or 11,192 units in 2008. The City of Coachella experienced the lowest rate at 4.4 percent or 386 units. The combined total number of vacant housing units for the six towns within the project region is 28,021, with 100,533 vacant units county-wide (California Department of Finance, 2008, as cited by Eagle Crest, 2009a). The U.S. Census 2005-2007 Community Survey shows 193,931 renter-occupied housing units with 12,818 vacant rental units and a rental vacancy rate of 6.2 percent.

Within the cities in the project region, there are about 257 hotels/motels accounting for 11,599 rooms. Palm Springs contains the highest number with 187 hotels and motels and 6,400 rooms (Riverside County Economic Development Agency, 2004, as cited by Eagle Crest, 2009a).

Community, Municipal, and Social Services

Community and social services available in the County include educational facilities, churches, libraries, hospitals, and nursing homes.

All major municipalities within the project region provide basic municipal services. Within unincorporated areas, services are provided by Riverside County.

Within the project region and specifically the Eagle Mountain area, water and sewer systems are adequate to meet the communities' existing needs. In addition to the basic services provided in the Eagle Mountain area, the County also provides enhanced services through County Service Areas (CSA). CSA 51, which includes the Eagle Mountain area, provides water, sewer, and trash disposal services. The Eagle Mountain town site has water and sewer services provided by Kaiser's wastewater collection and treatment system and two Kaiser-owned wells.

Enrollment of students in the Riverside County K-12 schools for 2006/2007 is 413,059. In addition, there are 23 school districts within the County. These districts contain 265 elementary schools, 74 middle schools and 65 high schools, 11 charter schools and 50 continuing education/adult education schools. The school districts employed 21,663 certified staff members with 11.8 average years of teaching experience and 17,105 classified staff.

Riverside County and local municipalities within the project region maintain law enforcement departments. Riverside County currently employs 1,879 patrol officers and a total of 3,865 funded positions. The nearest County Sheriff station to the project site is the Colorado River Station located in Blythe (Riverside County Sheriff's Department, 2008, as cited by Eagle Crest, 2009a), more than 40 miles from the proposed project site.

The major municipalities within the project region maintain fire departments. Riverside County operates 93 stations with 952 career and 1,100 volunteer personnel for unincorporated and sixteen contract cities. Riverside County station #49 at Lake Tamarisk is the closest station with #45 Blythe Air Base and #43 Blythe being the next nearest stations. All three stations are staffed full time, 24 hours a day, 7 days per week with a minimum 3-person crew, including paramedics.

Municipalities within the project region provide emergency medical services in addition to fire protection. The nearest hospitals to the project site are located at Indio and Blythe, each more than 40 miles away. Riverside County has about 18 licensed hospitals with 3,134 beds. Within the project region, there are four licensed hospitals with 816 beds. Within the County there are 24 community clinics, 35 surgical clinics, and 3 rehabilitation clinics.

3.3.7.2 Environmental Effects

Effects of Construction on Socioeconomics

Construction of the proposed project is expected to occur over a period of 4 years and to generate about 4,674 person-months of employment during that time. Peak monthly employment of 209 workers would occur in Year 2.

Eagle Crest estimates the total construction workforce payroll cost for the project to be $58 million. Additionally, project construction is estimated to require $39 million in design engineering, $49 million in construction administration and engineering, and $3 million in legal and administrative costs. The distribution of this payroll would fluctuate

over time and would parallel the fluctuations in employment. Labor expenditures would be highest in Year 2.

Eagle Crest does not propose any mitigation measures related to socioeconomic parameters such as employment, income, or local government services.

Our Analysis

Project construction would have a beneficial effect on local employment and income. Eagle Crest expects that most of the general labor required during construction would be available from the labor pool within the County and project region, indicating that as much as 50 percent of the skilled trades and management and support personnel could also be provided by regional labor. There would be some need for non-local workers to meet the project manpower requirements. Current estimates of the peak construction work force and the expected percentage of non-local workers suggest that during the peak period about 105 workers would require short-term (2 years or less) housing accommodations.

Eagle Crest is not proposing to use the Eagle Mountain town site for employee housing, but expects that workers needing short-term housing would find lodging in the available houses, rental units, or hotel/motel rooms that are locally abundant. This includes 28,021 vacant housing units and 12,818 vacant rental units within the County, as well as about 11,600 hotel/motel rooms within the communities of Blythe, Cathedral City, Palm Desert, Palm Springs, and Indio.

Primary and secondary schools within the project region have room for additional students if any school age children accompany the construction workers who temporarily relocate to the area.

Medical facilities also appear to be adequate, with one bed per about 645 people within the County. In addition, Riverside County operates a full-time fire station in Lake Tamarisk. Eagle Crest would be required to follow the Development Impact Fee Program as adopted by Riverside County to assess fees for the fire district. Because no new housing construction is anticipated, it is expected that existing public services (water, sewer, waste) would meet the requirements of the project-related workforce.

Because of the anticipated small effect on municipal services and infrastructure, the effect on local municipal costs during construction is expected to be insignificant; further, as described below, it would be offset by anticipated tax revenues.

The project would contribute to the revenues of County and local governments primarily through the payment of property taxes and sales and use taxes. With respect to property taxes, the assessed valuation of the project and the associated property tax payments would rise on an annual basis, in proportion to the work completed. Based upon on the construction cost estimate and tax schedule, Eagle Crest estimates that property taxes would rise to about $8,390,000 (2008 Dollars) per year by the time construction is complete. Sales tax, at a rate of 7.75 percent, is imposed on the sale of

tangible personal property and specified services. With an estimated construction cost of $1,171 million (2009 Dollars), the project could generate substantial sales tax revenue through the purchase of material and equipment within the county, although the amount of those purchases has not been estimated.

Project construction would also have indirect effects on employment, income, and government revenues associated with the construction workforce and the purchase of materials and supplies. For construction activity of this type, gross output multipliers often range from 1.0 to 1.5. This means for every dollar spent in the county on materials and supplies, the indirect effect would account for an additional $1.00 to $1.50 in spending.

Employment multipliers also generally range from 1.0 to 1.5 for construction projects. This means for every construction job created, another 1.0 to 1.5 job(s) would be created in the retail, service, and non-basic employment sectors.

Effects of Operations on Socioeconomics

An estimated 30 persons would manage, operate, and maintain the project, working in two 15-person shifts. The total staff requirement per shift includes three management personnel, seven engineers, two power plant operators, one maintenance technician and two administrative staff. Energy Crest estimates the annual labor cost (operations staff plus home office administration) at $2.3 million (2009 dollars).

Eagle Crest does not propose any mitigation measures related to socioeconomic parameters such as employment, income, and local government services.

Our Analysis

The socioeconomic effect of the project during the operation phase would be much less than during the construction phase, although the project estimates an annual operating budget of $28.3 million (2009 dollars).

The annual O&M budget for project supplies and parts would be $2.5 million. Purchase of supplies and parts within the region would add annual local economic benefits.

The project would not have any substantial ongoing effects on local/County government costs. The relatively small labor force is unlikely to create any effects on housing, schools, and other public services within the project area.

Eagle Crest estimates that the project would generate about $7.67 million per year in property tax revenue at the completion of construction. Sales tax revenue would decrease during the project's operational phase compared to the construction phase, but Eagle Crest estimates that about $187,500 in annual sales tax revenue could be generated from the purchasing of plant supplies and parts. Eagle Crest may also be required to pay taxes on the tangible personal property on the facility (equipment, inventories, etc.).

The ongoing expenditures for materials, services, and payroll would also generate indirect benefits within the region. The typical multiplier for utilities operations is 1.5 for employment. Therefore, the operations workforce of 30 personnel may generate up to an additional 15 indirect or secondary jobs.

There would be no displacement of residences or business establishments due to construction and operation of the project.

3.3.8 Air Quality and Noise

3.3.8.1 Affected Environment

Air Quality

The California Air Resources Board (CARB), part of the California EPA and one of the entities, along with local air districts, responsible for achieving and maintaining healthful air in California, reports that air pollution is one of the state's most serious problems (CARB, 2010). The reasons for the state's air quality problems include: (1) a large population (about 37 million and growing), which translates into a high number of vehicle miles traveled and associated vehicle emissions; (2) a geography with the most heavily populated areas of the state being valleys or basins surrounded by mountains; and (3) a climate of hot, stagnant summer air that traps air pollutants in heavily populated valleys and basins. Sources of air emissions in California include stationary sources (e.g., commercial facility operations), area-wide sources (e.g., fugitive dust, residential fireplaces), mobile sources (e.g., on-road vehicles and trucks, aircraft, boats, trains), and natural sources (e.g., biogenic and geogenic hydrocarbons, natural windblown dust, wildfires).

State and National Air Quality Standards

To maintain acceptable ambient air quality and protect public health, both California and the federal government have adopted ambient air quality standards (AAQSs) for criteria or indicator air pollutants. An AAQS establishes the concentration above which the pollutant is known to cause adverse health effects on sensitive groups within the population, such as children and the elderly. The goal is for localized project effects not to cause or contribute to an exceedance of the standards. AAQSs are classified as either "primary" or "secondary" standards. Primary standards define levels of air quality, including an adequate margin of safety, necessary to protect the public health. National secondary AAQSs define levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. The criteria pollutants for which standards have been established are carbon monoxide, lead, ozone, nitrogen dioxide, particulate matter (PM_{10} and $PM_{2.5}$), and sulfur dioxide. Brief descriptions for the four criteria pollutants of most relevance to the proposed project are provided below.

Carbon Monoxide

Carbon monoxide is a colorless, odorless gas that is directly emitted as a byproduct of combustion. The principal sources of carbon monoxide emissions are motor vehicles, and the highest concentrations of this gas occur under cold, stagnant weather conditions. Carbon monoxide is harmful because it is absorbed through the lungs into the blood stream and reduces the ability of the blood to transport oxygen. As a result, the blood supply to the heart, lungs, and other tissues is reduced, with potentially critical consequences for the sick and elderly.

Particulate Matter (PM_{10} and $PM_{2.5}$)

Particulate matter is a mixture of different substances, including metals, carbon, nitrates, sulfates, organic compounds, and complex mixtures such as diesel exhaust and soil. Particulate matter has been classified as either PM_{10} or $PM_{2.5}$ material. PM_{10} particulates, which have an aerodynamic diameter of 10 microns or smaller, are referred to as "respirable" material because they are small enough to penetrate into inner regions of the lungs where they can be harmful to human health. $PM_{2.5}$ particulate matter, which is even finer (aerodynamic diameter of 2.5 microns or smaller), can deposit deeper in the lungs when inhaled. Exposure to particulate matter aggravates respiratory illnesses and is especially harmful to people with pre-existing heart and lung diseases. Particulate matter (both PM_{10} and $PM_{2.5}$) can either be directly emitted (e.g., dust or soot) or formed in the atmosphere from precursor gaseous emissions, including nitrogen oxides, sulfur oxides and ammonia. Based on EPA estimates, the largest contributor to PM_{10} levels nationwide is fugitive dust, which accounts for 89 percent of the total particulate matter. EPA also estimates that about 14 percent of fugitive dust is attributable to construction activities and 9 percent to re-suspension on paved roads.

Ozone

Ozone is a colorless, odorless gas that constitutes the main component of urban smog. Ozone is not directly emitted as a pollutant, but is formed when precursor hydrocarbon and nitrogen oxides emissions react photochemically in the presence of sunlight. Stagnant air or low wind speeds and warm temperatures provide optimum conditions for ozone formation. Ozone irritates the lungs and damages the respiratory system.

Sulfur Dioxide

Sulfur dioxide (SO_2) is a combustion product of sulfur or sulfur–containing fuels, such as coal and diesel. SO_2, which is also a precursor to the formation of atmospheric sulfate and particulate matter, contributes to potential atmospheric sulfuric acid formation that could precipitate downwind as acid rain.

For most of the criteria air pollutants, California State standards are more stringent than federal standards because of inferences from different health effects studies and incorporation of a higher margin of safety to protect sensitive individuals. California and federal (i.e., EPA) AAQSs for criteria pollutants are presented in table 16.

Table 16. Selected California and federal ambient air quality standards (Source: CARB, 2010; EPA, 2010).

Pollutant	Averaging Time	California Standards	Federal Standards	
			Primary	Secondary
Ozone (O_3)	1 hour	0.09 ppm (180 μg/m^3)	0.12 ppm (235 μg/m^3)	Same as primary standard
	8 hour	0.07 ppm	0.08 ppm (157 μg/m^3)	
Respirable particulates (PM_{10})	24 hour	50 μg/m^3	150 μg/m^3	Same as primary standard
	Annual mean	20 μg/m^3	50 μg/m^3	
Fine particulates ($PM_{2.5}$)	24 hour	No standard	65 μg/m^3	Same as primary standard
	Annual mean	12 μg/m^3	15 μg/m^3	
Carbon monoxide (CO)	8 hour	9 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	None
	1 hour	20 μg/m^3 (23 mg/m^3)	35 μg/m^3 (40 mg/m^3)	
	1 hour	0.18 ppm (472 μg/m^3)	0.100 ppm	
Sulfur dioxide (SO_2)	Annual mean	--	0.03 ppm (80 μg/m^3)	--
	24 hour	0.04 ppm (105 μg/m^3)	0.14 ppm (365 μg/m^3)	--
	3 hour	--	--	0.5ppm (1,300 μg/m^3)
	1 hour	0.25 ppm (655 μg/m^3)	--	--

Under the federal Clean Air Act, each state must identify non-attainment areas that do not meet the National Ambient Air Quality Standards (NAAQS). For any non-attainment designation, a State Implementation Plan (SIP) is developed to define actions to be taken to achieve attainment of the applicable NAAQS. In summary:

- An attainment area is any area that meets the NAAQS,
- A non-attainment area is any area that does not meet the NAAQS, and
- A maintenance area is any area previously designated non-attainment that is in transition back to attainment.

As shown in table 17, the area surrounding the proposed project site is currently designated as attainment for all criteria pollutants subject to NAAQS, but is designated by CARB as nonattainment for ozone and PM_{10} under the California AAQSs.

Table 17. Project area designations in 2010 under NAAQS and California AAQS (Source: Eagle Crest, 2009a).

Designation by:	**CO**	**PM_{10}**	**$PM_{2.5}$**	**O_3**	**NO_2**	**SO_2**	**Pb**
NAAQS[a]	A	A	A	A	A	A	A
California AAQS[b]	U	N	U	N	A	A	A

Notes: A – attainment
CO – carbon monoxide
N – non-attainment
NO_2 – nitrogen dioxide
O_3 –ozone
Pb – lead
$PM_{2.5}$ – fine particulate matter
PM_{10} – respirable particulate matter
SO_2 – sulfur dioxide
U – unclassified (treated as attainment)

[a] EPA (2010)
[b] CARB (2010)

General Conformity is the federal process used to ensure that the air quality effects of federal actions not related to motor vehicle transportation plans are also considered in the air quality planning of nonattainment and maintenance areas. Because the area surrounding the proposed project site is currently designated as attainment/unclassified for all NAAQS, although it is nonattainment for the California AAQS for ozone and $PM_{10,}$ General Conformity is not applicable and a General Conformity Determination is not required for the Eagle Mountain Project.

Prevention of Significant Deterioration (PSD) regulations were first promulgated by the EPA (40 CFR part 52) to prevent air quality degradation in those areas where

criteria air pollutant concentrations are below (within) the ambient standards (i.e., attainment areas). Exceedance of a PSD trigger level requires a demonstration by pollutant dispersion modeling that the emissions will not interfere with the attainment or maintenance of any NAAQS at the point of maximum effect and would not cause an exceedance of a PSD increment.

South Coast Air Quality Management District

To better manage common air quality problems, California is divided into 15 air basins, each of which is associated with an Air Quality Management District (AQMD). The project site is located within the Mojave Desert Air Basin, which is within the jurisdiction of the SCAQMD The SCAQMD acts as the primary reviewing agency for environmental documents addressing potential air quality impacts, and it develops regulations that must be consistent with, or more stringent than, federal and state air quality policies. The SCAQMD is responsible for developing attainment plans for the region for inclusion in California's SIP, as well as establishing and enforcing air pollution control rules and regulations. The attainment plans must demonstrate compliance with federal and state AAQSs, and must first be approved by CARB before inclusion into the SIP. The SCAQMD regulates, permits, and inspects stationary sources of air pollution, while the state is responsible for emission standards and controlling actual tailpipe emissions from motor vehicles. For the Eagle Mountain Project, the relevant rules and regulations are as follows:

- Rule 402—requires implementation of dust suppression techniques to prevent fugitive dust from creating a nuisance off site, and
- Rule 403—requires use of best available technologies to reduce the amount of particulate matter (dust) entrained in ambient air as a result of anthropogenic (human-made, e.g. construction) activities.

Because the project site is in California, the potential effects on air quality are determined based on CEQA guidelines, SCAQMD thresholds for criteria pollutants, and other relevant considerations. These guidelines identify certain thresholds that may be pertinent in determining whether an effect is significant. Using these thresholds, the project would be examined to determine whether it would:

- Result in a cumulative increase in ambient concentrations or emissions of any criteria pollutant that is designated as in non-attainment for the project area under an applicable federal or state AAQS and emission thresholds,
- Create new sensitive receptors to be affected by substantial increases of pollutant concentrations, and
- Create objectionable odors affecting a substantial number of people.

With respect to criteria pollutants, the SCAQMD provides quantitative guidance regarding thresholds for both construction and operational activities. These thresholds, listed in pounds per day, are presented in table 18 for construction and operations.

Table 18. South Coast Air Quality Management District thresholds (pounds per day) (Source: SCAQMD, 2009).

Source	**VOC**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**
Construction	75	100	550	150	55	150
Operation	55	55	550	150	55	150

Notes: CO – carbon monoxide

NOx – nitrous oxides

$PM_{2.5}$ – particulate matter greater than 2.5 microns in diameter

PM_{10} – particulate matter greater than 10 microns in diameter

SOx – sulfur oxide

VOC – volatile organic compounds

Noise

Noise, which is defined as unwanted sound, is emitted from many sources including airplanes, factories, railroads, power generation plants, and highway vehicles. The magnitude of noise is described by its sound pressure. Because the range of sound pressure varies greatly, a logarithmic scale is used to relate sound pressures to some common reference level, the decibel. Sound pressures described in decibels are called sound pressure levels.

To describe noise environments and to assess effects of noise on sensitive areas, a frequency weighting measure called A-weighting, which simulates human perception, is commonly used. It has been found that this measure of sound levels best reflects the human ear's reduced sensitivity to low frequencies and correlates well with human perceptions of the annoying aspects of noise. The A-weighted decibel scale (dBA) is cited in most noise criteria. Decibels are logarithmic units that compare the wide range of sound intensities to those that the human ear is most sensitive to. Table 19 identifies dBA levels of typical noise environments.

Several time-averaged scales represent noise environments and consequences of human activities. The most commonly used noise descriptors are as follows:

- Leq—the equivalent A–weighted sound level over a given period;
- Ldn—average day–night 24–hour average sound level; and
- Lmax—the maximum sound level measured over the measurement period.

Table 19. A-weighted decibel scale sound levels of typical noise environments (Source: FICON, 1992, as modified by staff).

A-Weighted	Overall Level	Noise Environment
120	Uncomfortably Loud (32 times as loud as 70 dBA)	Military jet takeoff at 50 feet
100	Very loud (8 times as loud as 70 dBA)	Jet flyover at 1,000 feet
80	Loud (2 times as loud as 70 dBA)	Propeller plane flyover at 1,000 feet; diesel truck 40 mph at 50 feet
70	Moderately loud	Freeway at 50 feet from pavement edge; vacuum cleaner (indoor)
60	Relatively quiet (1/2 as loud as 70 dBA)	Air condition unit at 10 feet; dishwasher at 10 feet (indoor)
50	Quiet (1/4 as loud as 70 dBA)	Large transformers; small private office (indoor)
40	Very quiet (1/8 as loud as 70 dBA)	Bird calls; lowest limit of urban ambient sound
10	Extremely quiet (1/64 as loud as 70 dBA)	Just audible
0	Threshold of hearing	

Note: dBA – A-weighted decibel scale

mph – miles per hour

Regulatory Setting

Most local jurisdictions have noise exposure standards designed to ensure that noise does not excessively affect the quality of life of citizens. Noise is regulated in the proposed project area through general plan policies and noise ordinances. The Riverside County General Plan (Riverside County, 2003, as cited in Eagle Crest, 2009a) identifies policies and standards intended to direct planning associated with the effects of new developments, while the county's noise ordinances establish standards and procedures for addressing specific noise sources.

For the state of California, noise intensity is also discussed in terms of Community Noise Equivalent Level, which describes a weighted average noise level that increases the relative significance of evening and nighttime noise. The Community Noise Equivalent Level descriptor is used to evaluate community noise levels, which includes a 5 and 10 dBA penalty added to evening (7:00 p.m. to 10:00 p.m.) and nighttime

(10:00 p.m. to 7:00 a.m.) sound levels, respectively, in consideration of people's increased sensitivity to noise during those periods.

Riverside County General Plan—Riverside County identifies land use compatibility noise levels to ensure acceptable noise environments for each land use within unincorporated Riverside County. As part of the general plan, the noise element also identifies noise compatibility, noise mitigation strategy, stationary noise, and temporary construction policies that may be applicable to the proposed project.

Riverside County Noise Ordinance—Riverside County Ordinance 847, Regulating Noise, identifies general noise level standards that are not to be exceeded within the county (Riverside County, 2009, as cited in Eagle Crest, 2009a). For example, the maximum noise level standards that would be applicable to sensitive receptor locations in the project vicinity (i.e., rural residences) are 55 dBA from 7:00 a.m. to 10:00 p.m. and 45 dBA from 10:00 p.m. to 7:00 a.m. The ordinance also regulates noise from the operation of power tools or equipment and motor vehicles.

Ambient Noise Levels

The general project area is remote, with relatively low noise levels that are estimated to average between 35 and 45 dBA. The main noise source in the area is vehicle noise on nearby roads, including Interstate 10, Eagle Mountain Road, and Kaiser Road. Vehicle noises can range up to 80 dBA, depending on the distance of the receptor from the source.

Ambient Leq noise measurement data were last collected in the project area for the review of the proposed Eagle Mountain landfill project (Riverside County, 1996, as cited in Eagle Crest, 2009a). Although these data are more than 13 years old, the ambient conditions in the study area are largely the same, with the exception that at the time of the measurements, a state-run correctional facility used some of the buildings at the Eagle Mountain town site. That correctional facility has since relocated from the site.

Ambient Leq noise levels at the Eagle Mountain town site were measured to be between 38 and 63 dBA, depending on the distance of the measurement locations from Kaiser Road. Now that the correctional facility is not located at the site, existing average ambient noise levels likely would be closer to the lower level of the measured range. Ambient Leq noise levels in the vicinity of the communities of Lake Tamarisk and Desert Center were measured to be moderately higher than those in the immediate project area, ranging between 54 and 60 dBA and 66 and 70 dBA, respectively. The ambient Leq noise level near Interstate 10 at Kaiser Road was measured to be 73 dBA.

Sensitive Receptors

For noise analyses, sensitive receptors are generally defined as land uses that are sensitive to noise, such as residential areas, schools, convalescent and acute care hospitals, some parks and recreational areas, and churches and other religious facilities.

The closest sensitive receptors to the proposed project site are residences about 4 miles to the south-southeast and southeast of the site, along Eagle Mountain Road/Phone Line Road and Kaiser Road, respectively. However, these sensitive receptors are within about 200 feet of the proposed location of the electric transmission line route along Eagle Mountain Road and the water supply line route that would be along Kaiser Road.

In addition, the general project vicinity is located about 2 miles from the closest JTNP boundary.

3.3.8.2 Environmental Effects

Air Quality

For the purposes of air quality analyses, sensitive areas are generally defined as land uses where the public has continuous access and with population concentrations that would be particularly susceptible to disturbance from dust and air pollutant concentrations associated with project construction and/or operation. These sites generally include schools, day-care centers, libraries, hospitals, residential-care centers, parks, and churches. Some locations are considered more sensitive to air pollutants than others, including places with concerns of pre–existing health issues, proximity to emissions sources, or duration of exposure to air pollutants.

In addition to the mostly abandoned Eagle Mountain town site, the two small communities of Lake Tamarisk and Desert Center are located about 9 and 10 miles southeast of the proposed reservoirs, respectively. The proposed site is also about 2 miles from the southeastern boundary of JTNP at its nearest point and about 30 miles from the more developed sections of JTNP. National Parks and wilderness areas are designated as Class I areas, and afforded protection through the federal PSD program. Visibility and air concentrations due to fugitive dust emissions during construction are the main issue for air quality.

Effects of Construction on Air Quality

Air emissions associated with construction activities would be temporary and variable, depending on project location, duration, and level of activity. These emissions would be predominantly associated with the exhaust generated by operating construction equipment, but could also be attributed to fugitive dust ($PM_{2.5}$ and PM_{10}) produced by materials staging, demolition, and earthworks activities, as well as concrete processing operations.

In its license application, Eagle Crest proposes measures derived from South Coast AQMD Rule 403 to limit dust sources from grading, trenching, wind erosion, and truck filling/dumping at the site (see section 2.2.4, *Proposed Environmental Measures*, for a description of proposed Measures AQ-1 through AQ-12). In addition, Eagle Crest proposes measures to reduce effects from engine exhaust, including developing and implementing a transportation management plan, using 2002 and newer equipment and

emission control devices for older equipment to reduce exhaust from diesel equipment, and using electrical drops from an existing electrical service in lieu of installing temporary electrical generators. Eagle Crest also proposes to work collaboratively on a cost-share basis with the Park Service to complete a 2-year air monitoring study.

Our Analysis

Two categories of construction equipment would generally be used at the site:

- On-road trucks and vehicles for the transport and delivery of supplies, materials, and equipment to and from the site, as well as the employee vehicles; and
- Non-road equipment operated exclusively on site for construction activities such as paving, utility installation, site clearing and fill operations, earth moving, earth loading and unloading, structure installation, and tunnel boring.

Eagle Crest developed activity levels and vehicle assignments for non-road and on-road construction vehicles based on requirements and projected construction schedules. Non-road exhaust emissions factors were calculated using the current version of the CARB OFFROAD2007 model, while on-road emissions factors were computed using county-specific data processed by the CARB EMFAC2007 model. Based on the construction equipment assignments, usage schedules and engine exhaust factors determined from the models described above, Eagle Crest estimated air emissions.

Eagle Crest also estimated fugitive dust PM emissions from soil disturbance, wind erosion of stockpiles, traffic on unpaved surfaces, blasting, and demolition using the SCAQMD's CEQA Air Quality Handbook, EPA's Compilation of Air Pollution Emissions Factors (i.e., AP-42), and other accepted guidance. Eagle Crest applied a 75 percent control efficiency pertaining to fugitive dust and relevant emissions based on implementation of the proposed mitigation techniques.

Table 20 provides the annual construction-related emissions associated with the proposed project identified by project year and pollutant type. Based on the current construction schedule, annual construction-related emissions would be highest in 2013 or 2014, depending upon the pollutant. Table 20 also shows that the proposed project would represent a very small percentage (less than 0.06 percent) of the forecasted annual emissions within the Mojave Desert Air Basin.

Table 20. Estimated annual construction emissions (tons) (Source: Eagle Crest, 2010a).

Year	CO	VOC	NO_x	PM_{10}	$PM_{2.5}$	SO_2	CO_2	N_2O	CH_4
2012	59.0	7.46	54	2.83	2.54	0.08	7,998	0.05	0.68
2013	57.8	7.86	57	2.95	2.64	0.09	9,021	0.05	0.71
2014	60.2	7.67	51	2.79	2.49	0.09	9,297	0.07	0.72
2015	15.8	1.66	10	0.61	0.54	0.025	1,931	0.03	0.15
Maximum	60.2	7.86	57	2.95	2.64	0.09	9,297	0.07	0.72
Percent of Mojave Desert Air Basin regional emissions	0.05%	0.02%	0.06%	0.004%	0.02%	0.003%	NA	NA	NA

Notes: CH4 – methane

CO – carbon monoxide

CO_2 – carbon dioxide

NA – not available

N_2O – nitrous oxide

NOx – nitrous oxides

$PM_{2.5}$ – particulate matter greater than 2.5 microns in diameter

PM_{10} – particulate matter greater than 10 microns in diameter

SO_2 – sulfur dioxide

VOC – volatile organic compound

Table 21 provides the estimated daily construction-related emissions associated with the proposed project before applying any of the mitigation measures proposed by Eagle Crest. These estimated emissions are less than the SCAQMD CEQA thresholds for all pollutants except NO_x, where the estimated emissions exceed the threshold in 3 out of 4 years. Eagle Crest proposes Measures AQ-1 through AQ-12, development and implementation of a transportation management plan, use of 2002 and newer equipment, use of emission controls on older equipment, and use of electrical drops in place of temporary generators to reduce construction-related emissions. Levels of NO_X might still exceed CEQA standards, but the monitoring during construction proposed by Eagle Crest would determine whether standards are exceeded and whether additional measures are needed.

Table 21. Daily construction emissions (pounds) (Source: Eagle Crest, 2010a).

Year	CO	VOC	NO_x	PM_{10}	$PM_{2.5}$	SO_2
2012	454	57	417	21.7	19.6	0.62
2013	444	60	436	22.7	20.3	0.71
2014	464	59	392	21.4	19.1	0.73
2015	121	13	74	4.7	4.2	0.16
Maximum	464	60	436	22.7	20.3	0.73
CEQA threshold	550	75	100	150	55	150
Exceed CEQA	No	No	Yes	No	No	No

Notes: CO – carbon monoxide

NOx – nitrous oxides

PM_{10} – particulate matter greater than 10 microns in diameter

$PM_{2.5}$ – particulate matter greater than 2.5 microns in diameter

SO_2 – sulfur dioxide

VOC – volatile organic compound

Air emissions related to the off-highway trucking movement of nearly 3 million cubic yards of on-site materials were included in the above emission calculations. Eagle Crest anticipates that there is an extensive stock of mine tailings available on site that Eagle Crest plans to use for facility construction. In the unlikely event that these materials are not usable and equivalent materials must be brought from off-site sources, the annual construction emissions would increase by about 1, 10, 17, and 1 tons of reactive organic gases, CO, NO_X, and PM_{10}, respectively, during the worst case year, and the daily construction emissions would increase by about 7, 75, 138, and 8 pounds per day, respectively. This would increase the daily construction emissions, but not to a level that would exceed the CEQA threshold (except for NO_X). Thus, the use of off-site fill material instead of on-site fill material would not change the overall effects related to the proposed project and air quality.

Eagle Crest also proposes to work collaboratively on a cost-share basis with the Park Service to complete a 2-year air monitoring study. As requested by the Park Service, the monitoring results would be used to adjust the construction workload if any exceedances are observed.

Effects of Operations on Air Quality

Project operation would have minimal direct effects on air quality. The indirect effects could be beneficial if power from the pumped storage project replaces or supplements fossil-fueled peaking generation facilities.

Our Analysis

During operations, air pollutant emissions associated with project maintenance activities would be minimal, and according to Eagle Crest, would not exceed SCAQMD thresholds for operation. Table 22 provides the estimated operation-related annual emissions associated with maintenance of the proposed project.

Table 22. Annual operational emissions (tons) (Source: Eagle Crest, 2009a).

CO	**VOC**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**CO_2**	**N_2O**	**CH_4**
0.57	0.01	0.05	0.01	0.01	0.00	102	0.00	0.01

Notes: CO – carbon monoxide

VOC – volatile organic compounds

NOx – nitrous oxides

PM_{10} – particulate matter greater than 10 microns in diameter

$PM_{2.5}$ – particulate matter greater than 2.5 microns in diameter

SO_2 – sulfur dioxide

CO_2 – carbon dioxide

N_2O – nitrous oxide

CH_4 – methane

The maximum energy requirement to refill the proposed upper reservoir would be about 1,600 MW, generally consumed during off-peak periods. Eagle Crest states that this energy would normally be provided by wind (typically with excess generation during nighttime conditions) and solar facilities during off-peak hours (generally on weekend days) and by general base-load electrical generation during the nighttime hours. In this manner, the project would act like a storage system for the energy generated during the off-peak hours. During peak energy demand periods, about 1,300 MW of generation would occur. In this manner, the project would eliminate the need for up to 1,300 MW of natural gas (fossil-fueled) peaking facilities during peak periods, and decrease emissions associated with the fossil-fueled facilities.

Eagle Crest estimated annual emissions for the modeled offset facility by assuming natural gas-fired generation using a simple cycle turbine. A simple cycle turbine plant was assumed because it is considered to be state-of-the-art and is the most likely source of generation if the proposed project were not built. Annual emissions were calculated assuming that up to 4,732,000 megawatt-hours (MWh) would be offset annually by the proposed project.

These emissions were calculated using emissions factors from two sources: (1) state average emission factors presented in EPA's Emissions & Generation Resource Integrated Database for emissions of NO_x and SO_2, and (2) worst-case emission factors by source type presented in EPA's AP-42 for other pollutants. Table 23 provides the

estimated amount of offset emissions, including about 1,443,260 tons of CO_2 from the project.

Table 23. Annual offset electrical generation air emissions (tons) (Source: Eagle Crest, 2009a).

CO	VOC	NO_x	PM_{10}	$PM_{2.5}$	SO_2	CO_2	N_2O	CH_4
345	48.2	1,796	276	276	1,323	1,443,260	8.75	15.9

Notes: CH_4 – methane

CO – carbon monoxide

CO_2 – carbon dioxide

N_2O – nitrous oxide

NOx – nitrous oxides

PM_{10} – particulate matter greater than 10 microns in diameter

$PM_{2.5}$ – particulate matter greater than 2.5 microns in diameter

SO_2 – sulfur dioxide

VOC – volatile organic compound

Noise

Staff's analysis of potential noise effects that could result from the short-term construction and long-term operation of the proposed project is discussed below. The noise analysis considers Riverside County noise regulations and ordinances and Federal Transit Administration guidelines.

Effects of Project Construction on Noise Levels

Construction of the project would have a temporary effect on ambient noise levels. Although a few intermittent activities such as rock drilling or pavement breaking would be louder, engine noise would be the dominant source of noise from most construction equipment.

Eagle Crest proposes to comply with the County of Riverside's General Plan and its applicable noise ordinance codes during construction (Measure NOI-1). Eagle Crest also plans to equip all construction equipment with properly operating and maintained noise mufflers and intake silencers, consistent with manufacturers' standards (Measure NOI-2).

Our Analysis

Aerial photographs of the region show that there are no sensitive land uses, such as residences, schools/churches, or parks located in the general project vicinity, which includes the proposed Eagle Mountain upper and lower reservoir sites, the proposed pressure and tailrace tunnel locations, and the proposed powerhouse, switchyard, and reverse osmosis treatment sites. These project sites are about 4 miles from the nearest sensitive receptors (i.e., rural residences along Kaiser Road and Eagle Mountain Road)

and about 2 miles from the closest boundary of JTNP. As noted earlier in this section, sensitive receptors would be within about 200 feet of the proposed locations of the electric transmission line along Eagle Mountain Road and the water supply line along Kaiser Road.

Project construction in the vicinity of the upper and lower reservoir sites would increase noise levels that could be audible in the JTNP. During construction, including construction of the electric transmission line and water supply line, the highest noise generating activities are expected to be earth moving, i.e., excavation, grading, and filling. For the noise analysis, the majority of construction equipment was assumed to be mobile off-road equipment, including dozers, backhoes, graders, and dump trucks, which generate maximum noise levels of up to 88 dBA at 50 feet (FTA, 2006, as cited in Eagle Crest, 2009a). The loudest piece of construction equipment is anticipated to be a stationary rock drill, which would generate maximum noise levels of 98 dBA at 50 feet.

Based on the assumed noise levels at 50 feet from the construction equipment, a standard acoustical equation was used to estimate the attenuation of noise based on the distance from the construction site to the nearest JTNP boundary and the nearest sensitive receptors. The equation uses a noise attenuation rate of about 7.5 dBA per doubling of distance to account for the absorption of noise waves due to ground surfaces such as soft dirt and bushes (Caltrans, 1998, as cited in Eagle Crest, 2009a). Table 24 shows estimated construction noise levels that would affect people at the nearest sensitive land uses to the proposed reservoir sites and the proposed pipeline/transmission line routes. These estimated noise levels represent the worst-case scenario because the estimates do not account for noise attenuation due to the presence of natural sound barriers. Noise levels associated with construction activities at the reservoir sites would be expected to be at least 5 to 10 dBA less at the nearest sensitive receptors because most of the work would be completed at the bottom of the proposed reservoir sites where the line of sight between the construction activities and the receptors would be blocked.

Table 24. Minimum distances and L_{max} noise levels (in dBA) at sensitive land uses (Source: Eagle Crest, 2009a).

Project Component	**Closest Distance to the Sensitive Land Use**	**L_{max} at 50 feet (rock drill/dump truck)**	**L_{max} at Closest Residence (rock drill/dump truck**
Reservoir sites	4 miles (residences)	98/88	32/22
Reservoir sites	2 miles (JTNP)	98/88	43/33
Pipeline/transmission line	200 feet (residences)	98/88	83/73

Notes: JNTP — Joshua Tree National Park and wilderness area

L_{max} — the maximum sound level measured over the measurement period

As indicated in table 24, maximum estimated construction noise from the vicinity of the reservoir sites at the nearest residences would be 32 dBA during rock drilling and 22 dBA for dump trucks and other construction activities. These noise levels would likely not be audible at the nearby residences. The same construction activities would generate noise levels at the boundary of JTNP that would be up to 43 dBA during rock drilling and 33 dBA during other construction activities. However, rock drilling, if necessary, would generate loud noises only during early stages of the construction and the noise would be substantially attenuated when excavation for the project tunnels and other facilities proceeds deep into the ground. Thus, rock drilling activities could be audible at the boundary of JTNP, but the effect would be temporary and not substantial.

Construction of the proposed tunnels and powerhouse facilities would occur underground. Therefore, noise effects associated with construction of these facilities would be limited. Maximum construction noise at the nearest sensitive receptors to the transmission line and water pipeline would be adverse; however, it is anticipated that construction of the facilities would proceed in a linear fashion, and construction noise effects at any one location along the pipeline or transmission line route would last for no more than several weeks.

Construction of the project would also create increased traffic on local roads. Increased traffic would be generated from the movement of workers, materials, and equipment to the site. The primary routes used to access the project site would be Interstate 10 and Kaiser Road, and workers coming to the site would use these routes. Given the existing low volumes of traffic levels along Kaiser Road, construction traffic would result in an increase in noise levels at residences along the road, an adverse temporary effect. Based on aerial photographs, about 20 residences would be affected by the increased traffic noise along Kaiser Road.

Compliance with the applicable County of Riverside noise ordinance codes during construction would minimize the effects of noise levels during construction. Eagle Crest's other proposed measures would lower the noise level during construction by equipping all construction equipment with properly operating and maintained noise mufflers and intake silencers, consistent with manufacturers' standards.

Effects of Project Operations on Noise Levels

Normal operation of the proposed project would result in a minimal increase in road traffic but would not substantially increase ambient noise levels along Kaiser Road. The proposed underground powerhouse would not affect above-ground noise levels. Noise could be generated from the transmission lines in some situations. Eagle Crest has not proposed any measures to limit noise levels during project operation.

Our Analysis

During project operation, the increase in traffic along the access roads north of Interstate 10 would be minimal due to the low number of employees expected to be

employed at the site. One exception would be related to salt removal operations from the evaporation and solidification ponds. Removal of the expected salt volume from on-site locations to an unspecified and likely off-site location would require about 280 truck trips per year if the removal were done on an annual basis. Because Eagle Crest proposes to implement the salt removal process at 10-year intervals, resulting in almost 3,000 truck trips in a short period, the truck noise related to this operation would be noticeable.

Under wet weather conditions, high-tension transmission lines may generate audible noises known as corona discharge. The degree or intensity of the corona discharge and the resulting audible noise (normally a low-level hissing or crackling noise) are affected by humidity, air density, wind, and water in the form of rain, drizzle, and fog. Humidity levels increase the conductivity of the air and therefore increase the intensity of the discharge. Also, irregularities on the conductor surface, such as nicks or sharp points and airborne contaminants, can increase the corona activity. The higher voltages at which modern transmission lines operate have increased the noise problem, and the power industry designs, constructs, and maintains transmission lines so that during dry conditions they would operate below the corona-inception voltage. This means that the proposed line would generate a minimal amount of corona-related noise during the vast majority of the time in the very dry desert location of the proposed transmission line. However, during rare foul weather conditions, corona discharges could be produced by water droplets and fog.

Eagle Crest estimates that the corona noise at the edge of the proposed 500-kV transmission line ROW (i.e., 100 feet from the centerline of the transmission line) would range from 45 to 50 dBA. At 200 feet from the transmission line, this would equate to a noise level range of about 37 to 43 dBA. This low-level noise would be noticeable only close to the line during the very rare wet weather conditions.

3.3.8.3 Cumulative Effects

The air quality cumulative effects analysis considers whether the project, in combination with other reasonably foreseeable local and regional developments, would create a significant cumulative effect. The other potential developments include several solar projects and the proposed Eagle Mountain landfill.

In general, the cumulative air quality analysis can consider applicable planning documents that guide development at, or in the vicinity of, the project and within the region; under CEQA this is considered a plan-based approach. The cumulative contribution of the proposed project to criteria pollutants is considered in the ongoing planning by the SCAQMD to meet the state and federal regulatory AAQSs into the future. This planning is based on inventories of emissions anticipated from development in accordance with each of the county general plans within the air basin.

Given the progress and locations of other projects, Eagle Crest concluded that construction of the solar projects would be removed from cumulative actions due to their locations and distances from the proposed project; while construction of the Eagle

Mountain landfill project would also be removed due to its time schedule (construction would probably not occur simultaneously with construction of the proposed project).

Because construction of the proposed project would result in a temporarily significant construction-related effect for NO_X in construction years 2013 and 2014, the proposed project would also be considered to have a significant cumulative air quality impact for NO_X, as a precursor to ozone formation, in those years. However, because of the temporary nature of construction activities and implementation of Eagle Crest's proposed measures, the severity and frequency of these effects would be limited. Furthermore, Eagle Crest's proposal to work collaboratively on a cost-share basis with the Park Service to complete a 2-year air monitoring study would provide data to adjust the construction workload if any exceedances are observed.

Based on the location and timing of the project, the CO, PM_{10}, and $PM_{2.5}$ effects are not likely to be cumulatively significant.

3.4 NO-ACTION ALTERNATIVE

Under the no-action alternative, the Eagle Mountain Project would not be constructed. There would be no changes to the physical, biological, or cultural resources of the area and electrical generation from the project would not occur. The power that would have been developed from a renewable resource would have to be replaced from other sources that would probably include nonrenewable fuels.

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4.0 DEVELOPMENTAL ANALYSIS

In this section, staff looks at the Eagle Mountain Project's use of environmental resources for hydropower purposes to see what effect various environmental measures would have on the project's costs and power generation. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp.*,[38] the Commission compares the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using the likely alternative source of power for the region (cost of alternative power). In keeping with Commission policy as described in *Mead Corp.*, staff's economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits.

For each of the licensing alternatives, staff's analysis includes an estimate of: (1) the cost of individual measures considered in the EIS for the protection, mitigation and enhancement of environmental resources affected by the project; (2) the cost of alternative power; (3) the total project cost (i.e., for construction, operation, maintenance, and environmental measures); and (4) the difference between the cost of alternative power and total project cost. If the difference between the cost of alternative power and total project cost is positive, the project produces power for less than the cost of alternative power. If the difference between the cost of alternative power and total project cost is negative, the project produces power for more than the cost of alternative power. This estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license. However, project economics is only one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

4.1 POWER AND DEVELOPMENTAL BENEFITS OF THE PROJECT

Table 25 summarizes the assumptions and economic information staff uses in its analysis. This information was provided by Eagle Crest in its license application. Staff finds that the values provided by Eagle Crest are reasonable for the purposes of its analysis. Cost items common to all alternatives include: taxes and insurance costs; net investment (the total investment in power plant facilities remaining to be depreciated); estimated future capital investment required to maintain and extend the life of plant equipment and facilities; relicensing costs; normal operation and maintenance cost; and Commission fees.

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[38] See *Mead Corporation, Publishing Paper Division*, 72 FERC ¶ 61,027 (July 13, 1995). In most cases, electricity from hydropower would displace some form of fossil-fueled generation, in which fuel cost is the largest component of the cost of electricity production.

Pumped storage facilities are net energy consumers. The amount of energy produced as water passes from the upper reservoir to the lower reservoir through the turbines is less than the amount of energy required to operate the plant and pump water back up to the upper reservoir. However, the benefits of pumped storage facilities are realized when the value of generation is greater than the cost of pumping. Typically, there are sources of power such as nuclear, solar and wind projects that can provide power at low rates during night-time or low-demand hours, compared to rates available during day-time, high-demand hours. Therefore, the pumped storage facility can provide power during the day when energy demands are high and can use power from other facilities during the night when energy demand is low. If power used to pump water to the upper reservoir can be purchased from renewable sources, including some of the substantial renewable projects that are proposed near the project, the need to use fossil-fueled facilities to provide that power would be avoided. There are substantial wind generation facilities near the proposed project site that could provide power to pump water to the upper reservoir during night-time hours. Solar facilities, which are planned near the site, could help provide power to pump water to the upper reservoir during lower power demand periods during day-time hours on weekends. The power produced during the day may also displace non-renewable, fossil-fired generation. Displacing the operation of fossil-fired generation may avoid some power plant emissions and create an environmental benefit.

Pumped storage facilities can be switched from pumping to generating and back again very quickly, as needed, for system support and demand response. These facilities also provide black start capabilities for larger baseload generation units, as well as spinning and non-spinning reserve, which are all important capabilities for the electrical grid and market. These ancillary services to the electric grid can provide additional revenue. The proposed energy storage volume would permit operation of the project at full capacity for up to 9 to 10 hours each weekday, with up to 12 to 14 hours of pumping each weekday night and additional pumping during the weekend to fully recharge the upper reservoir.

Table 25. Parameters for the economic analysis of the Eagle Mountain Project.

Parameter	Value	Source
Period of analysis (years)	30	Staff
Taxes and insurance (%)	2.1	Eagle Crest, 2009a, Exhibit D
Federal income tax rate (%)	35	Staff
Net investment, $	0	Staff
Operation and maintenance, $/year (includes property taxes, makeup water pumping costs, land leases, water treatment costs, property insurance, FERC fees, and administrative fees)	$29,473,000 in years 1-3 and $28,310,000 each year thereafter	Eagle Crest, 2009a, Exhibit D
Energy value ($/MWh)	$40	Estimated by staff based on Eagle Crest, 2009b
Capacity value ($/kW-year)	$154	Staff based on Energy Information Administration's Annual Energy Outlook
Ancillary services value ($/kW-year)	$95	Estimated by staff based on Eagle Crest, 2009b
Pumping ratio (MWh pumping/MWh generating)	1.25	Eagle Crest, 2009a, Exhibit D
Pumping energy value ($/MWh)	$20	Estimated by staff based on Eagle Crest, 2009b
Interest rate (%)	6	Eagle Crest, 2009a, Exhibit D
Discount rate (%)	6	Eagle Crest, 2009a, Exhibit D

Notes: kW kilowatt
MW – megawatt
MWh – megawatt-hour

4.2 COMPARISON OF ALTERNATIVES

Table 26 compares the installed capacity, annual generation, cost of alternative power, estimated total project cost, and difference between the cost of alternative power and total project cost for each of the alternatives considered in this draft EIS: no action, Eagle Crest's proposal, the staff alternative, and staff alternative with mandatory conditions.

Table 26. Summary of the annual cost of alternative power and annual project cost for the alternatives for the Eagle Mountain Pumped Storage Project (Source: staff).

	Eagle Crest's Proposal	**Staff Alternative**
Installed capacity (MW)	1,300	1,300
Annual generation (MWh)	4,308,000	4,308,000
Dependable capacity (MW)	1,276	1,276
Annual cost of alternative power	$493,872,000	$493,872,000
($/MWh)	114.64	114.64
Annual project cost	$359,817,540	$360,708,580
($/MWh)	83.52	83.73
Difference between the cost of alternative power and project cost	$134,054,460	$133,163,420
($/MWh)	31.12	30.91

Notes: MW – megawatt
MWh – megawatt-hour

4.2.1 No-action Alternative

Under the no-action alternative, the project would not be constructed as proposed and would not produce any electricity.

4.2.2 Eagle Crest's Proposal

Eagle Crest proposes to develop the Eagle Mountain Project using two existing inactive mine pits as upper and lower reservoirs. The project would require substantial civil modifications and additions to the site for use as a generating facility. Eagle Crest proposes various environmental measures to protect existing environmental resources in the vicinity of project features.

Under Eagle Crest's proposed alternative, the project would generate an average of 4,308,000 MWh annually. The annual cost of alternative power under Eagle Crest's proposed alternative would be $493,872,000, or $114.64/MWh. The average annual

project cost would be $359,817,540, or $83.52/MWh. Overall, the project would produce power at a cost that is $134,054,460, or $31.12/MWh, less than the cost of alternative power.

4.2.3 Staff Alternative

The staff alternative includes all of Eagle Crest's proposed environmental measures. The staff alternative would have the same capacity and energy attributes as Eagle Crest's proposed project. Table 27 shows the staff-recommended additions, deletions, and modifications to Eagle Crest's proposed environmental protection and enhancement measures and the estimated cost of each. Under the staff alternative, the average annual cost of alternative power would be $493,872,000, or $114.64/MWh. The annual project cost would be $360,708,580, or $83.73/MWh. Overall, the project would produce power at a cost that is $133,163,420, or $30.91/MWh, less than the cost of alternative power.

4.3 COST OF ENVIRONMENTAL MEASURES

Table 27 gives the cost of each of the environmental enhancement measures considered in staff's analysis. Staff converts all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 27. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of the proposed operation of the Eagle Mountain Pumped Storage Project (Source: staff).

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
Geologic and Soils Resources				
1. Implement the Erosion and Sediment Control Plan filed July 7, 2010, that describes the erosion and sediment control practices to minimize soil erosion in construction areas and prevent sediment transport into stormwater discharges away from the construction site (Measure GEO-1).	Eagle Crest, staff	$1,650,000	$0	$108,820
Water Resources				
1. Develop a groundwater level monitoring network (including existing and new monitoring wells) to confirm that project pumping would be maintained at levels in the range of the historical pumping (Measure WS-1).	Eagle Crest, staff	$698,000	$0	$46,030
2. During the initial fill pumping period, monitor wells on neighboring properties whose water production may be impaired by project groundwater pumping; if project pumping would adversely affect these wells, replace or lower the pumps, deepen the existing well, construct a new well, and/or compensate the owner for increased pumping costs (Measure WS-3)	Eagle Crest	$75,000	$1,000	$5,600

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
3. Monitor wells on neighboring properties whose water production may be impaired by project groundwater pumping during the initial fill pumping period. If it is determined that project pumping is lowering water levels in those wells by 5 feet or more, replace or lower the pumps, deepen the existing wells, construct a new well, and/or compensate the well owner for increased pumping costs to maintain water supply to those neighboring properties (Measure MM GW-2)	State Water Board	$75,000[a]	$100,000[a]	$69,950
4. Monitor groundwater on a quarterly basis for the first 4 years of project pumping; possibly extend monitoring from quarterly to bi-annually or annually, depending on findings and prepare annual reports for submittal to the Commission and the State Water Board, confirming actual drawdown conditions (Measure WS-4).	Eagle Crest, staff	$0	$19,100	$12,420
5. Perform aquifer tests during final engineering design to confirm the seepage recovery well rates and aquifer characteristics (Measure SR-1).	Eagle Crest, staff	$2,428,000	$155,000	$260,880

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
6. Alternatively, manage seepage from the reservoirs, which if left unimpeded could raise the groundwater levels by up to 3 feet (implementation of this alternative would require confirmation of groundwater rises and water quality of the resulting seepage) (Measure SR-1A).	(only presented by Eagle Crest as an alternative measure to Measure SR-1 if SR-1 is unacceptable)	$0	$0	$0
7. Control seepage from the upper reservoir by using a separate set of seepage recovery wells, employ a testing program for these seepage recovery wells and make final drawdown observations in nearby observation wells to support final engineering design (Measure SR-2).	Eagle Crest, staff	$3,279,000	$297,000	$409,300
8. Develop a groundwater level monitoring network (including existing and new monitoring wells) to confirm that seepage recovery well pumping would be effective at managing groundwater levels beneath the CRA and in the Eagle Creek Canyon portions of the proposed landfill, and record groundwater levels, water quality, and production at the project seepage recovery wells (Measure SR-3).	Eagle Crest, staff	$0[b]	$0	$0

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
9. Maintain seepage from the upper reservoir below the bottom of elevation of the landfill liner and maintain seepage from the lower reservoir to prevent a significant rise in water levels beneath the CRA (Measure SR-4)	Eagle Crest, staff	$0[c]	$0[c]	$0
10. Monitor groundwater on a quarterly basis for the first 4 years of project pumping; possibly extend monitoring from quarterly to bi-annually or annually, depending on findings (Measure SR-5).	Eagle Crest, staff	$0	$28,600	$18,590
11. Install a reverse osmosis desalination facility and brine disposal lagoon to remove salts and metals from reservoir water and maintain total dissolved solids concentrations at the level of the source water, as part of project design (Measure GQ-1).	Eagle Crest, staff	$45,400,000	$715,000	$3,458,930
12. Implement a monitoring program to measure groundwater quality to assess and maintain groundwater effects less than significant by sampling reservoirs, seepage recovery wells, and wells upgradient and downgradient of the reservoirs and brine disposal lagoon on a quarterly basis for the first 4 years (Measure GQ-2).	Eagle Crest, staff	$753,000	$50,800	$82,680
13. Replace wells located within the reservoir with wells located outside of reservoirs (Measure LF-1).	Eagle Crest, Staff	$981,000	$0	$64,700

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
14. Implement measures to release excess water from the reservoirs during large rainfall events, such as the 100-year event and up to and including the probable maximum flood.	Eagle Crest, Staff	$10,000,000[d]	$0	$659,510
15. Construct two extensometers—one in the upper Chuckwalla Valley near OW-3 and the other in the Orocopia Valley near OPW15—to measure potential inelastic subsidence that could affect the operation of the CRA (Measure WS-2).	Eagle Crest, staff	$368,000	$0	$24,270
16. Develop and implement a reservoir-level monitoring plan to ensure that the water levels are managed properly within operational restraints and to help determine possible water level effects on terrestrial resources.	Staff	$20,000	$5,000	$4,570
17. Develop and implement a brine pond-level monitoring plan to ensure that the brine levels of the ponds are managed properly and to help determine if a leak has developed in the linings of the ponds.	Staff	$10,000	$12,000	$8,460
18. Develop and implement a more comprehensive monitoring well placement and monitoring program around the proposed brine and solidification ponds to allow for the earlier detection of a possible leak in the lining of the ponds.	Staff	$75,000	$6,000	$8.850

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
19. Develop a groundwater hydrologic budget report which combines the data from groundwater monitoring, pumpage, seepage recovery, precipitation and evaporation and groundwater flow direction.	Staff	$2,000	$2,000	$1,430
20. Perform channel modifications and other measures to contain flows associated with the probable maximum flood to the Eagle Creek channel and to direct these flows into the proposed lower reservoir.	Staff	$4,000,000	$0	$263,800
Fisheries Resources				
1. Obtain a Streambed Alteration Agreement, which would identify the condition and location of all state jurisdictional waters, effects, and mitigation measures, including the acreage assessment of washes that may be affected, construction requirements associated with working on or near the washes, and compensation for lost or damaged acreage (Measure BIO-23).	Eagle Crest, staff	$60,000	$0	$3,960
Terrestrial Resources				
1. Concurrent with final design engineering, develop a comprehensive site-specific mitigation and monitoring program in consultation with the Biological Technical Advisory Team (Measure BIO-1).	Eagle Crest, staff	$15,000	$25,000	$17,240

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
2. Designate a project biologist who would be responsible for implementing and overseeing the biological compliance program (Measure BIO-2).	Eagle Crest, staff	$0	$25,000	$16,250
3. Implement the WEAP to ensure that project construction and operation would be conducted within a framework of safeguarding environmentally sensitive resources and restrict construction and maintenance activities to minimize project effects (Measures BIO-3 and BIO-19).	Eagle Crest, staff	$100,000	$0	$6,600
4. Regularly submit reports to the relevant resource agencies, documenting project activities, mitigation implemented, and mitigation effectiveness, and providing recommendations, as needed (Measure BIO-4).	Eagle Crest, staff	$80,000	$8,000	$10,480
5. During construction in native habitats, restrict disturbance to the smallest area necessary to complete the construction; design new spur roads and improvements to existing roads in a way that would preserve existing desert wash topography and flow patterns (Measure BIO-5).	Eagle Crest, staff	$0[c]	$0[c]	$0

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
6. Conduct pre-construction surveys to identify special-status plant populations and species protected by the CDNPA, and establish avoidance areas in construction zones for special plant resources. Where avoidance is not feasible, salvage and transplant any species that can be reasonably transplanted in an approved area (Measure BIO-6).	Eagle Crest, staff	$15,000	$0	$990
7. In compliance with CDNPA, consult with the County Agricultural Commissioner for direction regarding disposal of protected plants (Measure BIO-7).	Eagle Crest, staff	$5,000	$0	$330
8. Implement the Revegetation Plan, dated October 27, 2009, for areas that are temporarily disturbed during construction (Measure BIO-8).	Eagle Crest, staff	$45,000	$5,000	$6,220
9. Implement the Invasive Species Monitoring and Control Plan, dated October 27, 2009, to minimize the spread of invasive non-native vegetation (Measure BIO-9).	Eagle Crest, staff	$15,000	$5,000	$4,240

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
10. Implement requirements of the Northern and Eastern Colorado Desert Coordinated Management (NECO) Plan to avoid disturbance of impoundments and restrict surface flow to impoundments. If avoidance is not possible, construct a new impoundment as close as feasible to replicate and replace each lost impoundment (Measure BIO-10).	Eagle Crest, staff	$3,000	$0	$200
11. For construction activities scheduled to occur between about February 15 and July 30 in vegetated habitat, survey all potential nesting sites for active bird nests (Measure BIO-11).	Eagle Crest, staff	$5,000	$0	$330
12. Develop and implement a plan to manage evaporation ponds to minimize their attractiveness and access to migratory birds and establish a monitoring program to identify bird usage of the evaporation ponds, effectiveness of bird deterrents, and water quality. Based on monitoring results, implement adaptive management (Measure BIO-12).	Eagle Crest, staff	$200,000	$40,000	$39,190

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
13. If requested, complete a Phase III survey, including a nesting season survey, followed by a winter survey if no burrows or owls are observed during the nesting season survey, and a pre-construction survey, to further assess burrowing owl use of the project area and potential effects. (With California DFG approval, the pre-construction survey may obviate the need for the Phase III survey) (Measure BIO-13).	Eagle Crest, staff	$7,000	$0	$460
14. Limit the construction to September 1 through February 1, if burrowing owls are present, to avoid disruption of breeding activities; avoid disruption of burrowing owl nesting activities; use a minimum of a 250-foot buffer to avoid active nests until fledgling has occurred (Measure BIO-14).	Eagle Crest, staff	$10,000	$0	$660
15. Determine through pre-construction surveys if 0.25-mile construction buffers would be required during prairie falcon or golden eagle nesting seasons (Measure BIO-15).	Eagle Crest, staff	$2,000	$0	$130

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
16. Conduct pre-construction surveys for all burrows that might host badger or kit fox, avoid active burrows, where possible, and mark the perimeters of all avoidance areas with 3-foot-high, and no more than 10-foot-apart, wooden stakes. Where avoidance is infeasible, encourage occupants to leave their burrows (Measure BIO-16).	Eagle Crest, staff	$15,000	$0	$990
17. Conduct pre-construction surveys to determine the existence, location, and condition of bat roosts and identify foraging habitat. Based on results of surveys, develop a mitigation plan to avoid roosting and foraging effects on resident bats, minimize disturbance, or as an inescapable measure, evict bats (Measure BIO-17).	Eagle Crest, staff	$15,000	$5,000	$4,240
18. Construct security fencing around portions of the central project area to exclude larger terrestrial wildlife, including bighorn sheep, deer, coyotes, foxes and badger, from entering project areas that pose hazards (Measure BIO-18).	Eagle Crest, staff	$0[c]	$0[c]	$0
19. In areas without wildlife exclusion fencing or those areas that have not been cleared of tortoises, conduct construction activities only during daylight hours (Measure BIO-20).	Eagle Crest, staff	$0[c]	$0[c]	$0

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
20. Close, temporarily fence, or cover pipeline trenches every day. Conduct inspections (by an approved biological monitor) of any open trenches at first light, midday, and at the end of each day to ensure animal safety (Measure BIO-21).	Eagle Crest, staff	$0[c]	$0[c]	$0
21. Design, install, and maintain facility lighting to prevent casting of light into adjacent native habitat (Measure BIO-22).	Eagle Crest, staff	$0[c]	$0[c]	$0
22. Modify the proposed Invasive Species Monitoring and Control Plan to include criteria for success and an adaptive management plan to be implemented if initial efforts do not prove successful. Include the reservoirs and water seepage areas with other areas to be monitored for invasive plants. Monitor water seepage and reservoirs on an annual basis following vegetation establishment.	Staff	$2,000	$1,000	$780

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
23. Develop and implement a transmission line design plan that includes an avian protection plan, prepared in consultation with FWS, and design measures for reducing potential for electrocution and collision injuries; provides methods for surveying and reporting project-related raptor mortality; incorporates a worker education plan pertaining to avian–power line interactions; and includes procedures for managing nesting on power line structures.	Staff	$20,000	$5,000	$4,570
Threatened and Endangered Species				
1. Remove tortoises from harm's way during the construction period (Measure DT-1).	Eagle Crest, staff	$100,000	$0	$6,600
2. Ensure that no construction or maintenance that requires surface disturbance in unfenced areas on the linear facilities would occur without biological monitors (Measure DT-2).	Eagle Crest, staff	$200,000	$0	$13,190
3. Enclose the substation and other hazardous areas with permanent tortoise exclusion fence to keep adjacent tortoises from entering the site (Measure DT-3).	Eagle Crest, staff	$200,000	$5,000	$16,440
4. Implement the Desert Tortoise Removal and Translocation Plan dated October 27, 2009 (Measures DT-4 and DT-7).	Eagle Crest, staff	$40,000	$0	$2,640

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
5. Implement the Raven Monitoring and Control Plan dated October 27, 2009 (Measure DT-5).	Eagle Crest, staff	$0	$8,000	$5,200
6. Purchase about 160 acres of land to compensate for the Category I and Category III Desert Tortoise habitat that would be disturbed (Measure DT-6).	Eagle Crest, staff	$780,000	$0	$51,440
7. Conduct pre-construction surveys for the spadefoot toad in all areas of proposed construction activity not previously surveyed in 2009, and implement the same protection measures proposed for the central area.	Staff	$10,000	$0	$660
8. Amend the current Raven Monitoring and Control Plan to include baseline and post-construction survey methods for coyote, wild dogs, and gulls, and develop mitigation measures to be implemented if increases in population levels are detected, and develop tortoise predator control plan, as the Park Service recommends. Include a survey schedule that includes initiation of post-construction surveys during the second year after project completion, followed by surveys once every 5 years.	Staff	$25,000	$1,000	$2,300

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
Recreation Resources				
1. Coordinate construction activities with BLM and provide posted notices of construction activity and any temporary road/access closure (Measure REC-1).	Eagle Crest, staff	$0[c]	$0[c]	$0
Land Use				
1. Provide construction access to and from the substation site from the Eagle Mountain Road exit and follow the Frontage Road east to the site (Measure LU-1).	Eagle Crest, staff	$0[c]	$0[c]	$0
2. Two weeks prior to beginning construction, locally post notices stating hours of operation for construction near the Desert Center community and along State Route 177 (Measure LU-2).	Eagle Crest, staff	$20,800	$0	$1,370
Aesthetic Resources				
1. Incorporate directional lighting, light hoods, low pressure sodium bulbs or LED lighting, and operational devices in final design to allow surface night-lighting in the central site to be turned on as needed for safety (Measure AES-1).	Eagle Crest, staff	$180,000	$6,000	$15,770

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
2. Combine and organize staging areas and areas needed for equipment operation and material storage and assembly within construction lands to the extent feasible to minimize total footprint needed (Measure AES-2).	Eagle Crest, staff	$0[c]	$0[c]	$0
3. For construction of the water pipeline, reduce, to the extent possible, side cast soils to reduce color contrast with the surrounding landscape. Backfill the pipeline disturbed zone and revegetate with native vegetation immediately following completion of pipeline construction (Measure AES-3).	Eagle Crest, staff	$0[c]	$0[c]	$0
4. Employ visual mitigation in the design of the transmission line to minimize visual effects (Measure AES-4).	Eagle Crest, staff	$0[c]	$0[c]	$0
5. Use existing access roads and construction laydown areas to the extent feasible and revegetate with native vegetation immediately following construction (Measure AES-5).	Eagle Crest, staff	$0[c]	$0[c]	$0
6. Design and construct the transmission line along the State Water Board's recommended transmission line route.	Staff	$9,072,000[e]	$0	$598,310

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
7. Consult with the Park Service to develop and implement a formal night sky monitoring study plan that includes descriptions of monitoring methods and number and types of sampling events. The plan should also include a process for incorporating study findings into design and lighting product selection that would minimize light pollution from project sources. The anticipated night sky study would incorporate measures proposed by Eagle Crest in Measure AES-1.	Staff	$95,000	$0	$6,270
Cultural Resources				
1. Implement the project's December 2009 HPMP, including Measures CLT-1, -2, -3.	Eagle Crest	$282,500	$6,500	$22,860
2. Revise the December 2009 HPMP in consultation with the BLM, California SHPO and participating tribes to address the following: (1) clarification in the HPMP's Overview and Executive Summary that the Eagle Mountain mine, town site, and associated railroad are potential historic properties; (2) requirements for annual reporting during construction and an annual HPMP implementation report; (3) a plan to address curation of recovered archaeological materials; (4) clarification of when cultural resources monitoring and which monitoring	Staff	$30,000	$6,500	$6,200

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
protocols would be required; (5) a requirement for consultation with Native American tribes regarding employee training and public interpretation programs; and (6) a detailed discussion of the expanded APE alternatives, including revised APE maps; (7) a description of the sites documented by Schaefer (2010) and located within the expanded APE; (8) a plan and schedule for National Register evaluations, assessment of effects, and identification of measures to resolve adverse effects of project construction, operations and maintenance on any of sites identified within the specific Commission staff's recommended transmission line corridor and substation location; and (9) measures for handling newly discovered paleontological resources and the reporting of such discoveries to BLM. The anticipated PA would implement the HPMP.				
Air Quality and Noise				
1. Periodically water or apply suitable surfactant for short-term stabilization of disturbed surface areas and storage piles (Measure AQ-1).	Eagle Crest, staff	$461,250	$0	$30,420
2. Prevent project-related trackout onto paved surfaces by using a variety of construction management strategies (Measure AQ-2).	Eagle Crest, staff	$25,000	$0	$1,650

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
3. Stabilize graded site surfaces upon completion of grading when subsequent development is delayed or expected to be delayed by more than 30 days, except when precipitation dampens the disturbed surface (Measure AQ-3).	Eagle Crest, staff	$92,500	$0	$6,100
4. Limit areas of active surface disturbance (such as grading) to no more than 15 acres per day (Measure AQ-4).	Eagle Crest, staff	$30,750	$0	$2,030
5. Reduce non-essential earth-moving activities during windy conditions, and cease clearing, grading, earth-moving, or excavation activities if winds exceed 25 mph averaged over a 1-hour duration (Measure AQ-5).	Eagle Crest, staff	$30,500	$0	$2,010
6. Develop and implement a transportation management plan for employees (Measure AQ-6).	Eagle Crest, staff	$20,000	$0	$1,320
7. Strictly abide by the applicable state law requirements for diesel truck idling (AQ-7).	Eagle Crest	$10,000	$0	$660
8. Use electrical drops in place of temporary electrical generators, and substitute low- and zero-emitting construction equipment and/or alternative fueled or catalyst equipped diesel construction equipment wherever economically feasible (Measure AQ0-8).	Eagle Crest, staff	$10,000	$0	$660

Enhancement/Measure	Entity	Capital Cost (2010$)	Annual Cost (2010$)	Levelized Annual Cost (2010$)
9. Obtain proper South Coast Air Quality Management District permits for electrical generators (Measure AQ-9).	Eagle Crest	$10,000	$0	$660
10. Properly tune and maintain heavy-duty diesel trucks in accordance with manufacturer's specifications to ensure minimum emissions under normal operations (Measure AQ-10).	Eagle Crest, staff	$20,000	$0	$1,320
11. Use 2002 model or newer construction equipment, where feasible (Measure AQ-11).	Eagle Crest, staff	$80,000	$0	$5,280
12. Retrofit older off-road construction equipment with appropriate emission control devices prior to onsite use, wherever feasible (Measure AQ-12).	Eagle Crest, staff	$50,000	$0	$3,300
13. Establish an air quality study design for two years of air quality monitoring (Measure AQ-13).	Eagle Crest, staff	$40,000	$0	$2,640
14. Comply with the County of Riverside General Plan applicable noise ordinance codes during construction (Measure NOI-1).	Eagle Crest	$30,000	$0	$1,980
15. Equip construction machinery with properly operating and maintained noise mufflers and intake silencers (Measure NOI-2).	Eagle Crest, staff	$20,000	$0	$1,320

[a] Based on very limited, available information, staff estimated that the cost to compensate a single well owner for increased pumping costs per well over a 30-year period could be as high as $60,000. About 50 wells could experience a drawdown in excess of 5 feet due to proposed groundwater withdrawals associated with the project.

[b] In the revised table 4-1, submitted with Eagle Crest's December 22, 2009, additional information response filing, Eagle Crest (2009c) states that the costs for this measure are included in the costs presented for Measure WS-1 above; therefore, staff has shown no cost here.

[c] Eagle Crest did not provide specific costs to implement this measure; therefore, staff assumes that the cost is included in the base construction cost of the project.

[d] This measure would also include the cost to install the lower reservoir spillway and discharge channel proposed to add after the license application was filed. Eagle Crest did not provide an estimate for the cost to install the spillway and channel, so staff has conservatively estimated the cost of this measure at $10,000,000.

[e] Staff estimated that the implementation of this measure would increase the length of the transmission line by about 3.0 miles. The cost shown represents only the incremental cost to extend the line based on Eagle Crest's estimated cost for the proposed 13.5-mile-long route of $40,824,000 ($3,024,000 per mile). The cost of Eagle Crest's proposed 13.5-mile-long route is included in the base construction cost of the project

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 COMPARISON OF ALTERNATIVES

In this section, staff compares the development and non-developmental effects of Eagle Crest's proposal, Eagle Crest's proposal as modified by staff, and the no-action alternative.

Staff estimates the annual generation of the project under the three alternatives identified above. Staff analysis shows that the annual generation would be 4,308 GWh for the proposed action; 4,308 GWh for the staff alternative; and 0 GWh for the no-action alternative.

Staff summarizes the environmental effects of the different alternatives below.[39] Staff presents the effects of the proposed and staff alternative transmission line and substation in table 28 and also discusses it in section 5.2.

Table 28. Comparison of the proposed action and the staff alternative for the Eagle Mountain Pumped Storage Project (Source: staff).

Resource	Proposed Action	Staff Alternative
Project Facilities	Construct the proposed substation location near Desert Center, as shown in figure 2.	Recommend construction of the substation about 6 miles east of Desert Center and south of Interstate 10, as shown in figure 2.
	Construct the proposed transmission line, as shown in figure 2.	Recommend construction of the transmission line along the State Water Board's recommended transmission line route, as shown in figure 2.
Geology and Soils	Implement the Erosion and Sediment Control Plan filed July 7, 2010.	Same as proposed.
Water Resources	To evaluate effects of project operations on groundwater levels and ensure that levels are maintained at historical values, develop a groundwater level monitoring network and monitor	Same as proposed, but include in the recommended comprehensive groundwater monitoring program.

[39] Under the no-action alternative, the project would not be built.

Resource	Proposed Action	Staff Alternative
	during project operations (including reservoir filling) initially quarterly and possibly extending to bi-annual or annual monitoring depending on findings and prepare annual reports.	
	To limit the effects of project groundwater pumping during the initial fill pumping period, monitor existing wells on neighboring properties whose water production may be impaired if project pumping would adversely affect these wells, replace or lower the pumps, deepen the existing well, construct a new well, and/or compensate owner for increased pumping costs.	Include the monitoring aspect in the recommended comprehensive groundwater monitoring program. Regarding the replacement, or alteration of new wells, and compensation for increased pumping cost, staff notes that the FPA, section 10(c), 16 U.S.C. 803, makes clear that a licensee of a hydropower project "shall be liable for all damages occasioned to the property of others by the construction, maintenance, or operation of the project works…."
	To effectively control seepage from the upper and lower reservoirs, install an array of seepage recovery wells outside the down-gradient end of each of these two reservoirs. A testing program would be initially employed during final engineering (prior to project operations) to confirm the assumed hydrogeologic conditions (e.g., aquifer characteristics and bedrock fracture interconnectedness) and seepage recovery well pumping rates.	Same as proposed, but include in the recommended comprehensive groundwater monitoring program.
	To ensure that seepage recovery via pumping wells would be effective at managing groundwater levels beneath the Metropolitan	Same as proposed, but include in the recommended comprehensive groundwater monitoring program.

Resource	Proposed Action	Staff Alternative
	Water District's Colorado River Aqueduct (CRA) and in the Eagle Creek Canyon portion of the proposed landfill, develop a groundwater level monitoring network (including existing and new monitoring wells) and record groundwater levels, water quality, and production at the project seepage recovery wells	
	To limit the effects of seepage from the reservoirs, maintain seepage from the upper reservoir below the bottom of the elevation of the landfill liner and maintain seepage from the lower reservoir to prevent a significant rise in water levels beneath the CRA.	Same as proposed, but include in the recommended comprehensive groundwater monitoring program.
	Monitor groundwater levels by using the network of proposed groundwater monitoring wells on a quarterly basis for the first 4 years of project pumping; possibly extend monitoring from quarterly to bi-annually or annually, depending on findings. This measure would focus on assessing seepage conditions in the project vicinity, rather than drawdown conditions as a result of project pumping in the Desert Center area.	Same as proposed, but include in the recommended comprehensive groundwater monitoring program.
	To remove salts and metals from the reservoir water and maintain total dissolved solids concentration at the level of the source water, install a reverse osmosis desalination facility and brine disposal lagoons.	Same as proposed.

Resource	Proposed Action	Staff Alternative
	Assess effects on groundwater quality by sampling reservoirs, seepage recovery wells, and wells upgradient and downgradient of the reservoirs and brine disposal lagoons, and implement a monitoring program for groundwater quality on a quarterly basis for the first 4 years.	Implement a reservoir and brine pond-level monitoring plan and a more comprehensive monitoring program of monitoring wells for the proposed brine and solidification ponds.
	Replace four existing wells located within the proposed reservoir area with wells located outside of reservoirs.	Same as proposed.
	Release excess water from the reservoirs to Eagle Creek during large rainfall events, such as the 100-year event and up to and including the probable maximum flood (PMF).	Same as proposed, but also recommend modifications and other measures to Eagle Creek, if necessary, to contain the flow within Eagle Creek and direct the flow to the proposed lower reservoir.
	To ensure that potential subsidence would not affect the CRA, construct two extensometers.	Same as proposed, but also specify operation of these two devices.
Terrestrial Resources	Consult with a Biological Technical Advisory Team (including Eagle Crest, BLM, FWS, and California DFG) to develop a comprehensive site specific mitigation and monitoring plan.	Same as proposed, and file for Commission approval.

Resource	Proposed Action	Staff Alternative
	Implement the Worker Environmental Awareness Program, filed October 27, 2009, to provide oversight of construction activities by trained biologists and train construction crews to recognize biologically sensitive resources.	Same as proposed.
	Prepare status reports for resource agencies during construction period.	File quarterly reports with BLM, FWS, California DFG, and the Commission.
	Limit construction activities in native habitats, preserve existing desert wash topography and flow patterns.	File pre-construction plans that delineate limits of disturbance and limits of existing washes or impoundments.
	Conduct pre-construction surveys for state special-status plants, and establish avoidance areas where possible. When avoidance is not possible, implement transplant or salvage measures.	Include results of surveys, designated avoidance areas, and transplant locations in pre-construction plans filed with BLM, FWS, California DFG, and the Commission.
	Implement the Revegetation Plan filed October 27, 2009.	Same as proposed.
	Implement the Invasive Species Monitoring and Control Plan filed October 27, 2009.	Revise plan to incorporate success criteria and adaptive management that would be implemented if success criteria are not be achieved. Extend the plan's scope to include project reservoirs and water seepage areas. These areas should be monitored on an annual basis following vegetation establishment.
	Implement measures to avoid disturbance or restrict flow to impoundments that could support Couch's spadefoot toad.	Conduct pre-construction surveys for such impoundments in any areas of construction activity not already surveyed.

Resource	Proposed Action	Staff Alternative
	Prior to any construction activities occurring in vegetated areas between February 15 and July 30, conduct surveys for active migratory bird nests and provide a 15-foot no-activity buffer around active nests.	Same as proposed.
	Develop and implement a evaporation pond management plan to limit effects on birds.	Revise plan to include proposed hazing and habitat techniques, success criteria, and thresholds for implementing exclusionary pond covering.
	Conduct Phase III or pre-construction surveys for burrowing owls.	Conduct pre-construction surveys, but no Phase III surveys. Incorporate results of pre-construction surveys into development of site specific comprehensive mitigation plan.
	If needed (based on survey results), limit construction from September 1 through February 1 in areas with burrowing owls and provide protection buffer for active nests.	Same as proposed.
	Based on pre-construction surveys, determine need for and implement 0.25-mile construction buffers around active golden eagle or prairie falcon nests.	Same as proposed.
	Conduct pre-construction surveys for all burrows that could host badger or kit fox and implement measures to avoid causing injury to animals.	Same as proposed.
	Conduct pre-construction surveys for bat roosts and foraging areas.	Include agency consultation, proposed mitigation measures,

Resource	Proposed Action	Staff Alternative
	Develop and implement avoidance and mitigation measures based on survey results.	success criteria, and proposed adaptive management measures in the plan and submit the plan for Commission approval.
	Construct security fencing around project reservoirs, collection substation, and evaporation ponds to exclude large mammals like badger, fox, deer, coyote, and bighorn sheep. Design fence to provide access to drinking water in the lower reservoir.	Same as proposed.
	In construction areas without wildlife exclusion fencing or those areas that have not been cleared of tortoises, conduct construction activities only during daylight hours.	Same as proposed.
	Implement measures to ensure animals are not trapped in pipeline trenches during construction.	Same as proposed.
	Design lighting to prevent casting light into adjacent native habitat.	Same as proposed.
	Develop and implement a transmission line design plan to reduce potential for avian electrocutions and design lines in accordance with industry guidelines.	Include measures in plan to reduce risk of avian collisions, protocols for monitoring and reporting avian/powerline interactions, and worker education measures.
Threatened and Endangered Species	Implement Desert Tortoise Removal and Translocation Plan filed October 27, 2009.	Same as proposed.
	Purchase and manage for conservation about 160 acres of desert tortoise habitat to	Upon completion of final project design and construction plans, recalculate acres of project-related

Resource	Proposed Action	Staff Alternative
	compensate for effects on desert tortoise.	disturbance to Category I and Category III desert tortoise habitat and determine appropriate compensation acreage based on NECO Plan compensation ratios.
	Implement Raven Monitoring and Control Plan filed October 27, 2009.	Modify plan to include baseline surveys and post-construction monitoring methods for coyotes, wild dogs, and gulls. Include mitigation measures to be implemented if increases in population levels are detected following construction. Include a monitoring schedule that would begin the second year after project completion, followed by surveys once every 5 years.
Recreation Resources	Coordinate construction schedules with BLM and provide posted notices of construction activity and any temporary road/access closure.	Same as proposed.
Land Use	Provide construction access to and from the substation site from the Eagle Mountain Road exit and follow the Frontage Road east to the site.	Same as proposed for access to the site, but incorporate truck trip plans and traffic controls related to the removal of salts from the proposed desalination facilities.
	Two weeks prior to beginning construction, locally post notices stating hours of operation for construction near the Desert Center community and along State Route 177.	Same as proposed.
Aesthetics	Incorporate lighting measures in the central project area to minimize the effect on surrounding areas outside of the	Same as proposed.

Resource	Proposed Action	Staff Alternative
	project; also conduct night sky monitoring after consultation with the Park Service.	
	Combine and organize staging areas and areas needed for equipment operation and material storage and assembly within construction lands to the extent feasible to minimize total footprint needed.	Same as proposed.
	For construction of the water pipeline, reduce color contrast with the surrounding landscape and revegetate with native vegetation.	Same as proposed.
	Employ visual mitigation in the design of the transmission line to minimize visual effects.	Same as proposed.
	Use existing access roads and construction laydown areas to the extent feasible and revegetate with native vegetation.	Same as proposed.
Cultural Resources	Implement the project's revised HPMP.	Modify plan to include: 1. Clarification in the *Executive Summary* that the Eagle Mountain mine, town site, and railroad are potential historic properties. 2. Annual HPMP implementation reporting during and after construction. 3. Curation of recovered archaeological materials. 4. Specific criteria that would determine the need for cultural resources monitoring and a plan to identify appropriate Native

Resource	Proposed Action	Staff Alternative
		American involvement. 5. A plan to include interested Native American tribes in the development of staff training and public interpretation programs. 6. A detailed discussion of the expanded APE transmission alternative, including revised APE maps. 7. A description of the sites document by Schaefer (2010) and located within the expanded APE 8. Inclusion of a detailed plan and schedule for National Register evaluations, assessment of effects, and identification of measures to resolve adverse effects of project construction, operations and maintenance to sites identified within the specific Commission staff alternative transmission line corridor and substation location. 9. Measures for handling newly discovered paleontological resources and reporting discoveries to BLM.
Air Quality	Prevent project-related trackout onto paved surfaces by using a variety of construction management strategies.	Same as proposed, and include in the Erosion and Sediment Control Plan.
	Provide measures and standards to stabilize graded site surfaces upon completion of grading.	Same as proposed, and include in the Erosion and Sediment Control Plan.
	Limit areas of active surface disturbance (such as grading) to no more than 15 acres per day.	Same as proposed.

Resource	Proposed Action	Staff Alternative
	Reduce non-essential earth-moving activities during windy conditions.	Same as proposed.
	Develop and implement a transportation management plan for employees.	Same as proposed.
	Use electrical drops in place of temporary electrical generators, and substitute low- and zero emitting construction equipment and/or alternative fueled or catalyst-equipped diesel construction equipment wherever economically feasible.	Same as proposed.
	Properly tune and maintain heavy-duty diesel trucks in accordance with manufacturers' specifications to ensure minimum emissions under normal operations.	Same as proposed.
	Use 2002 model or newer construction equipment.	Same as proposed.
	Retrofit older off-road construction equipment with appropriate emission control devices prior to onsite use.	Same as proposed.
	Implement a 2-year air monitoring study after consultation with the Park Service.	Same as proposed.
Noise	Equip construction machinery with properly operating and maintained noise mufflers and intake silencers.	Same as proposed.

5.2 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, staff's recommendations for licensing the Eagle Mountain Project. Staff weighs the costs and benefits of its recommended alternative against other proposed measures.

Based on staff's independent review of agency and public comments filed on this project and review of the environmental and economic effects of the proposed project and its alternatives, staff selected the staff alternative, as the preferred option. Staff recommends this option because: (1) issuance of an original hydropower license by the Commission would allow Eagle Crest to operate the project as an economically beneficial and dependable source of electrical energy during high demand hours; (2) the 1,300 MW of electric energy generated from a renewable resource may offset the use of fossil-fueled, electric generating plants during high demand hours, thereby reducing atmospheric pollution; (3) the majority of the power used to pump water to the upper reservoir during low demand hours is expected to come from renewable sources or available base-load sources; (4) the public benefits of this alternative would exceed those of the no-action alternative; and (5) the recommended measures would help protect water, wildlife, recreation, land use, aesthetics, cultural, air quality and noise resources during construction and operations.

In the following section, staff makes recommendations as to which environmental measures proposed by Eagle Crest or recommended by agencies and other entities should be included in any license issued for the project. In addition to Eagle Crest's proposed environmental and mitigation measures, staff recommends additional staff-recommended environmental measures to be included in any license issued for the project. Staff also discusses which measures it does not recommend including in the license.

Measures Proposed by Eagle Crest

Based on staff's environmental analysis of Eagle Crest's proposal discussed in section 3.0 and the costs discussed in section 4.0, staff recommends including the following environmental measures proposed by Eagle Crest in any license issued for the project. Staff's recommended modifications to Eagle Crest's proposed measure are shown in *italics*.

Geology and Soils

- Implement the Erosion and Sediment Control Plan filed July 7, 2010, that describes the erosion and sediment control practices to minimize soil erosion in construction areas and prevent sediment transport into stormwater discharges away from the construction site (Measure GEO-1).

Water Quality/Water Quantity

Measures for Drawdown Monitoring and Control

- Develop a groundwater level monitoring network (including existing and new monitoring wells [see figure 7]) to confirm that project pumping throughout the project operations would be maintained at levels that are in the range of historical pumping in the Chuckwalla Aquifer (Measure WS-1). Possibly extend monitoring from quarterly to bi-annually or annually, depending on findings and prepare annual reports for submittal to the Commission and State Water Board, confirming actual drawdown conditions (Measure WS-4).
- During the initial fill pumping period, monitor existing water supply wells on neighboring properties whose water production may be impaired by project groundwater pumping; if project pumping would adversely affect these wells, replace or lower the pumps, deepen the existing well, construct a new well, and/or compensate owner for increased pumping costs (Measure WS-3).

Measures for Seepage Monitoring and Control

- To confirm aquifer characteristics and adequate pumping rates in the reservoir seepage recovery wells, perform aquifer tests during final engineering design (prior to project operations) (Measure SR-1).
- To effectively control seepage from the upper reservoir, use a separate set of seepage recovery wells, employ a testing program for these seepage recovery wells, and make drawdown observations in nearby observation wells to support final engineering design (Measure SR-2).
- Confirm that seepage recovery well pumping would be effective at managing groundwater levels beneath the Metropolitan Water District's CRA and in the Eagle Creek Canyon portion of the proposed landfill, and record groundwater levels, water quality, and production at the project seepage recovery wells (Measure SR-3).
- Maintain seepage from the upper reservoir at a groundwater level below the bottom of the elevation of the landfill liner and maintain seepage from the lower reservoir to prevent a significant rise in water levels beneath the CRA (Measure SR-4).

- Using the network of groundwater monitoring wells proposed under Measure WS-1, monitor groundwater levels on a quarterly basis for the first 4 years of project pumping; possibly extend monitoring from quarterly to bi-annually or annually, depending on findings (Measure SR-5). Unlike WS-4, this measure would focus on assessing seepage conditions in the project vicinity, rather than drawdown conditions as a result of project pumping in the Desert Center area.
- As an adaptive management measure pending the initial findings of measures SR-1 through SR-5, manage seepage from the reservoirs, which if left unimpeded could raise groundwater levels by up to 3 feet (implementation of this alternative would require confirmation of groundwater level rises and water quality of the resulting seepage) (Alternative Measure SR-1A).

Measures for Water Quality Monitoring and Control

- Install and operate a reverse osmosis desalination facility and brine disposal ponds to remove salts and metals form reservoir water and maintain total dissolved solids concentrations at the level of the source water (Measure GQ-1). Monitor groundwater quality to assess and limit groundwater effects by sampling reservoirs, seepage recovery wells, and wells upgradient and downgradient of the reservoirs and brine disposal lagoons on a quarterly basis for the first 4 years (Measure GQ-2). *Modify this measure to include implementation of a comprehensive water quality monitoring plan for the reservoirs, seepage wells, monitoring wells, and brine ponds, and include steps to be taken in the event of water quality degradation.*
- Monitor groundwater quality to assess and maintain groundwater effects at levels less than significant by sampling reservoirs, seepage recovery wells, and wells upgradient and downgradient of the reservoirs and brine disposal lagoon on a quarterly basis for the first 4 years (Measure GQ-2). *Modify this measure to include implementation of a comprehensive water quality monitoring plan for the reservoirs, seepage wells, monitoring wells, and brine ponds, and include steps to be taken in the event of water quality degradation.*

Other Water Resources Measures

- Replace four existing wells located within the proposed reservoirs with wells located outside of reservoirs (Measure LF-1).
- Release excess water from the reservoirs during large rainfall events, such as the 100-year event and up to and including the PMF.
- Construct *and operate* two extensometers—one in the upper Chuckwalla Valley near Observation Well 3 (OW-3) and the other in the Orocopia Valley near OW-15—to measure potential subsidence that could affect the operation of the CRA (Measure WS-2).

Terrestrial Resources

- Concurrent with final design engineering, develop a comprehensive site-specific mitigation and monitoring program in consultation with the Biological Technical Advisory Team, made up of representatives from Eagle Crest, BLM, FWS, California DFG (Measure BIO-1) *to protect state sensitive, BLM sensitive, and federally listed plant and wildlife species*.
- Implement the WEAP filed October 27, 2009, to ensure that project construction and operation would be conducted within a framework of safeguarding environmentally sensitive resources (Measure BIO-3).
- Submit *quarterly* reports to *BLM, FWS, California DFG, and the Commission*, documenting project activities, mitigation implemented, and mitigation effectiveness, and providing recommendations, as needed (Measure BIO-4).
- Prior to construction in native habitats prepare, in consultation with BLM, FWS, and California DFG, and file for Commission approval, a plan that details construction plans and limits of disturbance such that surface disturbance is restricted to the smallest area necessary to complete the construction; and new spur roads and improvements to existing roads are designed in a way that would preserve existing desert wash topography and flow patterns, and avoid disturbing or restricting flow to impoundments that could support Couch's spadefoot toad (Measures BIO-5 and BIO-10).
- Use pre-construction surveys to identify state special-status plant populations and species, and establish avoidance areas in construction zones for special plant resources. Where avoidance is not feasible, salvage and transplant any species that can be reasonably transplanted in an approved area (Measure BIO-6). *Include location of sensitive plant resources, construction avoidance areas, and transplant locations on construction plans filed with the Commission.*
- Implement the Revegetation Plan filed October 27, 2009, for areas that are temporarily disturbed during construction (Measure BIO-8).
- Implement the Invasive Species Monitoring and Control Plan filed October 27, 2009, to minimize the spread of invasive non-native vegetation (Measure BIO-9). *Modify the proposed Invasive Species Monitoring and Control Plan, and file for Commission approval, to include criteria for success and an adaptive management plan to be implemented if initial efforts do not prove successful. Include the reservoirs and water seepage areas along with other areas to be monitored for invasive plants. Monitor water seepage and reservoirs on an annual basis following vegetation establishment.*
- For construction activities scheduled to occur between about February 15 and July 30 in vegetated habitat, survey all potential nesting sites for active bird

nests. Active nests would be flagged and provided a 15-foot buffer from construction activities (Measure BIO-11).

- Develop and implement a plan to manage evaporation ponds to minimize their attractiveness and access to migratory birds and establish a monitoring program to identify bird usage of the evaporation ponds, effectiveness of bird deterrents, and water quality. Based on monitoring results, implement adaptive management to include more intensive hazing measures or exclusionary pond covers (Measure BIO-12). *Include in the plan proposed hazing and habitat modification techniques, methods for measuring success, and thresholds for implementing exclusionary pond covering and file for Commission approval*.
- Conduct a pre-construction survey to further assess burrowing owl use of the project area and potential effects. *Incorporate survey results and mitigation measures into the comprehensive mitigation and monitoring program* (Measure BIO-13). If burrowing owls are present, limit the construction to September 1 through February 1, to avoid disruption of breeding activities; avoid disruption of burrowing owl nesting activities; use a minimum of a 250-foot buffer to avoid active nests until fledging has occurred (Measure BIO-14).
- Determine through pre-construction surveys if 0.25-mile construction buffers would be required during prairie falcon or golden eagle nesting seasons (Measure BIO-15).
- Conduct pre-construction surveys for all burrows that might host badger or kit fox, avoiding active burrows, where possible, and mark the perimeters of all avoidance areas with 3-foot-high and no more than 10-foot-apart, wooden stakes. Where avoidance is infeasible, encourage occupants to leave their burrows (Measure BIO-16).
- Conduct pre-construction surveys to determine the existence, location, and condition of bat roosts and identify foraging habitat. Based on results of surveys, develop a mitigation plan to avoid roosting and foraging effects on resident bats, minimize disturbance, or, as an inescapable measure, evict bats (Measure BIO-17). *Prepare the bat mitigation plan after consultation with FWS and California DFG and file for Commission approval, to include proposed environmental measures, methods for determining success, and adaptive management strategies to ensure successful mitigation for loss of bat habitat is achieved.*
- Construct security fencing around project reservoirs, collection substation, and evaporation ponds to exclude larger terrestrial wildlife, including bighorn sheep, deer, coyotes, foxes, and badger, from entering project areas that pose hazards (Measure BIO-18).

- In areas without wildlife exclusion fencing or those areas that have not been cleared of tortoises, conduct construction activities only during daylight hours (Measure BIO-20).
- Close, temporarily fence, or cover pipeline trenches each day. Conduct inspections of any open trenches at first light, midday, and at the end of each day to ensure animal safety (Measure BIO-21).
- Design, install, and maintain facility lighting to prevent casting of light into adjacent native habitat (Measure BIO-22).
- Develop and implement, after consultation with FWS *and file for Commission approval*, a transmission line design plan that considers adequate separation of energized conductors, ground wires, and other metal hardware, adequate insulation, and any other measures necessary to protect raptors from electrocution hazards and design and construct raptor-friendly transmission lines in strict accordance with the industry standard guidelines set forth in Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006, by Avian Power Line Interaction Committee, Edison Electric Institute, and Raptor Research Foundation. *After consultation with FWS, design measures for reducing potential for avian collision injuries, provide methods for surveying and reporting project-related avian mortality, incorporate a worker education plan pertaining to avian–power line interactions, and include procedures for managing nesting on power line structures.*

Threatened and Endangered Species

- Implement Desert Tortoise Removal and Translocation Plan to protect desert tortoise from potential effects related to construction activities.
- Following completion of final project design and interconnection plans, calculate projected-related effects on Category I and Category III Desert Tortoise Habitat. Prepare and file for Commission approval a desert tortoise habitat compensation plan that identifies acres of disturbance and acreage and location of proposed compensation lands.
- Implement the Raven Monitoring and Control Plan filed October 27, 2009 (Measure DT-5). Amend the current Raven Monitoring and Control Plan to include baseline and post-construction monitoring methods for coyotes, wild dogs, and gulls and develop mitigation measures to be implemented if increases in population levels are detected, and develop a desert tortoise predator control plan, as the Park Service recommends. Include a survey schedule that includes initiation of post-construction surveys during the second year after project completion, followed by surveys once every 5 years.

Recreation Resources

- Coordinate construction schedules with BLM and provide posted notices of construction activity and any temporary road/access closure (Measure REC-1).

Land Use

- Provide construction access to and from the substation site from the Eagle Mountain Road exit and follow the Frontage Road east to the site (Measure LU-1).
- Two weeks prior to beginning construction, locally post notices stating hours of operation for construction near the Desert Center community and along State Route 177 (Measure LU-2).

Aesthetic Resources

- Incorporate directional lighting, light hoods, low pressure sodium bulbs or LED lighting, and operational devices in final design to allow surface night-lighting in the central site to be turned on as needed for safety. Also*, develop, after consultation with the Park Service,* a night sky monitoring plan during the post-licensing design period (to represent baseline conditions) and during construction and a trial operational period (Measure AES-1). *File the plan for Commission approval.*
- Combine and organize staging areas and areas needed for equipment operation and material storage and assembly within construction lands to the extent feasible to minimize total footprint needed (Measure AES-2).
- For construction of the water pipeline, reduce, to the extent possible, side cast soils to reduce color contrast with the surrounding landscape. Backfill the pipeline disturbed zone and revegetate with native vegetation immediately following completion of pipeline construction (Measure AES-3).
- Employ visual mitigation in the design of the transmission line to minimize visual effects such as specifying materials with a dull finish and background appropriate colors (Measure AES-4).
- Use existing access roads and construction laydown areas to the extent feasible and revegetate with native vegetation *within 3 months following completion of construction of the respective component* (Measure AES-5).

Cultural Resources

- Implement the project's December 2009 HPMP.

Air Quality

- Periodically water or apply suitable surfactant for short-term stabilization of disturbed surface areas and rock and soil storage piles (Measure AQ-1).
- Prevent project-related trackout onto paved surfaces by using a variety of construction management strategies (Measure AQ-2).
- Stabilize graded site surfaces upon completion of grading when subsequent development is delayed or expected to be delayed by more than 30 days, except when precipitation dampens the disturbed surface (Measure AQ-3).
- Limit areas of active surface disturbance (such as grading) to no more than 15 acres per day (Measure AQ-4).
- Reduce non-essential earth-moving activities during windy conditions, and cease clearing, grading, earth-moving, or excavation activities if winds exceed 25 mph averaged over a 1-hour duration (Measure AQ-5).
- Develop and implement a transportation management plan including ride sharing, shuttle transit and other measures for employees to reduce vehicle trips (Measure AQ-6).
- Use electrical drops in place of temporary electrical generators, and substitute low- and zero emitting construction equipment and/or alternative fueled or catalyst equipped diesel construction equipment wherever economically feasible *or if necessary to meet CARB or other applicable air quality standards* (Measure AQ-8).
- Properly tune and maintain heavy-duty diesel trucks in accordance with manufacturers' specifications to ensure minimum emissions under normal operations (Measure AQ-10).
- Use 2002 model or newer construction equipment, where feasible *or if necessary to meet CARB or other applicable air quality standards* (Measure AQ-11).
- Retrofit older off-road construction equipment with appropriate emission control devices prior to onsite use, where feasible *or if necessary to meet CARB or other applicable air quality standards* (Measure AQ-12).
- In consultation with the Park Service develop and implement a 2-year air monitoring study to determine possible effects of the project on air quality.

Noise

- Equip construction machinery with properly operating and maintained noise mufflers and intake silencers (Measure NOI-2).

Additional Measures Recommended by Staff

In addition to Eagle Crest's proposed measures listed above, staff also recommends including the following staff-recommended measures in any license issued for the Eagle Mountain Project:

Project Facilities

- File for Commission approval a plan that identifies the route and tower placements associated with constructing the project transmission line along the staff-recommended transmission line route (State Water Board recommendation) as shown in figure 2.
- File for Commission approval a plan to connect the project to the electrical grid by terminating the transmission line at the staff-recommended substation location, about 6 miles east of the proposed substation location and south of Interstate 10 (State Water Board recommendation) as shown in figure 2.

Water Resources

- During project construction, perform channel modifications and other measures, such as rip rap protection, to contain flows associated with the PMF to the Eagle Creek channel and direct these flows into the proposed lower reservoir and file a report with the Commission when measures are completed.
- Develop and implement a reservoir-level monitoring plan to ensure that the water levels are managed properly within operational restraints to ensure protection of terrestrial resources and file for Commission approval.
- Develop and implement a brine pond-level monitoring plan to ensure that the ponds are managed properly and help limit leakage through the lining of the ponds and file for Commission approval.
- Implement a comprehensive monitoring well placement plan including partially horizontal monitoring wells and monitoring program around the proposed brine and solidification ponds to allow for the earlier detection of leaks in the lining of the ponds and file for Commission approval.
- The applicant proposes groundwater monitoring under five different measures—WS-1, WS-3, WS-4, SR-3, and SR-5—that each have specific purposes. Implement these separate measures together as a comprehensive groundwater monitoring program to ensure that information collected as part of each measure are reported simultaneously for the purpose of better evaluating the project effects on the groundwater levels in the Chuckwalla Aquifer. Use the comprehensive groundwater monitoring program results to develop a groundwater hydrologic budget and annually submit the associated reports for review by the State Water Board and filed with the Commission.

- In addition to the applicant's proposed actions under Measure WS-3, modify this measure to continue monitoring beyond the initial fill period (estimated 4-7 years, as estimated by Eagle Crest); the length of additional monitoring should be determined through consultation with the State Water Board and filed for Commission approval.

Terrestrial Resources and Threatened and Endangered Species

- Conduct pre-construction surveys for the spadefoot toad in all areas of proposed construction activity not previously surveyed in 2009 or 2010, and implement the same protection measures proposed for the proposed project reservoir areas.

Recreation, Land Use, and Aesthetics

- Incorporate truck trip plans and traffic controls related to the removal of salts from the proposed desalination facilities.

Cultural Resources

- Consult with BLM, participating tribes, and California SHPO to revise the December 2009 HPMP to include: (1) clarification in the HPMP's *Overview and Executive Summary* that the Eagle Mountain mine, town site, and associated railroad are potential historic properties; (2) requirements for annual reporting during construction and an annual HPMP implementation report, (3) a plan to address curation of recovered archaeological materials, (4) clarification of when cultural resources monitoring and which monitoring protocols would be implemented; (5) a requirement for consultation with Native American tribes regarding employee training and public interpretation programs; (6) a detailed discussion of the expanded APE alternatives, including revised APE maps; (7) a description of the sites documented by Schaefer (2010) and located within the expanded APE; (8) inclusion of a detailed plan and schedule for National Register evaluations, assessment of effects, and identification of measures to resolve adverse effects of project construction, operations and maintenance on any of sites identified within the specific Commission staff's recommended transmission line corridor and substation location, including the documentation of appropriate consultation with the participating tribes, BLM, and California SHPO; and (9) measures for handling newly discovered paleontological resources and the reporting of such discoveries to BLM. The anticipated PA would incorporate the revised HPMP.

Following is a discussion of the key issues and basis for the additional staff-recommended measures.

Transmission Line Route

Eagle Crest's proposed 13.5-mile transmission line route (see figure 2) would generally follow existing access roads and Eagle Mountain Road from the central project area to an intersection with the Metropolitan Water District's CRA. Along this segment, the line would parallel existing transmission lines. After crossing the CRA, the proposed line would continue to follow Eagle Mountain Road to a point about 2 miles north of Interstate 10. There are no existing utility structures such as towers or power lines along this segment. At this location, the line would turn to the southeast toward Desert Center sub-station. This 2.5-mile section of the line would require new ROW and would not follow existing landscape features. Of the total 13.5 miles, about 4.5 miles would be within BLM's designated utility corridor.

The staff alternative transmission line would diverge from the applicant's proposed route along Eagle Mountain Road and follow the existing SCE transmission line ROW and proposed water pipeline southeast to a point directly north of the proposed eastern substation southeast of the Desert Center airstrip, where it would turn south to connect to the substation. Unlike the applicant's proposed route, the staff alternative transmission line route would result in the construction of new structures closer to existing transmission line structures, thus reducing incremental effects on biological, visual, and land use resources.

As summarized in table 29, staff analysis shows that the staff alternative for the transmission line route would have lower environmental effects than the applicant's proposed route. The majority of the applicant's proposed measures to reduce construction effects associated with the transmission line are applicable to both routes. However, because the staff alternative: (1) would be located outside of the desert tortoise critical habitat area, (2) would not bisect and would be outside the DWMA, and (3) would parallel an existing transmission line, it is staff's recommended alternative transmission line route.

Table 29. Summary of key differences in the potential effects of Eagle Crest's proposal and the staff alternative for the route of the proposed transmission line (Source: staff).

Resource	Applicant's Proposed Transmission Line	Staff-Recommended Transmission Route (State Water Board's Recommended Route)
Vegetation	A Revegetation Plan for disturbed areas would be implemented.	Due to a longer route (additional 2.9 miles), revegetation measures would need to cover about a 20% larger area.

Resource	Applicant's Proposed Transmission Line	Staff-Recommended Transmission Route (State Water Board's Recommended Route)
Desert Tortoise	Desert tortoise protection measures would be conducted, including surveys, relocation, and exclusion fencing for areas under construction. About 2.4 miles would be within designated critical habitat.	Same protection measures would be conducted, but co-locating the line within an existing transmission corridor would result in less disturbance to sensitive tortoise habitat and lower predation risks associated with perching and nesting habitat. Not within designated critical habitat.
Raptors	Line would be constructed according to APLIC guidelines and an avian protection plan would be prepared.	Same protection measures, but new structure locations would be less attractive to raptors due to proximity to existing structures.
Couch's Spadefoot Toad	Proposed corridor was surveyed and no suitable habitat was identified.	Additional surveys would be needed for areas not previously surveyed.
Recreation	The transmission line would be about 2 miles from the JTNP boundary.	The transmission line would be farther from the National Park boundary.
Aesthetics	Line would follow Eagle Mountain Road then cut across the Chuckwalla Valley directly to Desert Center. Line would not cross Interstate 10.	Line would be co-located with existing lines. Line would cross Interstate 10.
Land Use	Line would be located outside the BLM CDCA Utility corridor and would cross 0.4 mile of private land.	Line would cross 4.9 miles of private land.
Cultural Resources	Line would avoid most potential project effects.	Line would avoid most potential project effects.

Water Resources

The project effects on groundwater and water resources are key issues with the proposed project. Major proposed project facilities and measures, which would limit the environmental effects on the surrounding environment from groundwater withdrawal, seepage of groundwater from the reservoirs, degradation of the water quality in the reservoirs due to evaporation, and potential water releases from the reservoirs, include the following:

- Groundwater monitoring, aquifer testing, and seepage control measures,
- Construction of the reverse osmosis facility, and
- Development of a water release system for the reservoirs.

Aquifer tests and groundwater level monitoring would help ensure that the effects of the proposed water withdrawal for project facilities do not exceed the historical drawdown levels of about 130 feet near Desert Center. This amount of drawdown occurred in the 1980s during a period of much more intensive irrigation for agricultural fields near Desert Center which are now mostly abandoned. Nearer to the proposed reservoirs, the aquifer tests and seepage control measures will help insure that the seepage amounts do not raise groundwater levels and affect nearby infrastructure and users such as the CRA. The reverse osmosis system, which also includes evaporation ponds and other facilities, would address water quality degradation such as increased salt content caused by from high evaporation rates by removing salts and other particles. The water release procedures to emergency overflow structures on the reservoirs would ensure that following a rare high inflow event, excess water would be released in a manner that ensures that the nearby infrastructure and the CRA facility, located downgradient of the lower reservoir, would not be affected.

Construction and operation of the proposed Eagle Mountain Project without adequate surface and especially groundwater quality and quantity protection measures could adversely affect the dry desert environment where water is a limited and valuable resource. On-site investigations, once access is possible, should help determine if acid production is likely to result by filling the existing mining pits with water for the proposed pumped storage project, which could affect water quality degradation in the reservoirs. The likelihood of acid production when the mineral deposits of the existing mining pits are exposed to water is very dependent on the characteristics of the ore deposits and reliable information is currently not available due to the lack of site access.

While staff finds Eagle Crest's proposed measures to be largely adequate, staff recommends additional monitoring and associated measures to limit extent of effects of the proposed project. Under the staff alternative, reservoir level monitoring would be implemented not only for operational compliance and safety issues, which would largely be covered under Part 12 of the Commission's regulations for safety of water power projects and project works, but also to provide information on the extent of availability of

and access to water in the lower reservoir for terrestrial resources as proposed to enhance the desert bighorn sheep native to the area. Similarly, staff recommends modifying the Eagle Creek channel to ensure that it is capable of conveying water from large storm events without affecting existing or proposed infrastructure. However, it is possible that once future access to the site is allowed and more detailed investigations and hydraulic calculations are possible, this measure may not be needed depending on the filing of the investigative report with the Commission.

As noted above, Eagle Crest proposes to install a reverse osmosis system to maintain the water quality of the reservoirs in the high evaporation desert environment to be similar to the quality of the groundwater used to fill and operate the project. Eagle Crest proposes to direct brine from the reverse osmosis system to evaporation and drying ponds where it would be removed, likely in 10-year intervals. While maintenance and monitoring of these ponds, including the installation of monitoring wells to help identify leaks, was proposed by Eagle Crest, additional monitoring should occur to allow for corrective action to occur sooner than under Eagle Crest's proposal. Eagle Crest should file a brine pond-level monitoring plan to ensure that the ponds are not overfilled and that the water level fluctuations are representative of the evaporation rate. If water levels in a brine pond decrease faster than expected, it could be an indication of that the pond liner has failed and a leak has developed. In the area of the proposed brine ponds, the groundwater level is several hundreds of feet below the surface and Eagle Crest proposed monitoring wells would be placed in the groundwater to monitor for possible leakage of the brine ponds. Staff's analysis indicated that brine leakage could take months or years to reach the groundwater table before it could be detected in the monitoring wells. Therefore, staff recommends that in addition to the planned conventional monitoring wells, Eagle Crest should investigate whether partially horizontal monitoring wells extending beneath the evaporation ponds could detect a change in water vapor (an indication of a likely leak in the brine ponds) much more rapidly than normal groundwater monitoring. Due to a depth to groundwater of several hundred feet below the surface, it could take many years for leakage from the brine ponds to be detectable in conventional groundwater monitoring wells.

Staff estimates that implementation of the water resources measures proposed by Eagle Crest would have an annualized cost of $5,042,910. The majority of this cost is due to the cost and operation of the reverse osmosis system which is a key component to maintain water quality in the proposed closed system in a very high evaporation environment. Staff estimates that the additional measures described above would increase the annualized cost of measures by $287,110. Considering the extent of limited water resources in the area, and the possible project effects on water resources, staff considers the benefits and protection of water resources to be worth the costs.

Terrestrial Resources and Threatened and Endangered Species

Construction, operation, and maintenance of the proposed Eagle Mountain Project without adequate protection measures could adversely affect terrestrial resources. Eagle

Crest, as part of its license application, filed numerous monitoring and mitigation measures to protect the existing terrestrial resources. These proposals include measures to protect desert tortoises, including a Raven Monitoring and Control Plan and the purchase of 160 acres of land to compensate for desert tortoise habitat that would be disturbed during construction of the proposed project. Staff finds Eagle Crest's proposed measures largely suitable for the proposed project; however, staff recommends several additions.

The proposed pumped storage project would introduce water to the dry desert environment, potentially increasing suitable habitat for invasive plants. The applicant's Invasive Species Monitoring and Control Plan includes monitoring and treatment of areas disturbed during project construction to reduce potential encroachment of invasive species. However, the operation of the project will increase soil moisture surrounding the project reservoirs and any water seepage areas, which could create suitable conditions for invasive weed establishment. To avoid potential increases of invasive weeds in these areas, we recommend modifying the proposed Invasive Species Monitoring and Control Plan to include the reservoir shorelines and areas near the proposed water supply wells. However, because soil conditions in the existing mine pits may not be conducive to vegetation establishment, staff only recommends initiating monitoring for invasive weeds in these areas once vegetation becomes established.

Construction of the project transmission lines would create potential electrocution and collision hazards for raptors and other avian species in the Chuckwalla Valley. Eagle Crest's proposed transmission line design plan would address potential effects of electrocution, but the proposed plan does not include measures to reduce potential for avian collisions with power lines, provide monitoring and reporting protocol to track avian–powerline interactions, or include a worker education program. Therefore, Eagle Crest should modify, in consultation with FWS, its proposed transmission line design plan to include an avian protection plan. This plan should (1) meet the APLIC/FWS guidelines for an avian protection plan; (2) present designs to reduce the potential for avian electrocution and collisions; (3) provide methods for surveying and reporting project-related raptor mortality and managing nesting on the proposed transmission lines; and (4) include a workers education program.

Eagle Crest conducted surveys for the spadefoot toad in many areas near the project in 2009. However, as a result of site access limitation and modifications to the proposed project's footprint, including staff-recommended transmission line route, not all areas were surveyed for the spadefoot toad. As a result, staff recommends pre-construction surveys for spadefoot toad in areas not previously surveyed and where project construction, operation and maintenance activities would occur. Staff also recommends the same protection measures for the spadefoot toad as proposed for the central project area.

Ravens are a known predator of the threatened desert tortoise. However, the proposed Raven Monitoring and Control Plan does not address other desert tortoise

predators that may increase in numbers as a result of the construction and operation of the project. Therefore, staff recommends that Eagle Crest develop a desert tortoise predator control plan in addition to the proposed Raven Monitoring and Control Plan. This plan should: (1) include baseline and post-construction survey methods for other tortoise predators, including coyotes, wild dogs, and gulls; (2) include mitigation measures to be implemented if the number of predators increases; and (3) include a schedule that initiates post-construction surveys during the second year after project completion, followed by surveys once every 5 years.

Eagle Crest proposes to purchase and conserve about 160 acres of desert tortoise habitat to compensate for project-related disturbance in Category I habitat (within the DWMA) and Category III (suitable habitat outside the DWMA) desert tortoise habitat. Development of this measure was based on the design of the proposed project and the NECO Plan guidelines for 1:1 Compensation in Category III habitat and 5:1 compensation within DWMA. Specific compensation related to the staff alternative would depend on final project design and is expected to range between 6 acres (based on effects of the transmission line) and 375 acres (if Eagle Crest constructs the interconnection substation). To ensure the purchase of compensation lands is appropriately based on project effects, staff recommends Eagle Crest prepare a desert tortoise compensation plan following completion of final project design. The plan should identify acreage of project disturbance within Category I and Category III desert tortoise habitat and identify the proposed acreage and location of compensation lands. The plan should be prepared in consultation with FWS and BLM and filed with the Commission for approval.

Staff estimates that implementation of the terrestrial and threatened and endangered resources measures proposed by Eagle Crest would have an annualized cost of $204,060. Staff estimates that the additional measures that are described above would increase the annualized cost of measures by $8,310. Considering the possible project effects on these resources, staff considers the benefits and protection of terrestrial and threatened and endangered resources to be worth the costs.

Recreation, Land Use, and Aesthetics

Construction, operation, and maintenance of the proposed Eagle Mountain Project could adversely affect recreation, land use, and aesthetics in the project area. Likely effects include increased nighttime sky lighting, limits to some access routes, and inundation of some of the remaining but currently non-economical ore reserves. Most of the effects, other than those from the proposed transmission lines and substation, would be similar to or lesser than effects that occurred during historic operation of the Eagle Mine. Construction and operation of the proposed project would be designed to occur within historical mining pits also proposed for landfill development. Eagle Crest's proposal would be designed to co-exist with the proposed landfill if the two developments are constructed. In addition to designing the project to limit effects on the proposed landfill, Eagle Crest proposes measures to limit the effects of construction on

recreation, land use and aesthetics by coordinating planned road closures and other schedules with the public. Other measures proposed by Eagle Crest including measures associated with lighting of the proposed central project area and construction measures throughout the proposed project, would also limit the effects of lighting on the surrounding environment and avoid some of the visual degradation during the construction of the transmission line and other proposed linear features of the project.

Staff estimates that implementation of the recreation, land use, and aesthetics resources measures proposed by Eagle Crest would have an annualized cost of $17,140. Staff estimates that the additional measures that are described above would increase the annualized cost of measures by $804,010. This cost difference is largely the result of the incremental cost increase of staff's recommended transmission route and substation, as compared with the applicant's proposed route. Staff's recommended route would protect a wide range of resources, including terrestrial and threatened and endangered species, aesthetics, and cultural resources. Considering the possible project effects on these resources, staff considers the protection of these resources to be worth the costs.

Cultural Resources

Construction, operation, and maintenance of the proposed Eagle Mountain Project without adequate protection measures could adversely affect properties that are eligible for listing on the National Register. Eagle Crest filed an HPMP in September 2009 for the purpose of protecting and interpreting historic properties. The HPMP was revised in December 2009.

Staff finds that the HPMP adequately identifies the APE, describes the cultural resources inventories that were conducted within the APE, identifies potential disturbances to historic properties, and provides for the appropriate treatment of the CRA, Eagle Mountain mine and town site, and TCPs that may be identified in the future. The HPMP also provides procedures for handling unanticipated discoveries and the proper treatment of human remains and sacred objects, if they are encountered. However, staff's review of the HPMP reveals that the plan does not correctly identify the Eagle Mountain mine, town site, and associated railroad as a potential historic property that meets the age criteria for inclusion on the National Register and may be eligible for listing. Additionally, the HPMP does not provide for frequent enough reporting during construction and subsequent HPMP implementation reporting, and curation of archaeological materials that could be recovered during test or data recovery excavations that may become necessary. Further, although the HPMP does provide for cultural resources monitoring, it does not clearly specify the circumstances under which monitoring would be required or a means by which an appropriate Native American monitor would be determined. Further, it does not call for consultation with Native American tribes regarding employee training and public interpretation programs. Finally, because the 2009 HPMP was prepared prior to Eagle Crest's July 2010 Supplemental Information filing, it does not discuss the additional APE that includes the State Water

Board's recommended transmission line corridor and substation location or the potential effects on historic properties.

For these reasons, staff recommends that the HPMP be approved with the following additional modifications:

- Annual HPMP implementation reporting during and after construction;
- Curation of recovered archaeological materials;
- Specific criteria that would determine the need for cultural resources monitoring and a plan to identify appropriate Native American involvement;
- A plan to include interested Native American tribes in the development of staff training and public interpretation programs;
- A detailed discussion of the expanded APE alternatives, including revised APE maps;
- A description of the sites documented by Schaefer (2010) and located within the expanded APE;
- Inclusion of a detailed plan and schedule for National Register evaluations, assessment of effects, and identification of measures to resolve adverse effects of project construction, operations and maintenance on any of the 39 sites identified within the specific Commission staff recommended transmission line corridor and substation location, including the appropriate consultation process with the participating tribes, BLM, and California SHPO; and
- Measures for handing newly discovered paleontological remains, and reporting such discoveries to BLM.

Implementation of the HPMP with staff's additional measures would ensure that adverse effects on historic properties as a result of project operation and maintenance or other project-related activities would be addressed over the term of a license. Staff anticipates that any license issued for the project would include a condition to implement a PA executed among the Commission, the California SHPO, and the Advisory Council on Historic Preservation, if the Council chooses to participate. Eagle Crest, BLM, and others would be invited to sign the PA as concurring parties. The PA would include a measure to implement the HPMP with staff's additional measures.

Staff estimates that implementation of the protective measures proposed in Eagle Crest's HPMP would have an annualized cost of $22,860. Staff estimates that the additional measures that are list above would increase the annualized cost of measures included in the HPMP by $6,200. Considering the extent of cultural heritage that is present in the project area, staff considers the benefits to cultural resources to be worth the costs.

Socioeconomics

Under Eagle Crest's proposal, project construction would provide about 100 jobs during the peak construction period and would provide revenues to county and local government through property, sales, and use taxes. Project operation would provide about 30 jobs, as well as substantial property tax payments. During both construction and operation, staff anticipates tax payments would more than compensate for any increase in the need for government services. No residences or businesses would be displaced due to construction and operation of the project.

Air Quality and Noise

The vehicles and machinery used for the project construction would result in substantial amounts of emissions. However, most emissions are expected to remain below the state air quality levels except for Nitrogen Oxide. Eagle Crest proposes to consult with the Park Service to develop and implement a 2-year air monitoring study. Monitoring results would be used to adjust the construction workload if any air quality exceedances are observed during the later portions of the construction. During operation of the project, the annual offset of emissions by the proposed project is estimated at about 1,443,260 tons of CO_2 as compared to a conventional fossil fueled peaking generation facility of the same size.

Compliance with the applicable County noise ordinance codes during construction would minimize the effects of noise levels during construction. Eagle Crest's proposed measures would lower the noise level during construction by equipping all construction equipment with properly operating and maintained noise mufflers and intake silencers, consistent with manufacturers' standards.

5.3 UNAVOIDABLE ADVERSE EFFECTS

Unavoidable adverse effects are those that cannot be reversed except in the extreme long term. Unavoidable adverse effects within the project area are the following:

- About 1,700 acre-feet per year of the groundwater used to fill and maintain the reservoirs would evaporate.
- Visual impacts of the project structures, especially the transmission line and substation, would be irreversible but would be limited by mitigation measures and the recommended route and location.
- Construction of the project would eliminate between 35 and 46 acres of currently undisturbed desert habitat.

5.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) of the FPA, 16 U.S.C.§803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with the federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. Staff reviewed 13 comprehensive plans that are applicable to the Eagle Mountain Project, located in California. No inconsistencies were found.

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